

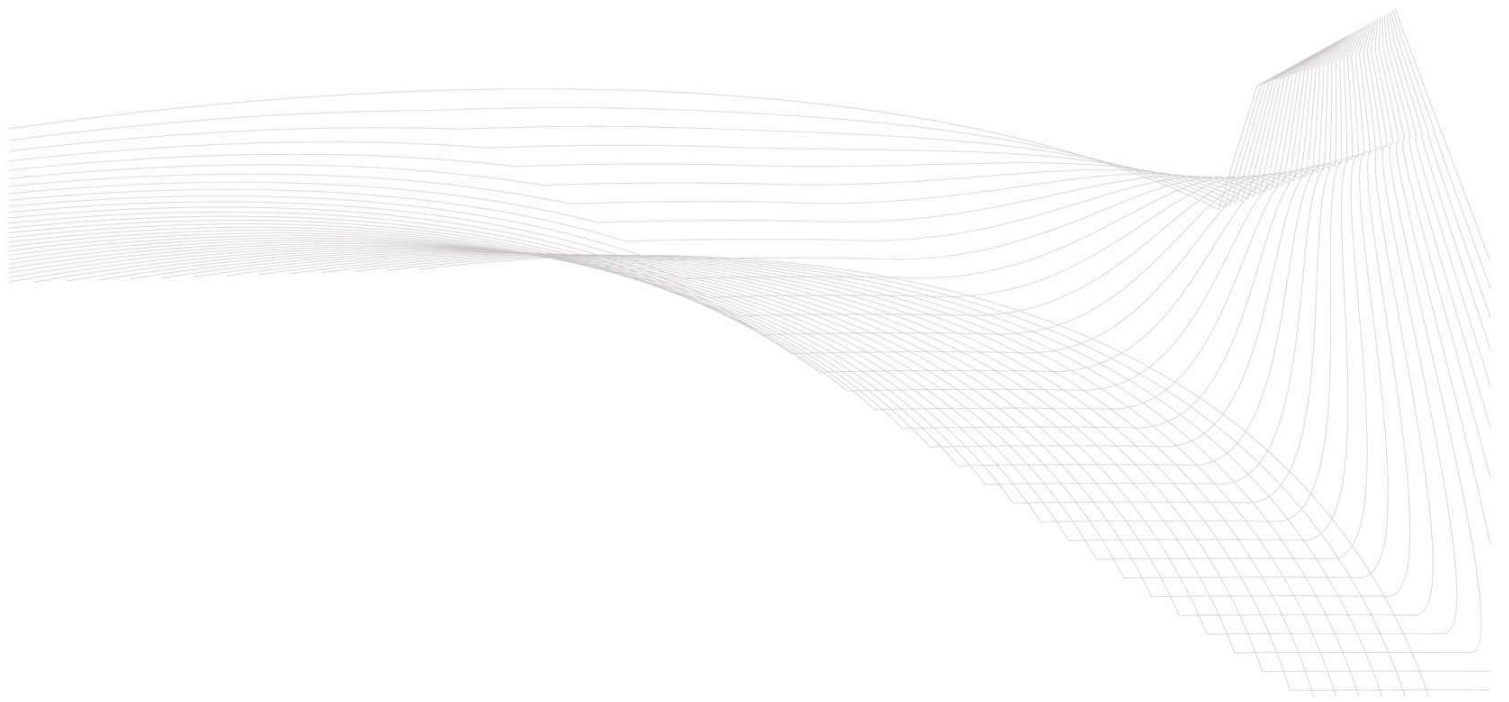


**Noise Impact  
Assessment**

**Train Support Facility**

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**Pacific National**





*Prepared For:*

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**Noise Impact  
Assessment  
Train Support Facility**

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## EXECUTIVE SUMMARY

Advitech was engaged by Monteath and Powys to prepare an assessment of potential noise impacts associated with the construction and operation of a Train Service Facility (TSF) at Greta. The facility will be operated by Pacific National and provide essential support to its coal haulage business in the Hunter Valley.

Long term background monitoring data was supplemented with operator attended noise monitoring to characterise the existing noise environment at 6 locations adjacent to the proposed TSF. These receiving environments were considered representative of a mix of rural, suburban and urban receiver types, depending on the level of influence of existing transportation and environmental noise sources. Existing transportation noise associated with the Main Northern Railway and the New England Highway was audible in all receiving environments, and found to present the dominant contribution to ambient noise levels at receivers in Greta, Illalong, Branxton and isolated residences on the New England Highway.

Existing noise levels from transportation sources during the night period were found to exceed the acceptable  $L_{Aeq,period}$  noise levels for the identified receiver types provided in the NSW Industrial Noise Policy. Accordingly, the Project Specific Noise Levels (PSNL) for all but one receiving environment were established in terms of the intrusiveness criteria.

Noise impact modelling was undertaken using the Environmental Noise Model (ENM) and Sound Power Level (SWL) data obtained from measurements at existing Pacific National operations. Review of prevailing meteorological conditions was also undertaken such that environmental propagation influences could be appropriately assessed.

Assessment of the impact modelling results indicates the proposed TSF operations will comply with the relevant criteria under worst case meteorological conditions at receivers in the Tuckers Lane, North Rothbury and Branxton receiving environments. Minor exceedences may be observed under worst case meteorological conditions at some receivers in the Greta and New England Highway receiving environments. Impacts are likely to exceed the intrusiveness criteria at these locations, however are compliant with the amenity criteria. Review of these predictions against ambient noise impacts indicates the impact is minor and likely to be masked by existing transportation sources.

Impacts above the PSNL are also expected at receivers on Mansfield Road, Illalong, directly adjacent to the proposed site access. Assessment of modelling outputs indicates these impacts can be ameliorated by the construction of a noise barrier adjacent to the site entrance.

Impact predictions for the TSF were also reviewed against potential impacts associated with the construction of the Hunter Expressway and expansion of the Main Northern Railway to include a third line. The results of this assessment indicate that impacts associated with these cumulative changes to the noise environment may lead to exceedence of the amenity criteria in some receiving environments. Further analysis of the contribution from TSF operations indicates noise levels generated by the TSF will be significantly lower than those generated by the Hunter Expressway and Third Rail projects, and will effectively make no contribution to the cumulative noise impacts in receiving environments around Greta, Illalong and Branxton.

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## 1. INTRODUCTION

Advitech Pty Limited was engaged by Monteath and Powys Pty Ltd to prepare a Noise Impact Assessment (NIA) of potential noise impacts associated with the development of a Train Support Facility (TSF) at Greta, NSW. Pacific National proposes to construct and operate the facility to provide support to its coal haulage business in the Hunter Valley. The location of the proposed facility is provided in **Figure 1**. The site is currently zoned Rural 1a pursuant to the Cessnock Local Environment Plan (LEP) 1989 and is located between the existing Northern Railway and the proposed F3 freeway extension to Branxton. The purpose of this assessment is to provide an analysis of potential noise impacts associated with the construction and operation of the TSF.

It should be noted that Revision 1 of this document presents an amended version of the assessment following review undertaken by the NSW Department of Planning. This revision (Revision 2) supersedes earlier published versions of the assessment.

It should be noted that this report was prepared by Advitech Pty Limited for Monteath and Powys (“the customer”) in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

### 1.1 Site Location and Surrounding Land Uses

The site is located at Lot 300, DP1117342 Mansfield Road, Greta (**Figure 1**). The site has an area of approximately 46 hectares and is zoned 1(a) Rural pursuant to the Cessnock LEP (1989). The site surrounds include:

- 2(b) Village zoned residential development to the east (Greta);
- 1(c) Rural Residential development to the south-east (Illalong);
- 1(a) Rural development to the south (adjacent to Tuckers Lane);
- 2(b) Village zoned residential development to the west (North Rothbury);
- 2(a) Residential zoned urban development to the north-west (Branxton); and
- 1(a) Rural development to the north (adjacent to the New England Highway);

The LEP zoning maps for the areas adjacent to the proposed site are provided in **Figure 2**.



Figure 1: Site Location

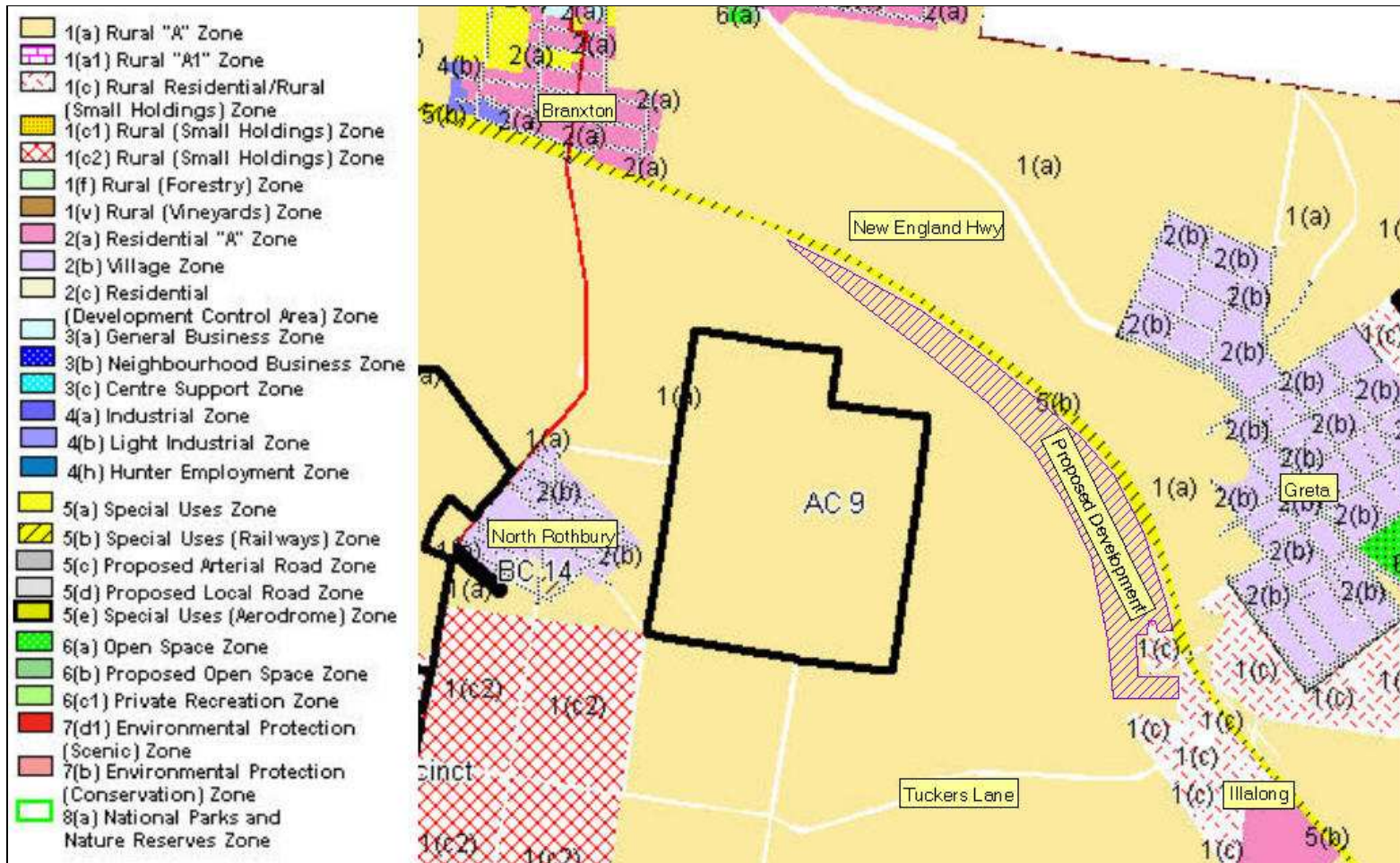


Figure 2: Zoning Plan

## 1.2 Project Description

Pacific National's intention is to establish the Greta site as a train support facility. The new facility is required to meet the expected growth in coal exports through the Newcastle Port and will allow Pacific National to not only achieve its business objectives but to also meet responsibilities within the Hunter Valley coal chain. The development is referred to as a Train Support Facility, which includes the infrastructure required to service trains as well as provide the administration and ancillary development associated with the project.

### 1.2.1 Train Support Facility

The facility will operate as a service point for Pacific National's existing trains that utilise the Main Northern Railway. On return trips from delivering commodities to the Port of Newcastle, empty trains will utilise the proposed Greta facility to be re-fuelled, maintained and when necessary change crews. The trains currently operate 24 hours a day, seven days a week, and as a result the facility needs to be available to service the trains on this basis. Once the trains have been re-fuelled and serviced, they will return to the Main Northern Railway for their intended destination. Minor planned maintenance works would also be undertaken at the facility.

The layout of the proposed development is provided in **Figure 3**.

### 1.2.2 Development Staging

Development of the facility will be undertaken in a construction stage and three (3) operational stages. These stages include:

- **Construction** - vegetation clearance, bulk earthworks, establishment of internal stabling roads and establishment of site buildings and ancillary infrastructure;
- **Stage 1 Operations** -the facility will operate 24 hours a day, 7 days per week with approximately 10 trains serviced by the facility per day. The facility at this stage will have capacity to house 3 trains (totalling 9 locomotives and 273 wagons). Stage 1 operations are proposed to commence immediately upon commissioning of the facility.
- **Stage 2 Operations** - the facility will operate 24 hours a day, 7 days per week with approximately 15 trains serviced by the facility per day. The facility at this stage will have capacity to house 5 trains (totalling 15 locomotives and 455 wagons). Stage 2 operations are proposed to commence in 2014; and
- **Stage 3 Operations** - the facility will operate 24 hours a day, 7 days per week with approximately 25 trains serviced by the facility per day. The facility at this stage will have capacity to house 5 trains (totalling 15 locomotives and 455 wagons). Stage 3 operations are proposed to commence in 2018.

### 1.3 Sensitive Receivers

A number of potentially noise sensitive receivers were identified adjacent to the proposed development site including residential receivers:

- to the east at Greta;
- to the south-east at Illalong;
- to the south off Tuckers Lane;
- to the west at North Rothbury;
- to the north-west at Branxton; and
- to the north off the New England Highway.

A number of noise sensitive non-residential receivers were also identified within the receiving environments adjacent to the proposed development. These receivers are identified as:

- Greta Public School (Wyndham St);
- Greta Community Pre-school (Water St);
- Greta Arts and Sports Community Hall (Water St); and
- various commercial receivers on the New England Highway.

The location of potentially sensitive receivers adjacent to the development site is shown in **Figure 4**.

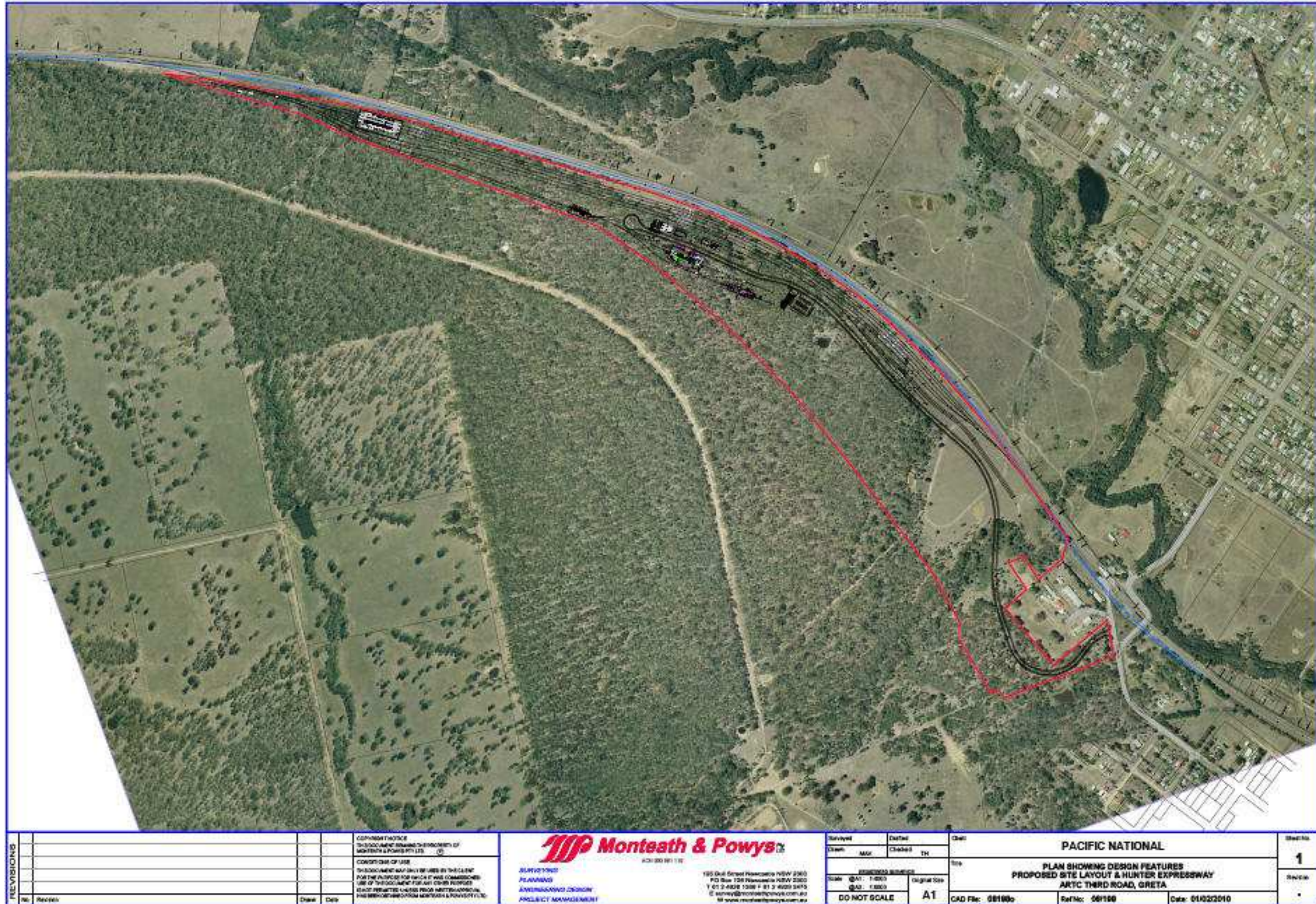


Figure 3: Proposed Site Arrangement



Figure 4: Location of Sensitive Receivers

## 2. NOISE ASSESSMENT CRITERIA

### 2.1 Director General's Requirements

The NSW Department of Planning (DoP) provides the following Director General's Requirements for the assessment of potential noise and vibration impacts of the proposed TSF at Greta:

- noise and vibration from all activities and sources on and off site and impacts to receivers;
- the noise assessment must consider the impact from the project in isolation and in a cumulative context with relevant existing and approved development, including development of the Hunter Expressway and the third railway line between Maitland and Minimbah; and
- taking into account the *NSW Industrial Noise Policy* (DECC, 2000), the *NSW Environmental Criteria for Road Traffic Noise* (EPA, 1999) and the *Interim Construction Noise Guideline* (DECC, 2009).

### 2.2 EPA Criteria for Industrial Noise Sources

The NSW Industrial Noise Policy (INP) presents two criteria for the assessment of industrial noise sources, intrusive noise impacts and noise amenity levels. In assessing the noise impact of industrial sources both components are considered for sensitive receivers. Typically the more stringent of these criteria would be applied as the Project Specific Noise Level (PSNL) for the development as a means of managing intrusive noise impacts and preserving the amenity of the receiving environment.

#### 2.2.1 Intrusive Noise Impacts

The intrusiveness of an industrial noise source is generally considered acceptable if the predicted  $L_{Aeq,15\text{minute}}$  impact does not exceed the background noise level by more than 5 dB when measured in the absence of the source. The background noise level, or Rating Background Level (RBL), is determined in accordance with Section 3 of the INP and is the median value of the Assessment Background Levels (ABL) determined for the monitoring period. The use of the median accounts for noise level variations over time. The intrusiveness criterion is equal to the RBL + 5.

#### 2.2.2 Amenity Noise Level

To limit continuing increases in noise levels, the EPA has identified recommended maximum ambient noise levels for typical receiver areas and land uses. The relevant section of *Table 2.1* of the INP has been reproduced as **Table 1**. Where the existing background noise level from industrial noise sources is close to the Acceptable Noise Level (ANL) for that receiver type, Section 2 of the INP (reproduced as **Table 2**) establishes the requirements for applying a modification factor to account for the existing level of industrial noise. The aim of this component of the INP is to protect against cumulative noise impacts associated with rapid development within the receiving noise environment.

**Table 1: Recommended L<sub>Aeq</sub> noise levels from industrial noise sources**

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended Acceptable Level dB(A)	Recommended Maximum dB(A)
Residential	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/Industrial Interface	Day	65	70
		Evening	55	60
		Night	50	55
School - internal	All	Noisiest 1-hr	35	40
Place of worship - internal	All	When in use	40	45
Passive recreation	All	When in use	50	55
Active recreation	All	When in use	55	60
Industrial Premises	All	When in use	70	75

*Source: Environment Protection Authority INP Table 2.1 (2000)*

**Table 2: Modification to Acceptable Noise Level (ANL) to account**

Total Existing L <sub>Aeq</sub> from Industrial Sources	Maximum L <sub>Aeq</sub> for Noise from New Sources Alone
≥ Acceptable Noise Level plus 2	If existing noise level is likely to decrease in future: ANL minus 10  If existing noise level is unlikely to decrease in future: Existing level minus 10
Acceptable Noise Level plus 1	Acceptable noise level minus 8
Acceptable Noise Level	Acceptable noise level minus 8
Acceptable Noise Level minus 1	Acceptable noise level minus 6
Acceptable Noise Level minus 2	Acceptable noise level minus 4
Acceptable Noise Level minus 3	Acceptable noise level minus 3
Acceptable Noise Level minus 4	Acceptable noise level minus 2
Acceptable Noise Level minus 5	Acceptable noise level minus 2
Acceptable Noise Level minus 6	Acceptable noise level minus 1
<Acceptable Noise Level minus 6	Acceptable noise level

*Source: Environment Protection Authority INP Table 2.2 (2000)*

### 2.2.3 Background Noise Monitoring

Background noise monitoring is undertaken in order to determine the character of the ambient noise environment adjacent to the proposed development. The monitoring locations selected should be representative of the noise environments at sensitive receivers adjacent to the proposed development.

### 2.2.4 Project Specific Noise Levels

Project specific noise levels for the development are assigned after determining the relevant noise levels from the intrusiveness and amenity criteria. The project specific noise levels typically reflect the most stringent noise level requirement derived from the intrusiveness and amenity criteria. They set the benchmark against which noise impacts and the need for noise mitigation are assessed.

### 2.2.5 Meteorological Conditions

The INP notes that meteorological conditions such as temperature inversions and prevailing winds may increase noise levels by focusing sound wave propagation paths towards a single point. Analysis of prevailing meteorological conditions with potential to influence noise propagation is presented in **Section 4**.

### 2.2.6 Predicting Noise Levels

Having determined the project-specific noise levels the objective is to accurately predict the noise impact from an industrial noise source. The INP presents the following procedure:

1. identify all possible source, site and receiver parameters so that noise can be adequately predicted;
2. predict noise levels from the source at receiver locations, taking into account all important parameters including the source noise levels and locations, operating times, receiver locations, weather conditions applicable to the site, site features and topography, as well as the project-specific noise levels; and
3. compare the predicted noise level with the project-specific noise levels to determine the noise impact.

The INP requires noise impacts to be quantified at all potentially affected receivers. Specifically, the noise levels predicted should correspond to the noise descriptor of the project-specific noise levels applicable to the project. Any assumptions made when determining descriptors should be clearly validated and reported in the noise assessment.

The noise impact of the development can then be determined by comparing the predicted noise level at the receiver with the project-specific noise levels that have been derived for that particular location. The extent of noise impact from the development is defined by the extent to which the predicted noise levels exceed the project-specific noise levels and the number of receivers affected.

### 2.2.7 Modifying Factors

Where the noise source contains annoying characteristics such as tonality, impulsiveness, intermittency, irregularity or dominant low frequencies the INP requires a modifying factor adjustment to the source noise level. This allows a representative comparison of noise levels to be made. Table 4.1 of the INP outlines the modifying factors with the relevant adjustment for this assessment shown in **Table 3**.

**Table 3: Modifying Factor correction**

Factor	Assessment/ Measurement	When to Apply	Correction
Tonal Noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by:  5 dB or more if the centre frequency of the band containing the tone is above 400 Hz  8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive  15 dB or more if the centre frequency of the band containing the tone is below 160 Hz	+5 dB
Low frequency noise	Measurement of A-wt and C-wt noise levels	Measure A-wt and C-wt noise levels over same time period. Correction to be applied if the difference between the two levels exceeds 15dB	+ 5dB
Impulsive Noise	A-weighted fast response and impulse response	If difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2dB	+5 dB

Source: Environmental Protection Authority INP Table 4.1 (2000)

### 2.3 EPA Sleep Disturbance Guidelines

Part 2 of the *Noise Guide for Local Government* (2004) notes that noise control measures should be applied to protect people from sleep arousal. Although the noise level required to awaken a person from their sleep is dependent on the individual and the stage of their sleep pattern, AS2107 - 1987 recommends a bedroom noise level of 25-30 dB(A).

The *Noise Guide for Local Government* recommends the  $L_{A1,1\text{minute}}$  noise level should not exceed the RBL by more than 15 dB when measured outside the bedroom window.

### 2.4 Road Traffic Noise Guidelines

The EPA's *Environmental Criteria for Road Traffic Noise* (1999) provides a framework for the management of traffic noise issues associated with new developments near existing or new roads, and new or upgraded road developments adjacent to new or planned building developments. Traffic generated by the proposed development should comply with the EPA *Environmental Criteria for Road Traffic Noise*  $L_{Aeq,period}$  day time and night time traffic noise levels (the relevant section is reproduced in **Table 4**) for traffic moving through Greta via Nelson Street.

**Table 4: Road traffic noise criteria**

Type of Development	Criteria, dB(A)	Where Criteria is already Exceeded
8. Land use developments with potential to create additional traffic on collector roads	Day time $L_{Aeq(1hr)}$ 60 Night time $L_{Aeq(1hr)}$ 55	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria.  In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

Source: *Environmental Criteria for Road Traffic Noise Table 1* (1999)

## 2.5 NSW Construction Noise Guideline

The NSW Interim Construction Noise Guideline (2009) provides guidance on managing construction works to minimise noise, with an emphasis on communication with and cooperation from all stakeholders affected by construction noise. The guideline does not identify a single approach for managing construction noise, rather it provides a framework for assessing construction noise impacts based on the complexity of the project and condition of the ambient noise environment.

The framework identifies the following steps for managing construction noise impacts:

- identify any sensitive land uses that may be affected;
- identify the operating hours and duration of the proposed construction works;
- determine the noise impacts at sensitive receivers; and
- select and apply the best work practices to minimise noise impacts.

The scale and duration of the construction works, and the number and type of potentially affected sensitive receivers defines the extent to which assessment and management of impacts should be undertaken. The guideline provides both qualitative and quantitative assessment methodologies.

The qualitative approach prioritises the implementation of worksite noise controls over detailed assessment of impacts and is applied in the case of small scale, short duration project such as essential road maintenance or the construction of a residential dwelling.

The quantitative approach is applied to larger projects with potential to affect many sensitive receivers over a longer period of time, or during noise sensitive periods (6pm to 7am) and requires that assessment of potential impacts be undertaken prior to the implementation of management strategies. The quantitative approach establishes management levels for airborne noise incident at typical receiver types as shown in **Table 5**

**Table 5: Construction noise management level**

Receiver Type	Management Level, dB(A) ( $L_{Aeq,15minute}$ )
<b>Residential<sup>1</sup></b>	
Management level	RBL + 10dB(A)
Highly noise affected	75 dB(A)
<b>Other Sensitive Land Uses<sup>2</sup></b>	
Classroom at school and other educational institutions	50 dB(A) (internal)
Hospital wards & operating theatres	40 dB(A) (internal)
Places of worship	45 dB(A) (internal)
Active recreation areas	65 dB(A) (external)
Passive recreation areas	60 dB(A) (external)
<b>Commercial and Industrial Premises<sup>2</sup></b>	
Industrial Premises	75dB(A) (external)
Commercial (offices, retail outlets)	70dB(A) (external)

1. Management level for residential receivers during standard hours (7am to 6pm). Management level for residential premises outside standard hours is RBL + 5 dB(A).

2. Management level for commercial, industrial and other sensitive land use applies only when in use.

### 3. ENVIRONMENTAL NOISE ASSESSMENT

#### 3.1 Continuous Noise Monitoring

Background noise monitoring was undertaken in six (6) sensitive receiving environments adjacent to the proposed development site. The location of the monitoring sites is provided in **Figure 5**. The details of the continuous data logger used for the monitoring are provided in **Table 6**.

**Table 6: Monitoring details**

Measurement Title	Hunter St, Greta	Mansfield St, Illalong	Tuckers Lane	Scott St, North Rothbury	Queen St, Branxton	New England Hwy
Receiver ID	R1	R2	R3	R4	R5	R6
Serial Number	194444	194531	194538	16-299-450	194410	16-203-513
Run Started	4/9/2009 18:00	4/9/2009 18:00	4/9/2009 18:00	4/9/2009 18:00	4/9/2009 18:00	4/9/2009 18:00
Run Stopped	17/9/2009 6:45	16/9/2009 10:00	17/9/2009 6:45	15/9/2009 18:45	16/9/2009 21:45	17/9/2009 6:45
Frequency Wt	A	A	A	A	A	A
Time Response	Fast	Fast	Fast	Fast	Fast	Fast
Engineering Units	dB(A) SPL	dB(A) SPL	dB(A) SPL	dB(A) SPL	dB(A) SPL	dB(A) SPL
Pre-Mes. Ref	94.0	n/a <sup>1</sup>	94.0	94.1	93.6	92.3
Post-Mes. Ref	93.9	n/a <sup>1</sup>	94.0	n/a <sup>2</sup>	93.8	92.1

Note 1. Pre-measurement and post measurement references were not written to the monitoring results file.

Note 2. Post measurement reference was not taken as logging was terminated prematurely due to battery depletion.

The continuous noise data loggers recorded the following data at 15 minute statistical intervals:

- date, time and temperature;
- maximum and minimum noise levels measured during the interval;
- the equivalent continuous noise level for the interval; and
- statistical noise levels representative of the noise environment.

**Tables 8 to 13** show the ABL's for all valid data at each of the monitoring locations. There are a number of periods that are invalid due to strong winds and rainfall which occurred during the monitoring period. This data was excluded in accordance with validation rules established in Appendix B of the INP.

The  $L_{A1}$ ,  $L_{A10}$ ,  $L_{A90}$  and  $L_{Aeq}$  noise levels for the continuous noise loggers are presented graphically in **Appendix I**.



Figure 5: Background monitoring locations

### 3.2 Noise Monitoring Results

Review of the Cessnock LEP (1989) and the results of operator attended monitoring indicates the receiving environment adjacent to the proposed development is characterised by three (3) distinct receiver types as defined in the INP:

**Rural** - an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic. Such areas may include:

- an agricultural area, except those used for intensive agricultural activities;
- a rural recreational areas such as resort areas;
- a wilderness area of national park; or
- an area generally characterised by low background noise levels (except in the immediate vicinity of industrial noise sources).

This area may be located in either a rural, rural-residential, environment protection zone or scenic protection zone, as defined on a council zoning map (LEP) or other planning instrument.

**Suburban** - an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristics:

- decreasing noise levels in the evening period (1800 to 2200); or
- evening noise levels defined by the natural environment and infrequent human activity;

This area may be located in either a rural, rural-residential or residential zone, as defined on an LEP or other planning instrument.

**Urban** - an area with an acoustical environment that:

- is dominated by *urban hum* or industrial noise sources;
- has through traffic with characteristically heavy and continuous traffic flows during peak periods; or
- is near commercial districts or industrial districts.

Where *urban hum* means the aggregate sound of many unidentifiable, mostly traffic-related sound sources.

This area may be located in either a rural, rural-residential or residential zone, as defined on an LEP of other planning instrument and also includes missed land-use zones such as mixed commercial and residential uses.

A summary of the receiving environments and the receiver types that characterise these environments is provided in **Table 7**.

**Table 7: Characterisation of receiving environments**

Receiving Environment	Receiver ID	Receiver Type
Greta (east of development)	R1	Urban
Illalong (south-east of development)	R2	Suburban
Tuckers Lane (south of development)	R3	Rural
North Rothbury (west of development)	R4	Rural
Branxton (north-west of development)	R5	Suburban
New England Highway (north of development)	R6	Urban

Receiving environments along the New England Highway around Greta are zoned 1(a) Rural and 2(b) Residential, but are significantly influenced by the passage of traffic at all times during the day and night. These receivers are best characterised as Urban receiver types.

Receiving environments around Branxton and Illalong are zoned 2(a) Residential and 1(c) Rural-residential respectively. These areas are subject to less influence by traffic noise and exhibit decreasing ambient noise levels during the evening and night, and are therefore characterised as Suburban receiver types.

Receiving environments around Tuckers Lane and North Rothbury are zoned 1(a) Rural and 2(b) Residential respectively, but typically experience very low background noise levels defined by the natural environment. These receiving environments are characteristic of the Rural receiver type.

The passage of trains on the existing Northern Railway is audible at all receiver locations. The results of attended monitoring used to characterise the background noise environment are presented in **Appendix II**.

### **3.2.1 Project Specific Noise Levels**

The RBL and Intrusiveness Criteria presented in **Tables 8 to 13** were determined for each monitoring location in accordance with guidelines established in Sections 2 and 3 of the INP. Periods for which the ABL is not presented were omitted from the analysis based on the data exclusion rules outlined in Appendix B of the INP.

### **3.2.2 Sleep Disturbance Criteria**

The sleep disturbance criteria defined in Part 2 of the Noise Guide for Local Government dictate that  $L_{A1}$  noise levels do not exceed the  $L_{A90}$  background levels by more than 15dB. For the purposes of this assessment background noise levels are considered equal to the Rating Background Level for each of the receiving environments as determined by background noise monitoring.

### 3.2.2.1 Background Noise Monitoring - Hunter St, Greta (R1)

The mean  $L_{Aeq}$  and corresponding Amenity Criteria for the Hunter St, Greta monitoring location are presented in **Table 8**. The recommended  $L_{Aeq}$  noise level used to determine the Amenity Criteria is the *Acceptable Urban* level from Table 2.1 in the INP.

**Table 8: Background noise results - Hunter St, Greta**

Time Period	Day (0700 to 1800)	Evening (1800 to 2200)	Night (2200 to 0700)
4/09/2009	-	39.2	-
5/09/2009	39.0	40.3	32.0
6/09/2009	38.0	38.5	30.7
7/09/2009	-	-	31.7
8/09/2009	41.0	38.5	32.7
9/09/2009	43.9	39.0	32.5
10/09/2009	44.0	40.0	33.9
11/09/2009	40.0	43.3	31.0
12/09/2009	39.6	41.5	34.2
13/09/2009	-	41.5	33.5
14/09/2009	38.7	34.5	28.7
15/09/2009	39.0	36.8	31.9
16/09/2009	39.5	36.3	29.0
Rating Background Level (RBL)	40	39	32
<b>Intrusiveness Criteria <math>L_{Aeq,15min}</math> (RBL +5)</b>	<b>45</b>	<b>44</b>	<b>37</b>
Mean $L_{Aeq}$	53	50	50
Recommended Acceptable $L_{Aeq}$ Noise Level (Urban)	60	50	45
<b>Amenity Criteria<sup>1</sup></b>	<b>60</b>	<b>50</b>	<b>45</b>
<b>Project Specific Noise Level</b>	<b>45</b>	<b>44</b>	<b>37</b>

1. Existing mean  $L_{Aeq}$  noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP, whereby transportation (road and rail) noise is distinguished from site-specific industrial noise sources. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

Assessment of attended noise monitoring results for this location presented in **Appendix II** indicates the night-time noise environment is dominated by the passage of vehicles on the New England Highway. The passage of passenger and heavy vehicles generates noise levels of up to 55 dB(A) in the receiving environment to the south-west of the highway. The impact of trains passing on the northern line is also significant at this location, generating pass by noise levels up to 60 dB(A). Typical pass by times for trains was observed to be on the order of two minutes, dependant on the direction of travel.

### 3.2.2.2 Background Noise Monitoring - Mansfield St, Illalong (R2)

The mean  $L_{Aeq}$  and corresponding Amenity Criteria for the Mansfield St, Illalong monitoring location are presented in **Table 9**. The recommended  $L_{Aeq}$  noise level used to determine the Amenity Criteria is the *Acceptable Suburban* level from Table 2.1 in the INP.

**Table 9: Background noise results - Mansfield St, Illalong**

Time Period	Day (0700 to 1800)	Evening (1800 to 2200)	Night (2200 to 0700)
4/09/2009	-	37.0	-
5/09/2009	36.2	38.0	32.5
6/09/2009	35.5	37.5	32.0
7/09/2009	-	-	32.0
8/09/2009	35.0	34.5	31.5
9/09/2009	39.9	35.0	32.2
10/09/2009	40.9	33.5	31.5
11/09/2009	35.0	39.5	30.5
12/09/2009	35.0	36.5	30.5
13/09/2009	-	37.5	31.5
14/09/2009	33.8	34.5	29.5
15/09/2009	35.0	37.0	32.7
16/09/2009	-		
Rating Background Level (RBL)	35	37	32
<b>Intrusiveness Criteria <math>L_{Aeq,15min}</math> (RBL +5)</b>	<b>40</b>	<b>42</b>	<b>37</b>
Mean $L_{Aeq}$	56	56	57
Recommended Acceptable $L_{Aeq}$ Noise Level (Suburban)	55	45	40
<b>Amenity Criteria<sup>1</sup></b>	<b>55</b>	<b>45</b>	<b>40</b>
<b>Project Specific Noise Level</b>	<b>40</b>	<b>40<sup>2</sup></b>	<b>37</b>

1. Existing mean  $L_{Aeq}$  noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP, whereby transportation (road and rail) noise is distinguished from site-specific industrial noise sources. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

2. Evening PSNL set at a level equal to the daytime PSNL in accordance with guidance established in the INP Application Notes

Assessment of attended noise monitoring results for this location presented in **Appendix II** indicates the night-time noise environment is dominated by the passage of vehicles on Mansfield Road and the passage of trains on the northern line. Pass by road noise levels of up to 60 dB(A) were observed at residential receivers adjacent to the existing Mansfield Road rail overpass. The passage of trains at this location generates noise levels of up to 68 dB(A) with typical pass by times on the order of 2 minutes. The passage of vehicles on the New England Highway was also audible at this location.

### 3.2.2.3 Background Noise Monitoring -Tuckers Lane (R3)

The mean  $L_{Aeq}$  and corresponding Amenity Criteria for the Tuckers Lane monitoring location are presented in **Table 10**. The recommended  $L_{Aeq}$  noise level used to determine the Amenity Criteria is the *Acceptable Rural* level from Table 2.1 in the INP.

**Table 10: Background noise results - Tuckers Lane**

Time Period	Day (0700 to 1800)	Evening (1800 to 2200)	Night (2200 to 0700)
4/09/2009	-	45.2	-
5/09/2009	32.0	41.5	36.7
6/09/2009	31.5	44.5	36.0
7/09/2009	-	-	37.2
8/09/2009	33.0	42.5	37.2
9/09/2009	35.9	41.0	36.2
10/09/2009	39.0	38.8	34.0
11/09/2009	31.2	38.0	34.5
12/09/2009	31.6	41.8	35.2
13/09/2009	-	44.8	37.2
14/09/2009	32.2	41.8	31.5
15/09/2009	32.0	44.5	32.0
16/09/2009	32.0	41.0	30.7
Rating Background Level (RBL)	32	42	36
<b>Intrusiveness Criteria <math>L_{Aeq,15min}</math> (RBL +5)</b>	<b>37</b>	<b>47</b>	<b>41</b>
Mean $L_{Aeq}$	56	51	50
Recommended Acceptable $L_{Aeq}$ Noise Level (Rural)	50	45	40
<b>Amenity Criteria<sup>1</sup></b>	<b>50</b>	<b>45</b>	<b>40</b>
<b>Project Specific Noise Level</b>	<b>37</b>	<b>37<sup>2</sup></b>	<b>37<sup>2</sup></b>

1. Existing mean  $L_{Aeq}$  noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP, whereby transportation (road and rail) noise is distinguished from site-specific industrial noise sources. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

2. Evening and night PSNL set at a level equal to the daytime PSNL in accordance with guidance established in the INP Application Notes.

Assessment of attended noise monitoring results for this location presented in **Appendix II** indicates noise levels are dominated by the natural environment at this location. Trains on the northern line are audible at this location, generating pass by noise levels of 38 to 40dB(A). Heavy vehicles on the New England Highway are also audible in this receiving environment, however only as a distant background source.

### 3.2.2.4 Background Noise Monitoring - Scott St, North Rothbury (R4)

The mean  $L_{Aeq}$  and corresponding Amenity Criteria for the Scott St, North Rothbury monitoring location are presented in **Table 11**. The recommended  $L_{Aeq}$  noise level used to determine the Amenity Criteria is the *Acceptable Rural* level from Table 2.1 in the INP.

**Table 11: Background noise results - Scott St, North Rothbury**

Time Period	Day (0700 to 1800)	Evening (1800 to 2200)	Night (2200 to 0700)
4/09/2009	-	36.8	-
5/09/2009	32.1	32.3	26.3
6/09/2009	31.7	34.2	27.0
7/09/2009	-	-	27.2
8/09/2009	36.0	34.4	28.8
9/09/2009	40.0	35.0	27.3
10/09/2009	40.6	35.1	26.2
11/09/2009	34.5	33.9	25.8
12/09/2009	34.0	31.7	26.7
13/09/2009	-	35.3	26.1
14/09/2009	34.7	29.1	25.0
15/09/2009	31.7	-	-
16/09/2009	-	-	-
Rating Background Level (RBL)	34	34	30
<b>Intrusiveness Criteria <math>L_{Aeq,15min}</math> (RBL +5)</b>	<b>39</b>	<b>39</b>	<b>35</b>
Mean $L_{Aeq}$	50	48	43
Recommended Acceptable $L_{Aeq}$ Noise Level (Rural)	50	45	40
<b>Amenity Criteria<sup>1</sup></b>	<b>50</b>	<b>45</b>	<b>40</b>
<b>Project Specific Noise Level</b>	<b>39</b>	<b>39</b>	<b>35</b>

1. Existing mean  $L_{Aeq}$  noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP, whereby transportation (road and rail) noise is distinguished from site-specific industrial noise sources. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

Assessment of attended noise monitoring results for this location presented in **Appendix II** indicates the background noise environment at this location is dominated by the passage of vehicles on the New England Highway and Wine Country Drive. Pass by levels of up to 43 dB(A) were observed for vehicles on Wine Country Drive, with impacts up to 40 dB(A) from the New England Highway. Trains on the northern line generate noise levels of 40 to 42 dB(A) with pass by times on the order of 3 minutes.

### 3.2.2.5 Background Noise Monitoring - Queen St, Branxton (R5)

The mean  $L_{Aeq}$  and corresponding Amenity Criteria for the Queen St, Branxton monitoring location are presented in **Table 12**. The recommended  $L_{Aeq}$  noise level used to determine the Amenity Criteria is the *Acceptable Suburban* level from Table 2.1 in the INP.

**Table 12: Background noise results - Queen St, Branxton**

Time Period	Day (0700 to 1800)	Evening (1800 to 2200)	Night (2200 to 0700)
4/09/2009	-	39.5	-
5/09/2009	38.0	40.0	32.7
6/09/2009	36.5	40.0	31.0
7/09/2009	-	-	30.7
8/09/2009	39.5	39.0	31.3
9/09/2009	44.0	38.8	33.2
10/09/2009	44.0	38.3	35.5
11/09/2009	39.0	42.0	32.2
12/09/2009	38.5	42.0	33.0
13/09/2009	-	39.8	34.2
14/09/2009	37.5	35.0	28.5
15/09/2009	37.5	36.0	32.0
16/09/2009	38.5	37.3	
Rating Background Level (RBL)	39	39	32
<b>Intrusiveness Criteria <math>L_{Aeq,15min}</math> (RBL +5)</b>	<b>44</b>	<b>44</b>	<b>37</b>
Mean $L_{Aeq}$	53	54	50
Recommended Acceptable $L_{Aeq}$ Noise Level (Suburban)	55	45	40
<b>Amenity Criteria<sup>1</sup></b>	<b>55</b>	<b>45</b>	<b>40</b>
<b>Project Specific Noise Level</b>	<b>44</b>	<b>44</b>	<b>37</b>

1. Existing mean  $L_{Aeq}$  noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP, whereby transportation (road and rail) noise is distinguished from site-specific industrial noise sources. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

Assessment of attended noise monitoring results for this location presented in **Appendix II** indicates the night-time noise environment is dominated by the passage of vehicles on the New England Highway. The passage of passenger and heavy vehicles generates noise levels of up to 50 dB(A) in the receiving environment to the south of the highway. The impact of trains passing on the northern line is also significant at this location, generating pass by noise levels up to 58 dB(A). Typical pass by times for trains was observed to be on the order of two and a half minutes.

### 3.2.2.6 Background Noise Monitoring - New England Highway, Greta (R6)

The mean  $L_{Aeq}$  and corresponding Amenity Criteria for the New England Highway, Greta monitoring location are presented in **Table 13**. The recommended  $L_{Aeq}$  noise level used to determine the Amenity Criteria is the *Acceptable Urban* level from Table 2.1 in the INP.

**Table 13: Background noise results - New England Highway, Greta**

Time Period	Day (0700 to 1800)	Evening (1800 to 2200)	Night (2200 to 0700)
4/09/2009	-	43.1	-
5/09/2009	41.4	42.2	33.2
6/09/2009	39.9	40.7	32.3
7/09/2009	-	-	35.0
8/09/2009	43.1	41.1	33.9
9/09/2009	48.7	43.1	36.3
10/09/2009	47.8	44.9	34.6
11/09/2009	43.3	46.2	32.3
12/09/2009	43.7	45.1	31.9
13/09/2009	-	45.4	32.6
14/09/2009	39.7	37.7	29.4
15/09/2009	40.6	40.6	33.7
16/09/2009	42.0	40.4	32.3
Rating Background Level (RBL)	43	43	33
<b>Intrusiveness Criteria</b> <b><math>L_{Aeq,15min}</math> (RBL +5)</b>	<b>48</b>	<b>48</b>	<b>38</b>
Mean $L_{Aeq}$	55	53	53
Recommended Acceptable $L_{Aeq}$ Noise Level (Suburban)	60	50	45
<b>Amenity Criteria<sup>1</sup></b>	<b>60</b>	<b>50</b>	<b>45</b>
<b>Project Specific Noise Level</b>	<b>48</b>	<b>48</b>	<b>38</b>

1. Existing mean  $L_{Aeq}$  noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP, whereby transportation (road and rail) noise is distinguished from site-specific industrial noise sources. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

Assessment of attended noise monitoring results for this location presented in **Appendix II** indicates the night-time noise environment is dominated by the passage of vehicles on the New England Highway. The passage of vehicles generates  $L_{Aeq,15minute}$  noise levels of up to 60 dB(A) in the receiving environment adjacent to the highway. Unattended monitoring results presented in **Appendix I** indicate the receiving environment is subject to rising background noise levels due to increasing traffic volumes from approximately 4:00am. Trains on the northern line are audible at this location, generating noise levels up to 62 dB(A) with pass by times of approximately 90 seconds.

### 3.3 Project Specific Noise Levels

#### 3.3.1 Non-Residential Sensitive Receivers

Additional non-residential receivers were identified as potentially sensitive to noise impacts associated with the proposed TSF. These receivers (and their corresponding INP defined receiver types) were identified as:

- Greta Public School (Wyndham St) (School Classroom (internal));
- Greta Community Pre-school (Water St) (Passive Recreation Area);
- Greta Arts and Sports Community Hall (Water St) (Passive Recreation Area); and
- various commercial receivers on the New England Highway (Commercial Premises).

The PSNL for these receivers were determined based on data from the background monitoring location in Hunter St, Greta. As the amenity criteria apply only when these receivers are in use, the PSNL were determined only for the following periods:

- Greta Public School - Day period (school only in use at this time);
- Greta Community Pre-school - Day period (only in use at this time);
- Greta Community Hall - Evening period (assumed to be in use during the day or evening);
- Commercial receivers - Night period (may be in use 24hrs per day).

Only the most stringent PSNL is presented for commercial receivers and the Arts and Sport Community Hall as compliance with this criterion means noise imission will comply with all other less stringent criteria. Assessment of the PSNL is presented in **Table 14** to **Table 17**.

##### 3.3.1.1 Analysis of PSNL - Greta Public School

An analysis of the PSNL for Greta Public School is presented in **Table 14**.

**Table 14: Assessment of PSNL - Greta Public School**

Day (0700 to 1800)	
Rating Background Level (RBL)	40
<b>Intrusiveness Criteria</b> <b>L<sub>Aeq,15min</sub> (RBL +5)</b>	<b>45</b>
Mean L <sub>Aeq</sub>	53
Recommended Acceptable L <sub>Aeq</sub> Noise Level (School Classroom)	45 <sup>1</sup> (35 internal + 10)
<b>Amenity Criteria<sup>2</sup></b>	<b>45</b>
<b>Project Specific Noise Level</b>	<b>45</b>

1 - The NSW Interim Construction Noise Guideline advises that as a guide, the difference between the internal noise level and the external noise level is typically 10dB with windows open for adequate ventilation. An external indicator of 45 dB (internal amenity level + 10dB) is therefore applied to this receiver as a means of assessing noise impacts.

2 - Existing mean L<sub>Aeq</sub> noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP, whereby transportation (road and rail) noise is distinguished from site-specific industrial noise sources. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

### 3.3.1.2 Analysis of PSNL - Greta Community Pre-School

An analysis of the PSNL for the Greta Community Pre-School is presented in **Table 15**.

**Table 15: Assessment of PSNL - Greta Community Pre-school**

Day (0700 to 1800)	
Rating Background Level (RBL)	40
<b>Intrusiveness Criteria</b> <b>L<sub>Aeq,15min</sub> (RBL +5)</b>	<b>45</b>
Mean L <sub>Aeq</sub>	53
Recommended Acceptable L <sub>Aeq</sub> Noise Level (Passive Recreation Area)	50
<b>Amenity Criteria<sup>1</sup></b>	<b>50</b>
<b>Project Specific Noise Level</b>	<b>45</b>

1 - Existing mean L<sub>Aeq</sub> noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

### 3.3.1.3 Analysis of PSNL - Greta Arts and Sport Community Hall

An analysis of the PSNL for the Greta Arts and Sport Community Hall is presented in **Table 16**.

**Table 16: Assessment of PSNL - Greta Arts and Sport Community Hall**

	Day (0700 to 1800)	Evening (1800 to 2200)
Rating Background Level (RBL)	40	39
<b>Intrusiveness Criteria</b> <b>L<sub>Aeq,15min</sub> (RBL +5)</b>	<b>45</b>	<b>44</b>
Mean L <sub>Aeq</sub>	53	50
Recommended Acceptable L <sub>Aeq</sub> Noise Level (Passive Recreation Area)	50 (when in use)	
<b>Amenity Criteria<sup>1</sup></b>	<b>50</b>	<b>50</b>
<b>Project Specific Noise Level</b>	<b>45</b>	<b>44</b>

1 - Existing mean L<sub>Aeq</sub> noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

### 3.3.1.4 Analysis of PSNL - Commercial Receivers

An analysis of the PSNL for commercial receivers in Greta is presented in **Table 17**.

**Table 17: Assessment of PSNL - Commercial receivers**

	Day (0700 to 1800)	Evening (1800 to 2200)	Night (2200 to 0700)
Rating Background Level (RBL)	40	39	32
<b>Intrusiveness Criteria</b> <b>L<sub>Aeq,15min</sub> (RBL +5)<sup>1</sup></b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Mean L <sub>Aeq</sub>	53	50	50
Recommended Acceptable L <sub>Aeq</sub> Noise Level (Commercial)	65 (when in use)		
<b>Amenity Criteria<sup>2</sup></b>	<b>65</b>	<b>65</b>	<b>65</b>
<b>Project Specific Noise Level</b>	<b>65</b>	<b>65</b>	<b>65</b>

1. Intrusiveness Criteria do not apply to commercial or industrial receivers according to INP Application Notes.

1 - Existing mean L<sub>Aeq</sub> noise levels are not considered to contain any contribution from industrial noise sources in accordance with provisions of Section 2.2 of the INP. The amenity criteria are therefore equal to the acceptable noise level for the receiver type.

### 3.3.2 Summary of Project Specific Noise Levels

A summary of the project specific noise levels for residential and non-residential receivers is presented in **Table 18** and **Table 19** respectively. The PSNL for all receivers and receiving environments were determined in accordance with provisions established in the NSW Industrial Noise Policy.

**Table 18: Summary of project specific noise levels for residential receivers, dB(A)**

Receiving Environment	ID	Intrusiveness Criteria (L <sub>Aeq,15minute</sub> )			Amenity Criteria (L <sub>Aeq,period</sub> )			Sleep Disturbance
		Day	Evening	Night	Day	Evening	Night	
Greta (east of development)	R1	45	44	37	60	50	45	47
Illalong (south-east of development)	R2	40	40 <sup>1</sup>	37	55	45	40	47
Tuckers Lane (south of development)	R3	37	37 <sup>1</sup>	37 <sup>1</sup>	50	45	40	51
North Rothbury (west of development)	R4	39	39	35	50	45	40	45
Branxton (north-west of development)	R5	44	44	37	55	45	40	47
New England Highway (north of development)	R6	48	48	38	60	50	45	48

1. PSNL for evening and night periods adjusted such as to not exceed PSNL for the less sensitive daytime period in accordance with guidelines established in the INP Application Notes.

**Table 19: Summary of project specific noise levels for non-residential receivers, dB(A)**

Receiver	Project Specific Noise Level <sup>1</sup>		
	Day	Evening	Night
Greta Public School	45	n/a	n/a
Greta Community Pre-School	45	n/a	n/a
Greta Arts and Sport Community Hall	45	44	n/a
Commercial Receivers	65	65	65

1 - Averaging times for  $L_{Aeq}$  PSNL vary with receiver type in accordance with provisions established in Table 2.1 of the INP. For the purposes of this assessment, the PSNL for non-residential receivers are considered in terms of  $L_{Aeq,15minute}$  noise level as this represents the most conservative assessment of impacts.

It should be noted that the sleep disturbance criteria do not apply to non-residential receivers as they are not considered to be in use during the night period.

The intrusiveness criterion was found to be the limiting criterion for all receiving environments with the exception of the Rural areas off Tuckers Lane and commercial receivers in Greta. The intrusiveness criterion is based on measured background ( $L_{90}$ ) noise level at each of the receiver locations and would be subject to change in response to any changes in the character of the ambient noise environment.

For the purposes of this assessment, NSW DoP requires analysis of the cumulative impacts of the Hunter Expressway extension and construction of a third rail line between Maitland and Minimbah. **Figure 6** shows the approximate location of these infrastructure projects in relation to the proposed TSF. The amenity criteria for each of the receiving environment are also presented in **Table 18** for the purposes of assessing impacts from multiple developments.

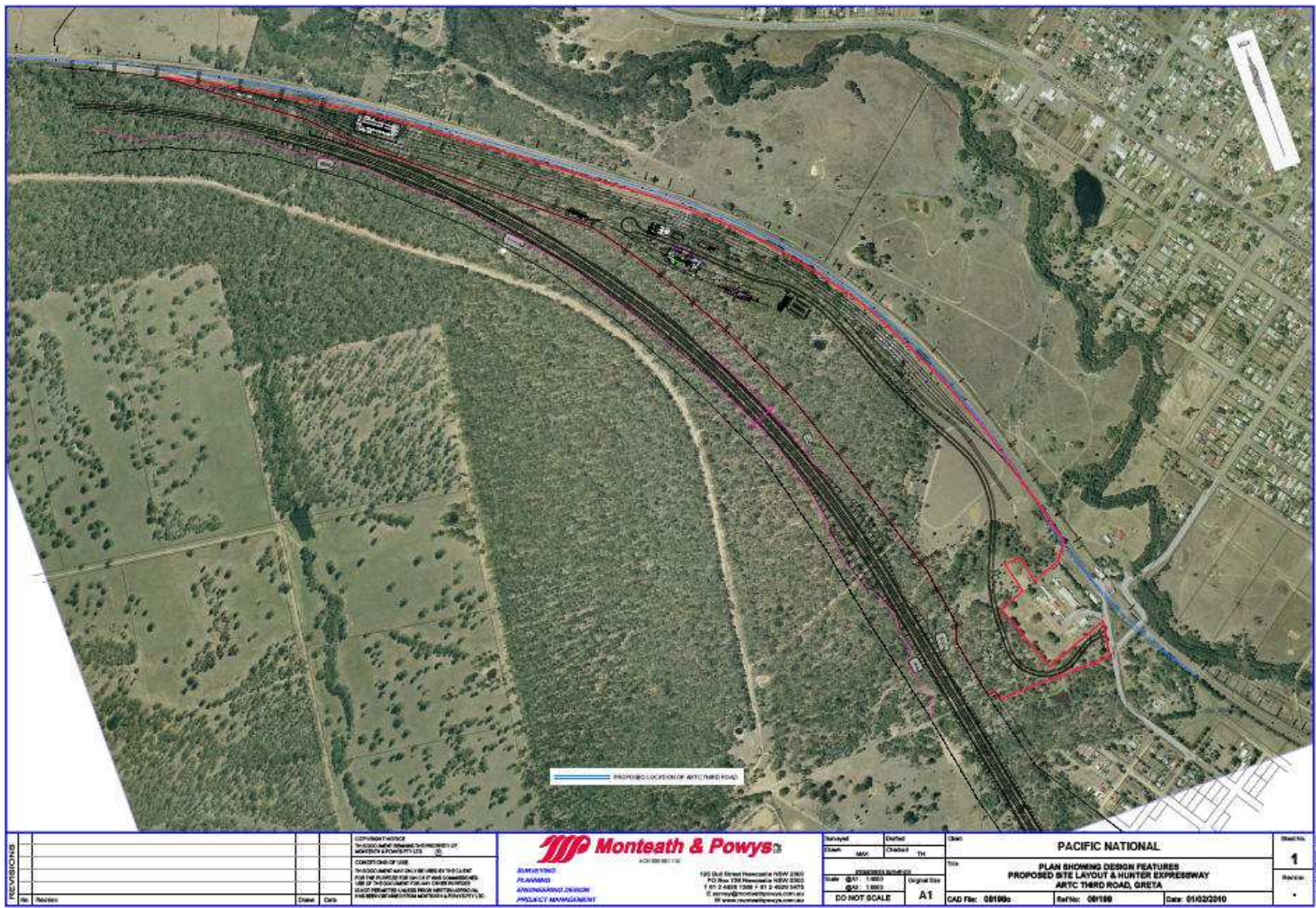


Figure 6: Location of proposed TSE, Hunter Expressway and Maitland to Minimbah Third Track

## 4. METEOROLOGICAL IMPACTS

### 4.1 Significance of Meteorological Impacts

Review of meteorological monitoring data representative of Greta was undertaken for the purposes of identifying any significant prevailing meteorology with potential to adversely impact on the propagation of noise from the proposed development. Section 5 of the INP considers a prevailing meteorological scenario to be significant if it is observed more than 30% of the time during an assessment period (day, evening or night) during any season.

### 4.2 Assessment of Meteorological Impacts

Meteorological data from the Bureau of Meteorology (BoM) Automatic Weather Station (AWS) at Cessnock was analysed for the purposes of identifying significant meteorological conditions that may affect the Greta locality. The Cessnock AWS is located approximately 15km to the south of Greta.

#### 4.2.1 Gradient Winds

Analysis of seasonal wind data was undertaken for the purposes of identifying prevailing gradient winds that may enhance the propagation of noise from the development. The presence of gradient winds is considered significant when wind speeds less than 3 m/s at 10 metres height are observed to occur more than 30% of an assessment period in any season. Seasonal wind roses for the day, evening and night assessment periods are presented in **Appendix III**. A summary of significant gradient winds is provided in **Table 20**.

Table 20: Summary of significant meteorology

Wind Direction $\pm 22.5^\circ$ , Wind Speed $<3\text{m/s}$ , Frequency $\geq 30\%$			
Season	Day	Evening	Night
Autumn	Nil	S (31%)	SE (30%), S (57%), <b>SW (55%)</b> , W (36%)
Winter	Nil	S (30%), <b>SW (30%)</b>	S (44%), <b>SW (48%)</b> , W (40%)
Spring	Nil	Nil	S (50%), <b>SW (49%)</b> , W (32%)
Summer	Nil	Nil	SE (34%), <b>S (47%)</b> , SW (41%)

#### 4.2.2 Temperature Inversions

Analysis of Pasquill Gifford atmospheric stability classes was undertaken in accordance with the methodology provided in Appendix E of the INP. This methodology was used to assess atmospheric stability during the night period based on daytime stability classes, wind speed and sigma theta results. The results presented in **Figure 7** indicate that F and G stability classes (indicative moderate to strong inversions) occur more than 30% of the night period during winter. Consequently, assessment of impacts of temperature inversions on noise propagation will be included in detailed impact modelling.

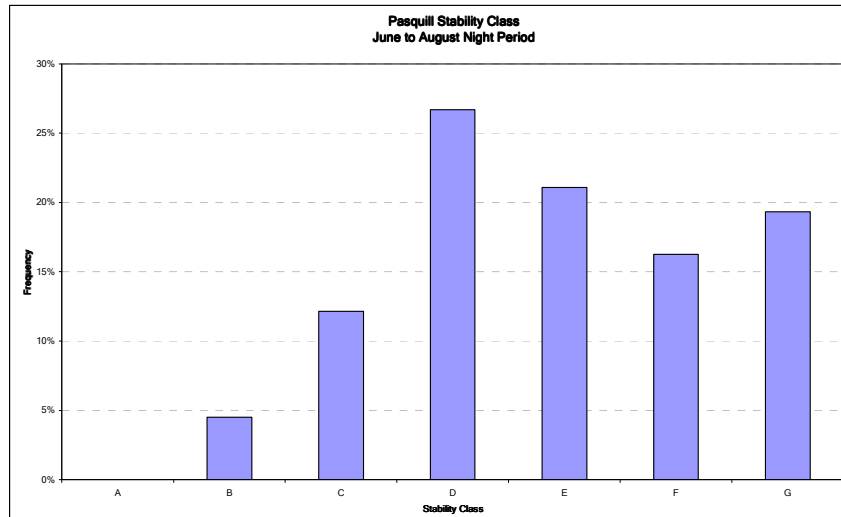


Figure 7: Winter night time atmospheric stability classes, Cessnock AWS

### 4.3 Meteorological Scenarios for Noise Impact Prediction

The results presented in **Section 4.2** indicate some meteorological scenarios occur with sufficient frequency that consideration of their potential influence on noise propagation be considered as part of the Noise Impact Assessment. Meteorological scenarios to be included as part of impact modelling are summarised in **Table 21**.

Table 21: Meteorological input parameters

Scenario	Period	Air Temperature	Relative Humidity	Wind Speed	Vertical Temperature Gradient
Neutral	All	18°C	60%	0 m/s	0°C / 100m
Adverse Summer, Spring, Autumn	Evening and Night	12°C	75%	3 m/s	0°C / 100m
Adverse Winter	Evening and Night	6°C	90%	0 m/s	3°C / 100m

The INP provides default meteorological parameters for the assessment of temperature inversion impacts of 3°C / 100m lapse rate with 2m/s drainage flow. For the purposes of this assessment no drainage flow will be modelled as the development is located at the bottom of a gully and any drainage flow would likely be towards the source. The impact of temperature inversions on the propagation of noise will therefore be modelled on neutral wind conditions.

## 5. OPERATIONAL NOISE IMPACTS

### 5.1 Modelling Methodology

Prediction of the cumulative  $L_{Aeq,15\text{minute}}$  noise level resulting from the proposed development was undertaken by modelling noise sources using the Environmental Noise Model (ENM) software. ENM calculates the noise level at specified receiver locations (Single Point Calculation) and generates noise level contours over a defined area (Contour Calculation).

The predicted cumulative  $L_{Aeq,15\text{minute}}$  noise levels are then compared against the project-specific noise levels. If the project-specific noise levels are exceeded, feasible and reasonable noise mitigation strategies will need to be assessed for the proposed development, to ensure compatibility with the existing noise environment. If the proposed development can achieve the project-specific noise levels during the night time period it will also achieve the less stringent day and evening criteria.

### 5.2 Noise Sources

The modelled impact of the proposed operation was based on the Sound Power Level (SWL) and location of noise sources within the project, consistent with the site arrangement provided in **(Figure 3)**. The purpose of this assessment is to provide detailed analysis of potential noise impacts and identify conflicts with the existing noise environment. The third octave SWLs applied to the model are based on measurements made of existing Pacific National operations and surrogate processes that are considered representative of stationary noise sources that comprise the proposed operation. The representative noise sources used in the model are presented in **Table 22**.

**Table 22: Representative source noise levels**

Description	SWL, dB(lin)
Idling locomotive (per unit)	112
Locomotive and wagon set (passby)	108
Shunting empty wagons	105
Idling semi-trailer	106
Vehicles on internal roadway	110
Maintenance shed operations	99
Wheel lathe operations	109
Wash-bay operations	100

The model presents a worst case noise impact for Stage 3 operations, comprising:

- an idling locomotive set (3 x locomotives) in the provisioning shed on tracks 1 to 3;
- an idling locomotive set to the south of the provisioning shed on tracks 4 and 5;
- one train entering the site via the arrival road and internal track No.1;
- one train leaving the site via internal track No.2 and the departure road;
- operations within maintenance shed, wash bay and wheel lathe buildings;
- shunting operations on the wagon siding;
- vehicle movements (light and heavy vehicles) on internal roadways; and
- idling semi-trailer pumping fuel to storage tanks.

It should be noted that while the impact predictions are made on the basis of the  $L_{Aeq,15\text{minute}}$  criteria, this level of activity is unlikely to occur simultaneously in any given 15 minute period. The maximum expected level of site activity for Stage 3 operations includes 25 train movements and 5 fuel deliveries per day, and 17 light vehicle movements per hour. On this basis the model predictions will likely overestimate the impacts associated with the development as emissions from these sources will rarely occur at the same time. Furthermore, level of site activity will vary throughout the day, resulting in extended periods of reduced noise emissions from the operation.

### 5.3 Assumptions of the Model

Key assumptions of the model include:

- the SWL for idling locomotives are based on measurements of stationary 82 class locomotives carried out at the Hunter Bulk Terminal (HBT) Port Waratah operations. The SWL for this source was time weighted assuming operation for the full duration of the 15 minute assessment period. A locomotive set was assumed to comprise three (3) individual locomotive units. The SWL for this source contains a +5dB modifying factor for tonal characteristics detected during 1/3 octave analysis;
- the SWL for trains entering the TSF from the main northern line are based on pass by measurements of trains entering the unloading yard at HBT Kooragang Island operations. The SWL for this source was time weighted assuming a typical pass by time of 3 minutes and 30 seconds during any 15 minute assessment period. This pass by time assumes a train length of 1500m and an average speed of 25km/h. The SWL for this source contains a +5dB modifying factor for tonal characteristics detected during 1/3 octave analysis;
- all trains enter the site via the arrival and internal track before proceeding directly to the provisioning shed. Locomotive sets on tracks 1 to 3 are to be contained entirely within the provisioning shed and stationary locomotives on tracks 4 and 5 are located to the south of the provisioning shed to such that the tail end of trains do not block track access to internal track junctions. The modelled SWL for locomotives within the provisioning shed was adjusted to account for transmission losses through the building. Pending advice on the final design of these structures, it was assumed that buildings are constructed of colourbond sheeting mounted on a steel frame. This is likely to provide a conservative assessment of actual transmission loss depending on the final construction of the building structures;
- the SWL for shunting of empty wagons on the wagon siding are based on pass by measurements of trains entering the unloading yard at HBT Kooragang Island operations. It is assumed that this source will contain intermittent and potentially impulsive characteristics associated with interaction between wagon couplings. The contribution from impulsive noise characters was weighted such that the impact is representative of the duration that these impacts may occur during a 15 minute assessment period. It was conservatively assumed that impulsive noise will be generated by this source up to three (3) times during a 15 minute assessment period, with each event possessing a duration of 3 seconds. A +5dB modifying factor was also added to the SWL to account for impulsive noise characteristics;
- impact predictions for traffic movements on internal roadways within the site are based on pass by  $L_{Aeq}$  noise levels for vehicles travelling at 50km/h. The SWL for this source is based on the predicted maximum number of hourly vehicle movements for Stage 3 operations and assumes 17 light vehicles access the site during the 15 minute assessment period;
- impact predictions assume heavy vehicles do not access the site between the hours of 22:00 and 7:00;

- the SWL for the idling semi-trailer delivering fuel to the tank farm is based on octave SPL provided for assessment of common noise sources on construction sites (DEFRA 2005). The SWL for this source was time weighted assuming operation for the full duration of the 15 minute assessment period. It is also assumed unloading point is located to the west of the tank farm and that the storage tank structures will act as a barrier to noise emissions to the east of the site;
- the SWL for the maintenance shed, wash-bay and wheel lathe sources account for transmission losses attributable to the buildings in which these operations are housed. Pending advice on the final design of these structures, it was assumed that buildings are constructed of colourbond sheeting mounted on a steel frame. This is likely to provide a conservative assessment of actual transmission loss depending on the final construction of the building structures. The SWLs for these sources are time weighted assuming operation for the full duration of the 15 minute assessment period; and
- the emission height for all rail and operational noise sources was assumed to be equal to the final site RL + 3.5 metres.

## 5.4 Results

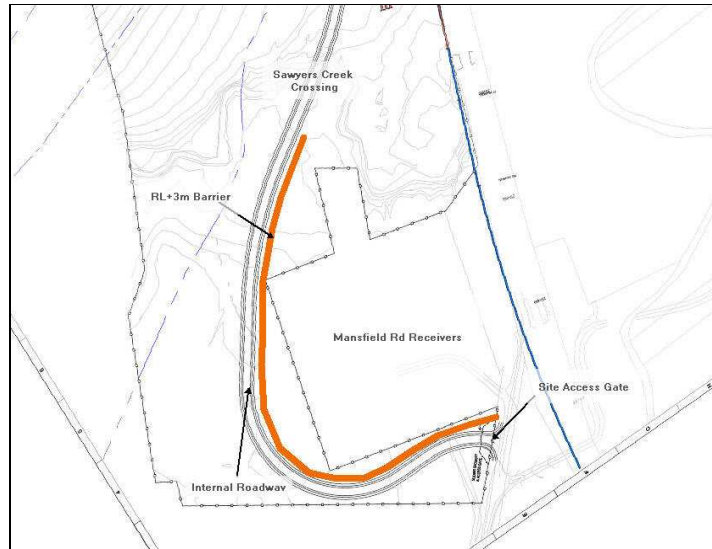
Preliminary modelling results presented in **Table 23** indicate traffic noise impacts associated with the site access road are likely to significantly exceed the PSNL in the receiving environment to the south-west of the site. While the impact is likely to be restricted to peak periods, the extent and frequency of the impact was considered significant to the community, particularly during the early morning shoulder period.

**Table 23: Predicted  $L_{Aeq,15\text{minute}}$  noise level, dB(A) (without mitigation of access road impacts)**

Description	R1	R2	R2(a)	R3	R4	R5	R6	R6(a)
Neutral Conditions	34	<b>48</b>	<b>40</b>	< 30	< 30	< 30	34	34
Adverse Spring / Summer / Autumn	37	<b>49</b>	37	< 30	< 30	< 30	<b>40</b>	<b>42</b>
Adverse Winter	37	<b>49</b>	<b>42</b>	34	< 30	< 30	38	<b>40</b>
Ambient $L_{Aeq(\text{night})}$ Noise Level	50	57	50	43	50	53		
PSNL								
Day (0700-1800)	45	40	37	39	44	48		
Evening (1800-2200)	44	40	37	39	44	48		
Night (2200-0700)	37	37	37	35	37	38		

An investigation into the efficacy of potential mitigation operations was undertaken as a means of assessing ways in which this impact may be managed at the planning stage of the development. The results of this investigation indicate that impacts from internal road noise may be ameliorated by:

- constructing a barrier to the east of the internal roadway to mitigate emissions from vehicles accessing the site. In concept, the barrier should commence immediately to the north of the site access gate and follow the eastern shoulder of the roadway to the southern edge of the riparian buffer at the Sawyers Creek crossing (**Figure 8**). The barrier will be approximately 500 metres long and RL+3m in height. The top of the barrier should be located no more than 10 metres from the shoulder of the roadway in order to maximise its efficacy. Where available space cannot accommodate the footprint of the barrier, a fence -type barrier or fence-topped earth barrier composite may be constructed; and
- implementing operational controls to restrict heavy vehicle movements during the night period.



**Figure 8: Concept design for site access road noise barrier**

Modelling results presented in **Table 24** assume the above controls are implemented to manage noise impacts associated with the site access road. **Figure 9** to **Figure 11** show the predicted noise level contours for each of the scenarios outlined in **Table 24**. Results in bold text indicate a predicted impact greater than the night period PSNL for that receiving environment. Care should be taken in interpreting the impact predictions as they represent the worst case  $L_{Aeq,15minute}$  noise impact, and are likely to over-estimate the  $L_{Aeq,period}$  contribution from site operations.

**Table 24: Predicted  $L_{Aeq,15minute}$  noise level, dB(A) (including mitigation of access road impacts)**

Description	R1	R2	R2(a)	R3	R4	R5	R6	R6(a)
Neutral Conditions	32	<b>40</b>	34	< 30	< 30	< 30	34	34
Adverse Spring / Summer / Autumn	36	<b>39</b>	30	< 30	< 30	< 30	<b>40</b>	<b>42</b>
Adverse Winter	36	<b>42</b>	<b>38</b>	32	< 30	< 30	38	<b>39</b>
Ambient $L_{Aeq(night)}$ Noise Level	50	57	50	43	50	53		
PSNL								
Day (0700-1800)	45	40	37	39	44	48		
Evening (1800-2200)	44	40	37	39	44	48		
Night (2200-0700)	37	37	37	35	37	38		

It should be noted that additional receiver points were modelled for receivers located:

- in the hamlet of Illalong (R2(a)); and
- on the New England Highway at Greta (R6(a)).

The PSNL for these locations was assumed the same as at background monitoring locations for these receiving environments.

#### 5.4.1 Modifying Factor

The results presented in **Table 24** and **Figure 9** to **Figure 11** include a +5 dB modifying factor correction for tonal noises detected during analysis of 1/3 octave sound pressure levels, in accordance with Table 4.1 of the INP.

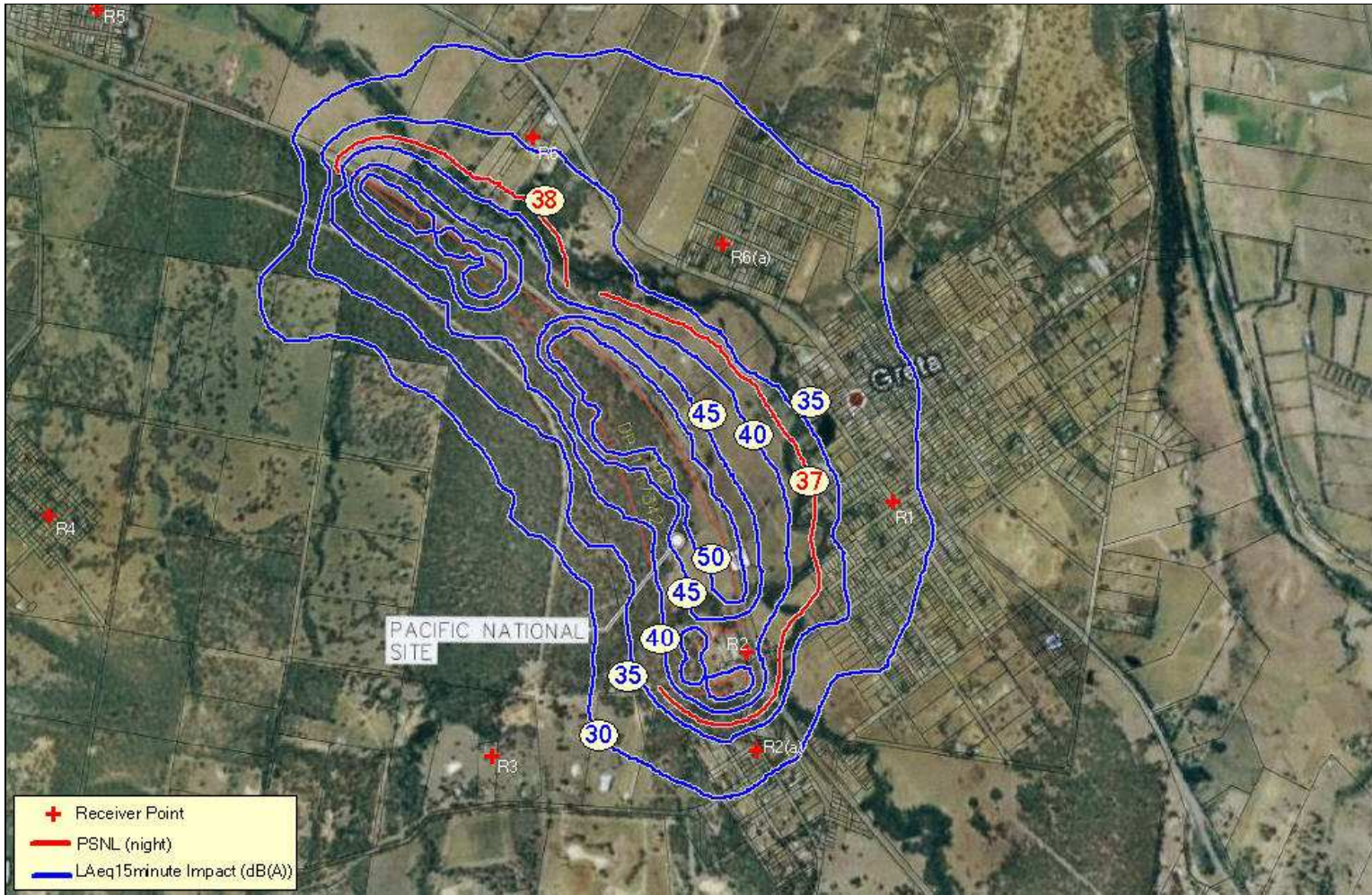


Figure 9: Predicted  $L_{Aeq,15\text{minute}}$  noise level, neutral conditions

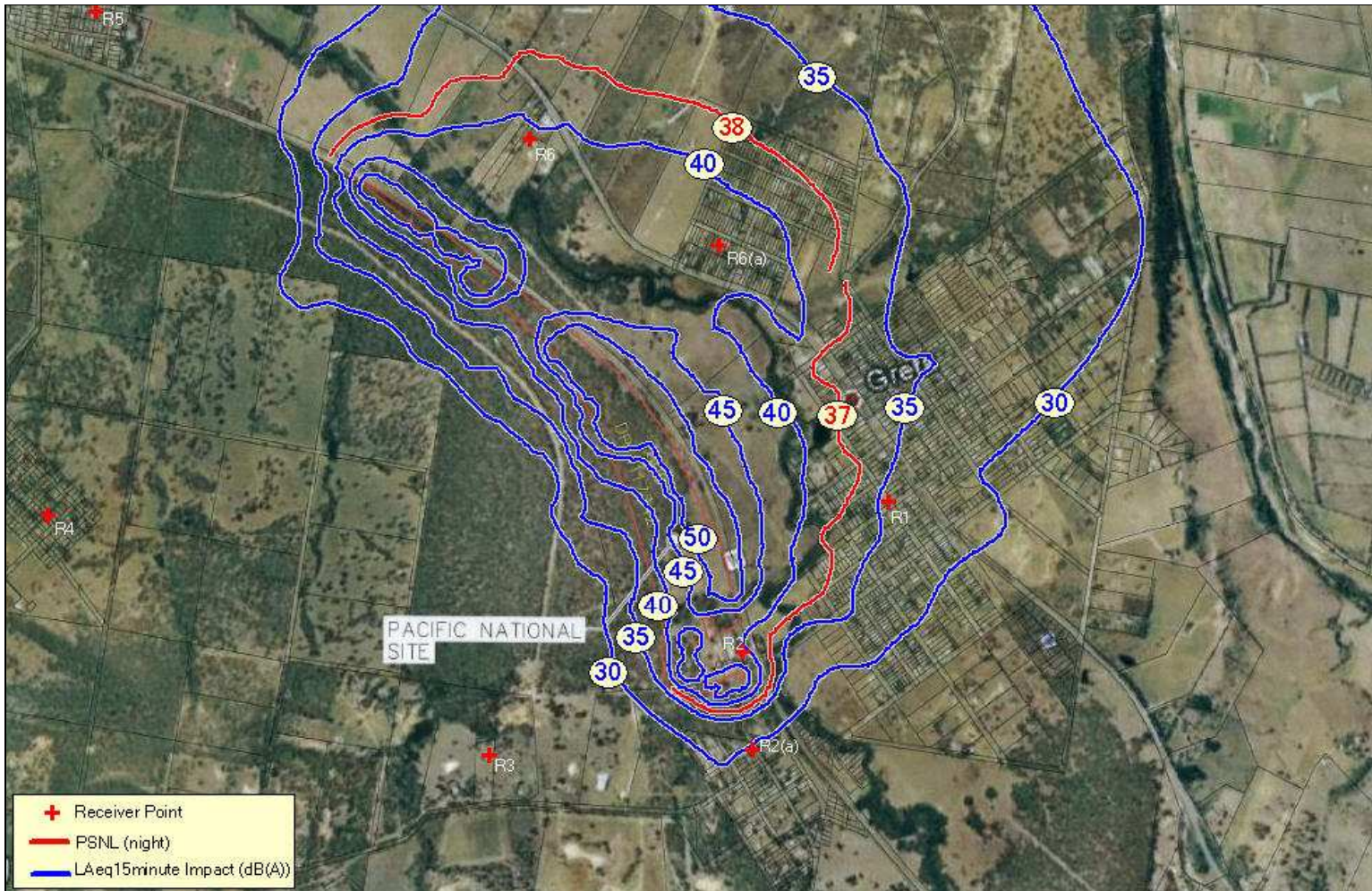


Figure 10: Predicted  $L_{Aeq,15\text{minute}}$  noise level, adverse SSW winds

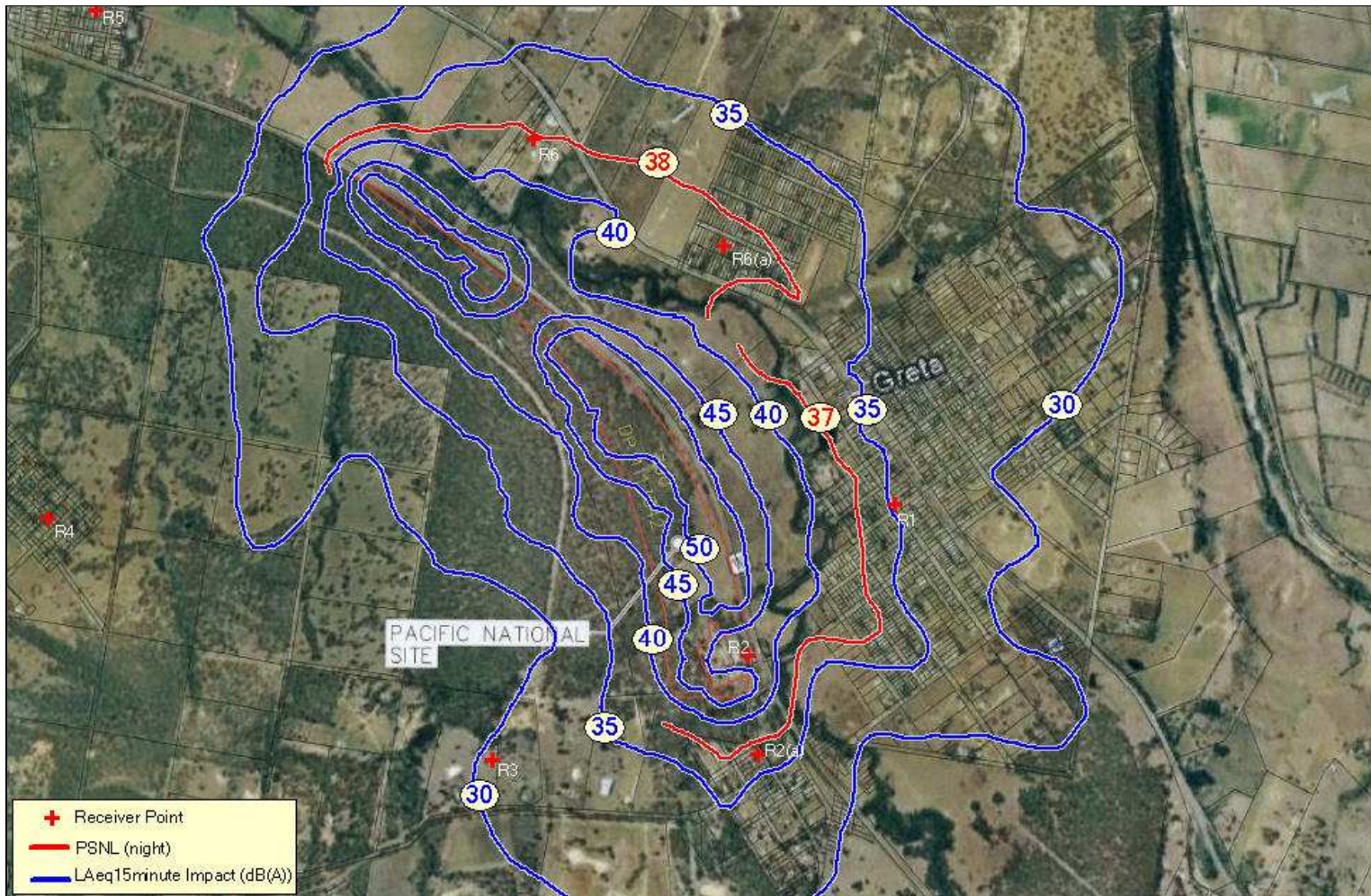


Figure 11: Predicted  $L_{Aeq,15\text{minute}}$  noise level, adverse Winter conditions

## 5.5 Interpretation of Modelled Impact Predictions

### 5.5.1 Greta Receiving Environment (R1)

The results presented in **Table 24** indicate noise generated by the proposed TSF will comply with the amenity criteria for the Greta receiving environment under all operational and meteorological conditions. Review of model outputs indicates dominant impacts on the Greta receiving environment are likely to be from trains entering the facility and moving along internal tracks 1 and 2. Impact predictions from the model indicate:

- under neutral conditions, Stage 3 operations are expected to comply with the day, evening and night PSNL.;
- during periods of south and south-west winds  $L_{Aeq,15minute}$  noise levels would likely exceed the night period criteria for the approximately half the receivers west of Nelson Street, including some to the north of the New England Highway. Receivers on Wyndham and Sale Streets (closest to the development) may experience  $L_{Aeq,15minute}$  noise levels up to 39 dB(A) under these meteorological conditions; and
- during periods of temperature inversion  $L_{Aeq,15minute}$  noise levels would likely exceed the night period criteria at most receivers south of the New England Highway and approximately half of the receivers to the east of Nelson Street. Receivers on Wyndham and Sale Streets may experience  $L_{Aeq,15minute}$  noise levels up to 40 dB(A).

While the assessment indicates the PSNL may be exceeded during Stage 3 operations, these results should be interpreted in the context of the ambient noise environment. Assessment of background monitoring data presented in **Section 3.2** indicates that ambient  $L_{Aeq,period}$  noise levels from existing transportation sources is on the order of 50 dB(A) during the night period, 10 dB(A) greater than the expected worst case  $L_{Aeq,15minute}$  noise impact. The facility is unlikely to make any measureable contribution under typical noise levels observed in this receiving environment. The facility may be audible at times where the impact exceeds the criteria, however the character of noise generated by the development is expected to be similar to emissions from existing rail and road transportation sources.

### 5.5.2 Illalong Receiving Environment (R2)

Review of model outputs indicates road traffic accessing the site via the Mansfield Street entrance presents the dominant noise impact from the TSF operations for receivers in the village of Illalong. Trains entering the site via the arrival road were found to potentially contribute to noise impacts at receivers adjacent to the site access on Mansfield Street, although road noise remains the dominant impact at this location. Consequently, the character of the noise impact in this receiving environment is not considered to change significantly from that currently experienced. Impact predictions from the model indicate:

- under neutral conditions exceedence of the  $L_{Aeq,15minute}$  criterion is restricted to receivers adjacent to the site access on Mansfield St.  $L_{Aeq,15minute}$  noise levels at receivers on Mansfield St adjacent to the site access road may experience noise levels up to 40 dB(A) during periods of peak internal vehicle movement.
- during periods of south and south-west winds the  $L_{Aeq,15minute}$  noise impact would likely comply with the night period PSNL for all receivers in Illalong..  $L_{Aeq,15minute}$  noise levels at receivers on Mansfield St adjacent to the site access road may experience noise levels up to 39 dB(A) attributable to the passage of vehicles on the internal access road; and

- during periods of temperature inversion there would likely be a minor exceedence of the  $L_{Aeq,15minute}$  noise criteria for receivers on the northern fringe of Illalong.  $L_{Aeq,15minute}$  noise levels at receivers on Mansfield St adjacent to the site access road may experience noise levels up to 42 dB(A).

While the assessment indicates the PSNL may be exceeded during Stage 3 operations, these results require interpretation in the context of the ambient noise environment. Assessment of background monitoring data presented in **Section 3.2** indicates that ambient  $L_{Aeq,period}$  noise levels from existing transportation sources is on the order of 57 dB(A) during the night period, 15 dB(A) greater than the expected worst case  $L_{Aeq,15minute}$  noise impact from the proposed TSF.

Review of data presented in **Appendix I** indicates the minimum  $L_{Aeq,15minute}$  noise level measured during background monitoring was 45 dB(A), with 99% of results exceeding 47 dB(A). Hence, it is considered that any contribution from TSF operations will be masked by existing transportation sources.

### 5.5.3 Tuckers Lane Receiving Environment (R3)

The results presented in **Section 5.4** indicate that noise impact will comply with the PSNL criteria for all receivers in the Tuckers Lane receiving environment under all significant meteorological conditions. The model indicates the proposed development will comply with the day, evening and night time criteria for Stage 3 operations.

### 5.5.4 North Rothbury Receiving Environment (R4)

The results presented in **Section 5.4** indicate that noise impact will comply with the PSNL criteria for all receivers in the North Rothbury receiving environment under all significant meteorological conditions. The model indicates the proposed development will comply with the day, evening and night time criteria for Stage 3 operations.

### 5.5.5 Branxton Receiving Environment (R5)

The results presented in **Section 5.4** indicate that noise impact will comply with the PSNL criteria for all receivers in the Branxton receiving environment under all significant meteorological conditions. The model indicates the proposed development will comply with the day, evening and night time criteria for Stage 3 operations

### 5.5.6 New England Highway Receiving Environment (R6)

Modelling results presented in **Table 24** indicate noise impacts associated with the TSF will comply with the amenity criteria for the New England Highway receiving environment. Review of model outputs indicates idling locomotives at the provisioning shed and movement of trains on internal roads 1 and 2 present the dominant contribution from the TSF operations for receivers along the New England Highway to the north of the proposed development. Impact predictions from the model indicate:

- under neutral conditions, Stage 3 operations are expected to comply with the day, evening and night PSNL.;
- during periods of south and south-west winds  $L_{Aeq,15minute}$  noise levels would likely exceed the night period criteria at receivers on the New England Highway between Greta and Branxton. Receivers south of the New England Highway (closest to the development) may experience  $L_{Aeq,15minute}$  noise levels up to 42 dB(A) under these meteorological conditions.

The model results that operations under this meteorological scenario would comply with the PSNL for the evening period; and

- during periods of temperature inversion  $L_{Aeq,15minute}$  noise impact would likely exceed the night period criteria at receivers on the New England Highway with noise levels under this meteorological scenario approaching 40 dB(A).

While the assessment indicates the PSNL may be exceeded during Stage 3 operations, these results should be interpreted in the context of the ambient noise environment. Assessment of background monitoring data presented in **Section 3.2** indicates that ambient  $L_{Aeq,period}$  noise levels from existing transportation sources is on the order of 53 dB(A) during the night period, 11 dB(A) greater than the expected worst case  $L_{Aeq,15minute}$  noise impact. The facility is unlikely to make any measureable contribution under typical noise levels observed in this receiving environment. The facility may be audible at times where the impact exceeds the criteria, however the character of noise generated by the development is expected to be similar to emissions from existing rail and road transportation sources.

### 5.5.7 Assessment of Impacts at Non-Residential Receivers

Review of impact predictions presents in **Figure 9** to **Figure 11** indicates Stage 3 operations impacts are likely to be well below the PSNL for all non-residential receivers identified in **Section 3.3.1**.

### 5.5.8 Assessment of Impacts above the PSNL

**Table 25** provides an assessment of the number of receivers likely to experience noise impacts above the PSNL during Stage 3 operations.

**Table 25: Quantification of Impacts above the PSNL, Stage 3 operations**

Receiving Environment	Neutral	Adverse Spring / Summer / Autumn	Adverse Winter
Greta	0	50	90
Mansfield Rd (at access road)	10	10	10
Illalong	0	0	5
Tuckers Lane	0	0	0
North Rothbury	0	0	0
Branxton receiving	0	0	0
New England Highway (Greta)	0	230	100
<b>Total</b>	10	290	205

**Table 25** indicates receiving environments in Greta and adjacent to the New England Highway are likely to be most affected by noise levels exceeding that of the PSNL under worst case conditions. This analysis should be interpreted in the context of monitoring and modelling results presented in **Section 3.2** and **Table 24** that indicate ambient  $L_{Aeq}$  noise levels associated with existing transportation sources exceed impact predictions by up to 10 dB(A) in these receiving environments.

Hence, while TSF noise impacts above that of the PSNL may affect up to 300 receivers under worst case conditions:

- these receivers are likely to currently experience similar or greater impacts from existing transportation sources; and
- this assessment is likely to overestimate the number of receivers affected, as no detailed assessment of receiver types or occupancy of individual lots has been undertaken.

#### **5.5.8.1 Assumptions of the Assessment**

Receivers were identified from cadastral data overlain on aerial photography of the receiving environment adjacent to the proposed TSF. Discrete receivers were considered to be any lot (developed or undeveloped) located in areas zoned either 1(a) Rural, 1(c) Rural Residential and 2(b) Village under provisions established in the Cessnock LEP 1989. The counts are considered to provide a conservative estimate of the actual number of receivers likely to experience impacts exceeding the PSNL, as this assessment:

- assumes all identified lots have been, or are to be developed;
- applies no corrections to account for lots that contain commercial, open space or other non-residential land-use activities;
- considers only the contribution from the TSF and applies no corrections for localised noise impacts that may mask noise imissions from the TSF; and
- applies no corrections for barrier effects generated by building structures that may locally attenuate noise levels at receivers.

## 6. SLEEP DISTURBANCE NOISE IMPACTS

The Noise Guide for Local Government suggests that to avoid sleep disturbance, the  $L_{A1}$  noise level associated with the source (that is the noise level which is exceeded for one per cent of the time) should not exceed the background noise level by more than 15 dB.

### 6.1 Sleep Disturbance Noise Criteria

Using the RBL as a guide, the corresponding maximum noise level to avoid sleep disturbance at adjacent residential receivers during the night period is presented in **Table 26**.

**Table 26: Sleep disturbance criteria**

Receiving Environment	RBL (night) dB(A)	Sleep Disturbance Criteria, dB(A)
Greta (east of development)	32	47
Illalong (south-east of development)	32	47
Tuckers Lane (south of development)	36	51
North Rothbury (west of development)	30	45
Branxton (north-west of development)	32	47
New England Highway (north of development)	33	48

### 6.2 Assessment of Transient Noise Impacts

Transient noise sources contributing to  $L_{A1}$  noise levels generated by the proposed facility are likely to be generated by bunching and stretching of wagons when trains are stopping, starting or shunting. The passage of vehicles on the internal roadways at night will also generate transient noise events.

#### 6.2.1 Transient Rail Noise

The predicted noise level that would contribute to sleep disturbance was modelled based on the difference between measured  $L_{Aeq}$  and  $L_{A1}$  noise levels from unattended monitoring data from the Hunter Bulk Terminal (HBT) operations at Kooragang Island. The results of this monitoring are presented in **Figure 12**. A summary of the monitoring results are presented in **Table 27**. Analysis of monitoring data indicates that on average  $L_{A1}$  noise levels exceed  $L_{Aeq}$  noise levels by approximately 7dB(A).

**Table 27: Sleep disturbance criteria**

	$L_{A1} - L_{Aeq}$ Differential
50 <sup>th</sup> percentile	7 dB(A)
95 <sup>th</sup> percentile	12 dB(A)

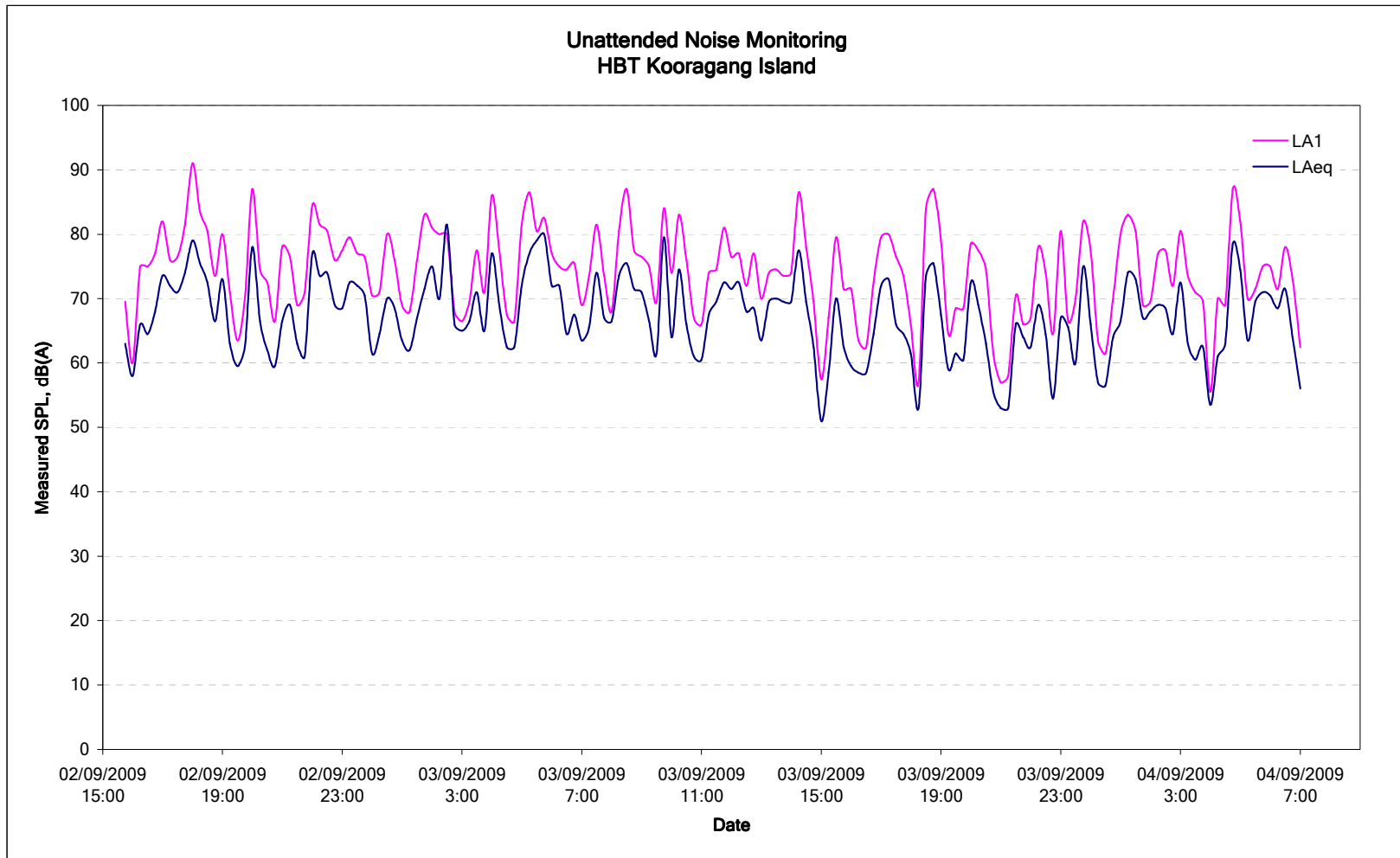


Figure 12: Unattended noise monitoring results, HBT operations Kooragang Island

The *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (DECC 2007) suggests that transient noise generated by rail traffic be assessed in terms of the 50<sup>th</sup> and 95<sup>th</sup> percentile  $L_{Amax}$  noise level. While it is acknowledged that the *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* does not apply to the assessment of noise from rolling stock maintenance facilities, as the character of noise generated by train pass by and wagon movements is similar, application of the 95<sup>th</sup> percentile difference between  $L_{Aeq}$  and  $L_{A1}$  noise levels is considered an appropriate indicator of transient noise impact for the proposed development. This represents a more conservative approach that provided by the INP, which typically considers the distribution of potential impacts by requiring assessment of 90<sup>th</sup> percentile noise levels.

It should also be noted the stabling yard and provisioning facilities the HBT Kooragang Island site are subject to very little topographic relief which would enhance the prevalence of bunching and stretching of wagons as trains stop and start. Information available at the time of the assessment indicates the track cross sections of the proposed TSF at Greta are subject to more significant relief, meaning wagons are more likely to remain compressed or under tension, leading to a reduction in bunching or stretching on departure. It is therefore considered the distribution of measured difference between  $L_{Aeq}$  and  $L_{A1}$  impacts presented in **Figure 12** provides a conservative assessment of  $L_{A1}$  noise levels likely to be experienced at Greta.

Assessment of sleep disturbance impacts generated by transient noise sources is assessed in terms of an  $L_{A1}$  noise level equal to the  $L_{Aeq,15minute}$  impact plus 12 dB(A). This provides an assessment of potentially sleep disturbing noise impacts from 95% of transient noise events.

### 6.2.2 Transient Road Noise

Noise generated by vehicles on the internal roadway will have potential to create sleep disturbance impacts at receivers adjacent to the site entry. The noise level that would contribute to sleep disturbance from this source is based on the results of operator attended monitoring at receivers on Mansfield Road. Analysis of monitoring data indicates that the  $L_{A1}$  noise level for pass by events on Mansfield Road exceeds the  $L_{Aeq}$  level by up to 15 dB(A). While it is acknowledged that vehicles entering the site are likely to be travelling at lower speeds than those observed in the monitoring data, application of the  $L_{Aeq}$  plus 15dB indicator as a means of assessing transient road noise impacts is considered a conservative assessment of potential sleep disturbance impacts.

### 6.2.3 Other Transient Noise Sources

Transient noise sources contributing to  $L_{A1}$  noise levels from maintenance operations may include materials handling operations and reversing alarms from vehicles moving around the maintenance facilities.

The predicted noise level that would contribute to sleep disturbance from these sources is modelled based on  $L_{A1}$  noise levels associated with materials handling operations observed during operator attended monitoring within a fabrication workshop from the Advitech noise source library. Materials handling  $L_{A1}$  levels are typically observed to be up to 10dB(A) greater than the equivalent  $L_{Aeq}$  noise level, however greater attenuation of  $L_{A1}$  noise levels would be expected due to the distribution of sound energy higher in the frequency spectrum.

### 6.3 Assumptions of the Model

Key assumptions of the modelled sleep disturbance noise impacts include:

- source  $L_{A1}$  noise levels for rail movements are based on monitoring data from existing Pacific National operations considered representative of proposed operations at Greta; and
- source  $L_{A1}$  noise levels for traffic movements are based on attended monitoring data of vehicle pass by noise levels at sensitive receivers on Mansfield Road and are considered to conservatively represent the expected  $L_{A1}$  impact;
- impact predictions assume the construction of the site access road noise barrier as discussed in **Section 5.4**;
- impact predictions assume heavy vehicles do not access the site between the hours of 22:00 and 7:00; and
- predicted  $L_{A1}$  noise levels are the contribution from proposed operations only and do not include contribution from existing noise sources including road and rail traffic.

### 6.4 Results

The predicted  $L_{A1}$  noise levels at the nearest sensitive receivers is shown in **Table 28**. A +12dB correction between  $L_{A1}$  and  $L_{Aeq}$  noise levels associated with proposed operations was applied in order to provide an assessment potential sleep disturbance impacts for 95% of transient noise events. The predicted  $L_{A1}$  noise level is therefore considered to represent the expected worst case impact.

**Table 28: Predicted  $L_{A1}$  noise level, dB(A)**

Description	R1	R2	R2(a)	R3	R4	R5	R6	R6(a)
<b>Predicted <math>L_{Aeq,15\text{minute}}</math> Noise Level</b>								
Neutral Conditions	32	40	34	< 30	< 30	< 30	34	34
Adverse Spring / Summer / Autumn	32	39	30	< 30	< 30	< 30	40	42
Adverse Winter	36	42	38	32	< 30	< 30	38	39
$L_{A1}$ correction factor	Rail Sources			+12 dB				
	Road Source			+15 dB				
	Maintenance Operations Sources			+10 dB				
<b>Predicted <math>L_{A1}</math> noise level</b>								
Neutral Conditions	44	<b>53</b>	47	36	30	< 30	46	46
Adverse Spring / Summer / Autumn	47	<b>52</b>	43	44	< 30	32	<b>53</b>	<b>54</b>
Adverse Winter	<b>48</b>	<b>55</b>	<b>50</b>	32	40	35	<b>50</b>	<b>52</b>
Existing $L_{A1}$ Noise Level	60	57	37	36	45	57		
Sleep Disturbance Level								
	Night (2200-0700)	47	47	51	45	47	48	

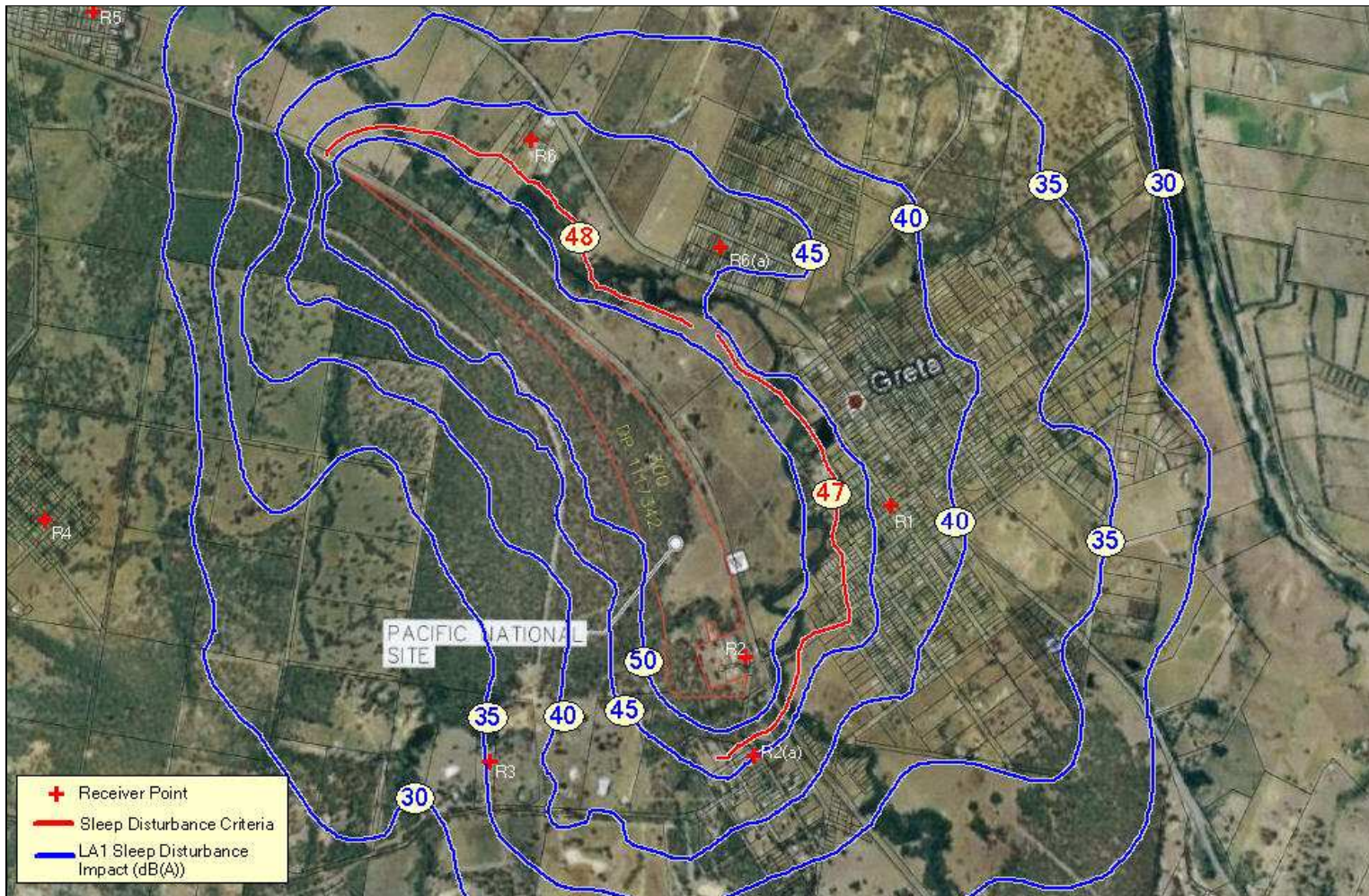


Figure 13: Predicted  $L_{A1}$  noise level, neutral conditions

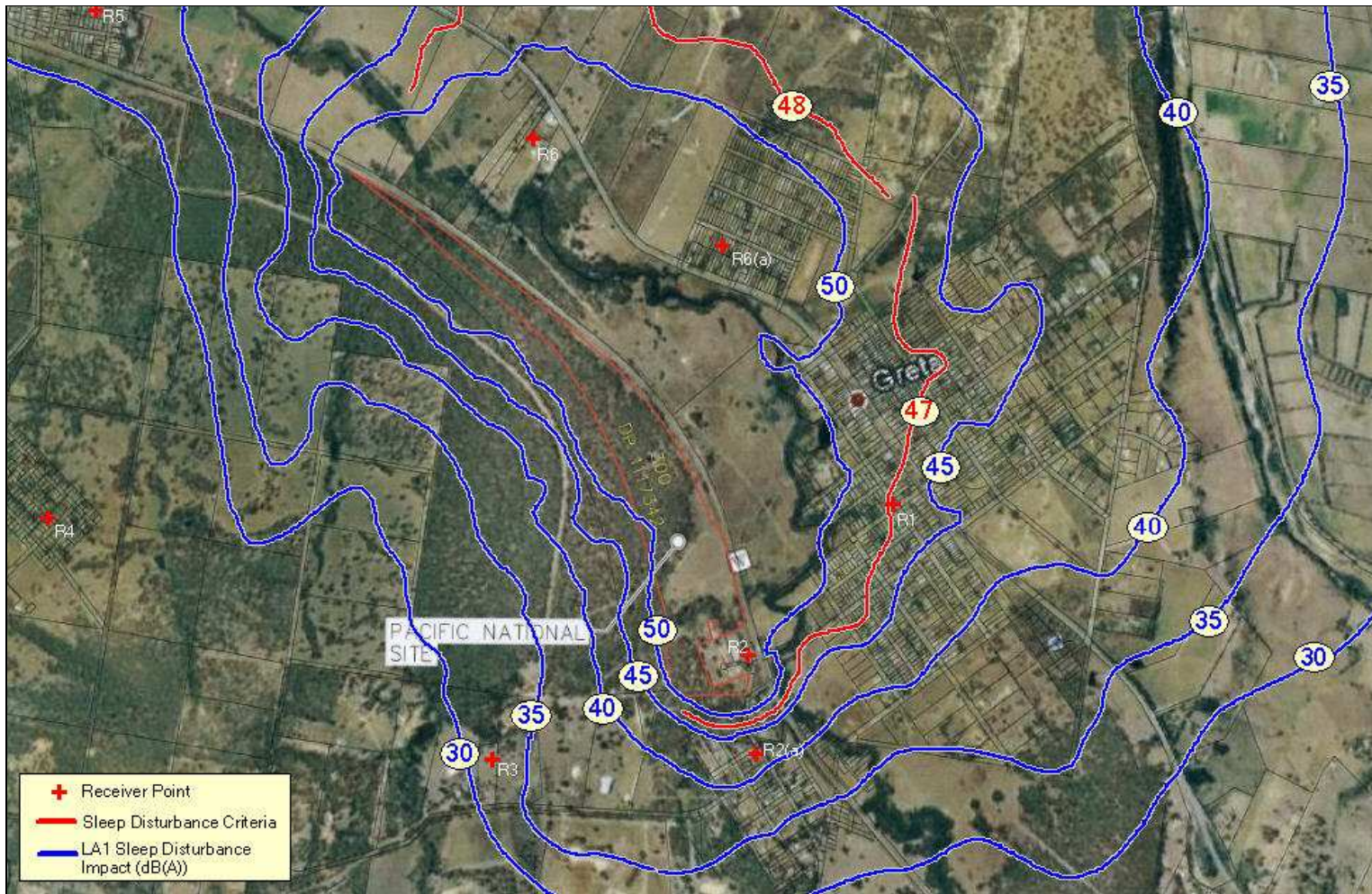


Figure 14: Predicted  $L_{A1}$  noise level, adverse SSW winds

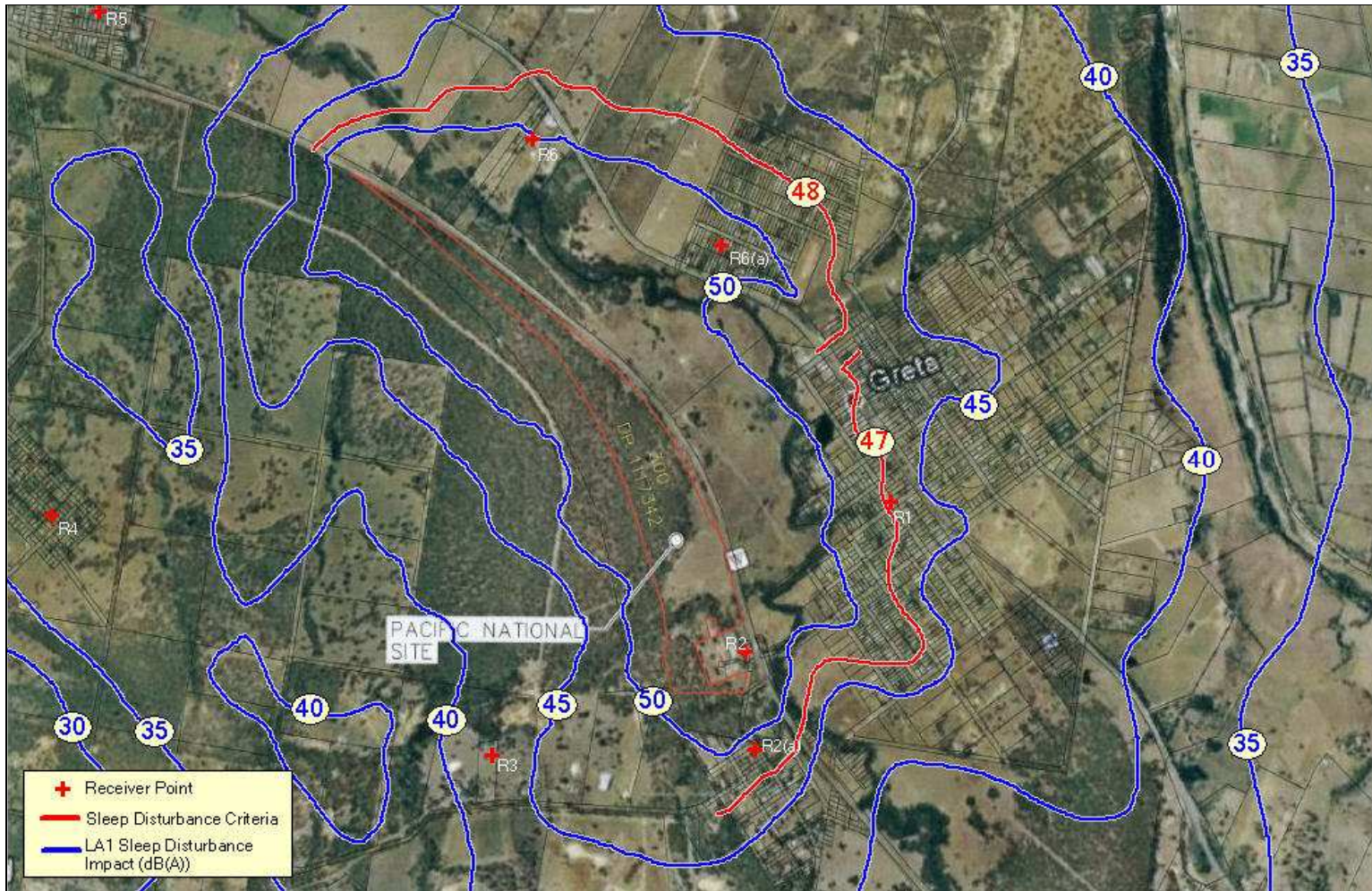


Figure 15: Predicted LA1 noise level, adverse Winter conditions

## 6.5 Interpretation of Modelled Impact Predictions

### 6.5.1 Greta Receiving Environment (R1)

The results indicate that impact will comply with the sleep disturbance criteria for the majority of receivers in Greta. Predicted  $L_{A1}$  noise levels indicate minor exceedences of the sleep disturbance criteria may occur:

- under neutral conditions exceedence of the  $L_{A1}$  criterion is restricted to a small number of receivers to the south-west of Sale St. Exceedence of the criteria in these locations is expected to be on the order of 1 to 2 dB(A);
- under SSW winds the  $L_{A1}$  noise impact would likely exceed the sleep disturbance criteria for the majority of receivers in Greta, including those north-east of the New England Highway. Receivers on Wyndham and Sale Streets closest to the industrial development may experience  $L_{A1}$  noise levels up to 50 dB(A) under these meteorological conditions; and
- during periods of temperature inversion  $L_{A1}$  noise impact would likely exceed the sleep disturbance criteria for approximately half of the receivers in Greta, including some to north-east of the New England Highway. Receivers on Wyndham and Sale Streets closest to the proposed TSF may experience  $L_{A1}$  noise levels up to 50 dB(A) under these meteorological conditions.

While the assessment indicates the sleep disturbance criteria may be exceeded during Stage 3 operations of the TSF, these results should be interpreted in the context of the ambient noise environment. Analysis of attended monitoring data presented in **Appendix II** indicates that ambient  $L_{A1}$  noise levels from existing transportation sources may reach levels up to 60 dB(A). While the TSF is considered an industrial noise source, the character of transient emissions from site operations is likely to be generally consistent with existing noise sources.

While  $L_{A1}$  emissions from the TSF may exceed the criteria with a maximum expected level of 49 dB(A), this impact is similar in character to, but significantly lower than existing  $L_{A1}$  noise levels experienced in the Greta receiving environment.

### 6.5.2 Illalong Receiving Environment (R2)

The results indicate that impact will comply with the sleep disturbance criteria for the majority of receivers in Illalong. Predicted  $L_{A1}$  noise levels indicate minor exceedences of the sleep disturbance criteria may occur:

- under neutral conditions the  $L_{A1}$  noise impact would comply with the sleep disturbance criteria for the all receivers in Illalong village.  $L_{A1}$  noise impacts may be up to 53dB(A) at receivers adjacent to the site access on Mansfield St;
- under SSW winds the  $L_{A1}$  noise impact would likely comply with the sleep disturbance criteria for the all receivers in Illalong village..  $L_{A1}$  noise impacts may be up to 52 dB(A) at receivers adjacent to the site access on Mansfield St; and
- during periods of temperature inversion  $L_{A1}$  noise impact would likely be on the order of 50 dB(A) at receivers north of the Tuckers Lane intersection.  $L_{A1}$  noise levels at receivers on Mansfield St adjacent to the site access road may experience noise levels up to 55 dB(A).

These results assume restrictions on access to the site by heavy vehicles between the hours of 10pm and 7am.  $L_{A1}$  noise levels associated with heavy vehicles accessing the site are likely to be in the order of +5dB above impact predictions presented above. Detailed review of modelling outputs indicates the  $L_{A1}$  noise levels in the Illalong receiving environment are generated by vehicles accessing the site via the Mansfield Road entrance. Review of attended monitoring results presented in **Appendix II** indicates that ambient  $L_{A1}$  noise levels associated with the passage of vehicles on Mansfield and Camp Roads may reach 56 dB(A), while the passage of trains generates  $L_{A1}$  noise levels up to 70 dB(A) at receivers on Mansfield Road.

While  $L_{A1}$  emissions from the TSF may exceed the criteria with a maximum expected level of 56 dB(A), this impact is similar to  $L_{A1}$  noise levels currently experienced in the Illalong receiving environment. The character of the  $L_{A1}$  impact is unlikely to differ significantly from existing road noise impacts associated with the poor alignment of the Mansfield Street rail overpass.

### 6.5.3 Tuckers Lane Receiving Environment (R3)

The results presented in **Section 6.4** indicate that noise impact will comply with the sleep disturbance criteria for all receivers in the Tuckers Lane receiving environment under all significant meteorological conditions.

### 6.5.4 North Rothbury Receiving Environment (R4)

The results presented in **Section 6.4** indicate that noise impact will comply with the sleep disturbance criteria for all receivers in the North Rothbury receiving environment under all significant meteorological conditions.

### 6.5.5 Branxton Receiving Environment (R5)

The results presented in **Section 6.4** indicate that noise impact will comply with the sleep disturbance criteria for all receivers in the Branxton receiving environment under all significant meteorological conditions.

### 6.5.6 New England Highway Receiving Environment (R6)

The results indicate that predicted  $L_{A1}$  noise levels may be above the sleep disturbance criteria for sensitive receivers to the north of the development along the New England Highway:

- under neutral conditions exceedance of the  $L_{A1}$  criterion is not expected to occur;
- under SSW winds the  $L_{A1}$  noise impact would likely exceed the sleep disturbance criteria for receivers along the highway.  $L_{A1}$  noise levels at receivers on the New England Highway may experience noise levels up to 55 dB(A); and
- during periods of temperature inversion  $L_{A1}$  noise impact would likely exceed the sleep disturbance criteria for the majority of receivers along the highway.  $L_{A1}$  noise levels at receivers on the New England Highway may experience noise levels up to 52 dB(A).

While the assessment indicates the sleep disturbance criteria may be exceeded during Stage 3 operations, these results should be interpreted in the context of the ambient noise environment. Analysis of attended monitoring data presented in **Appendix II** indicates that ambient  $L_{A1}$  noise levels from existing transportation sources may reach levels up to 64 dB(A). While  $L_{A1}$  emissions from the TSF are likely to exceed the criteria with a maximum expected level of 54 dB(A), the character of the impact is consistent with that from existing transportation sources, albeit at significantly lower levels.

## 6.5.7 Assessment of Impacts above the Sleep Disturbance Noise Level

**Table 29** provides an assessment of the number of receivers likely to experience noise impacts above the Sleep Disturbance noise level during Stage 3 operations.

**Table 29: Quantification of Impacts above the Sleep Disturbance Criteria, Stage 3 operations**

Receiving Environment	Neutral	Adverse Spring / Summer / Autumn	Adverse Winter
Greta	30	210	240
Mansfield Rd (at access road)	10	10	10
Illalong	5	0	20
Tuckers Lane	0	0	0
North Rothbury	0	0	0
Branxton receiving	0	0	0
New England Highway (Greta)	0	255	180
<b>Total</b>	45	475 <sup>^</sup>	450 <sup>^</sup>

<sup>^</sup> While the assessment indicates the Sleep Disturbance Criteria may be exceeded at up to 475 receivers, review of monitoring data for these locations (Appendix II) indicates these receivers already experience noise levels well in excess of the Sleep Disturbance Criteria.

**Table 29** indicates receiving environments in Greta and adjacent to the New England Highway are likely to be most affected by noise levels exceeding the Sleep Disturbance level under worst case conditions. This analysis should be interpreted in the context of monitoring and modelling results presented in **Section 3.2** and **Table 28** that indicate  $L_{A1}$  noise levels associated with existing transportation sources exceed:

- TSF impact predictions by a minimum of 2 dB(A); and
- the sleep disturbance criteria by 10 dB(A).

Consequently, while transient noise impacts associated with TSF operations may exceed the Sleep Disturbance criteria at up to 475 receivers under worst case conditions this represents the maximum extent of impacts as:

- these receivers are likely to currently experience similar or greater impacts from existing transportation sources; and
- this assessment is likely to overestimate the number of receivers affected, as no detailed assessment of receiver types or occupancy of individual lots has been undertaken.

Furthermore, the guidelines that establish the Sleep Disturbance criteria recognise these impacts are heavily influenced by the character and sensitivity of the individual to noise. Given the nature of the development, the character of proposed impacts is unlikely to differ significantly from existing impacts in the receiving environment adjacent to the rail corridor. Therefore, while quantitative analysis indicates the Sleep Disturbance criteria may be exceeded at 475 receivers under worst case conditions, existing impacts, occupancy and community response should be considered when assessing whether an this constitutes an adverse impact occurs at all 475 receivers.

### **6.5.7.1 Assumptions of the Assessment**

Receivers were identified from cadastral data overlain on aerial photography of the receiving environment adjacent to the proposed TSF. Discrete receivers were considered to be any lot (developed or undeveloped) located in areas zoned either 1(a) Rural, 1(c) Rural Residential and 2(b) Village under provisions established in the Cessnock LEP 1989. The counts are considered to provide a conservative estimate of the actual number of receivers likely to experience impacts exceeding the Sleep Disturbance noise level, as this assessment:

- assumes all identified lots have been, or are to be developed;
- applies no corrections to account for lots that contain commercial, open space or other non-residential land-use activities;
- considers only the contribution from the TSF and applies no corrections for localised noise impacts that may mask noise imissions from the TSF; and
- applies no corrections for barrier effects generated by building structures that may locally attenuate noise levels at receivers.

## 7. CONSTRUCTION NOISE IMPACTS

### 7.1 Staging of Construction Works

It is estimated that the construction works associated with the proposed development will take 12 to 14 months. Detailed information relating to the construction program is not available at this stage of the development however the following summary of works is provided:

- vegetation clearance and major earthworks (including blasting);
- establishment of rail sidings and turnouts from main northern line;
- construction of buildings, tank farm and ancillary infrastructure;
- construction of internal roadways; and
- commissioning of site infrastructure.

Major earthworks and establishment of final site levels are identified as a potentially significant source of construction noise given the expected requirement for blasting, rock breaking equipment and the significant volume of material to be cut. While the type and number of specific items of plant are not known at the time of this assessment it is assumed that the following construction plant will be utilised as part of the construction works:

- |                                   |   |
|-----------------------------------|---|
| ▪ excavators;                     | ▪ rigid heavy vehicles;                 |
| ▪ dozers;                         | ▪ semitrailers;                         |
| ▪ scrapers;                       | ▪ mobile cranes;                        |
| ▪ dump trucks;                    | ▪ concrete trucks and boom pumps;       |
| ▪ water cart;                     | ▪ asphalt laying plant;                 |
| ▪ backhoe;                        | ▪ rock breaking and crushing equipment; |
| ▪ specialised track laying plant. |   |

It is anticipated that cut material will be transported within the site only where it is required for use as fill or for construction of noise barriers at the site boundary. While it is acknowledged that the entire construction program is anticipated to last approximately 12 to 14 months, individual stages within the project will occur over shorter durations and are likely to be mobile in nature. For the purposes of this assessment construction works are considered in terms of two major components:

- **Phase 1:** major earthworks and establishment of final levels; and
- **Phase 2:** establishment of rail sidings, site infrastructure and ancillary services.

A separate assessment of potential overpressure and ground vibration impacts associated with blasting is presented in the Blasting and Vibration Impact Assessment for the proposed development.

#### 7.1.1 Construction Hours

It is understood that proposed working hours for the construction phase of the development will be generally consistent with the standard hours of construction (7am to 6pm) as outlined in the *Interim Construction Noise Guideline* (DECC, 2009).

The TSF will connect to the proposed third rail line in the Main Northern Rail corridor, and as such this phase of the construction schedule will not be dependant on track possession for the completion of connection works. While the requirement for 24 hour operations (that would be associated with works during periods of track possession) is not expected, assessment of potential impacts of night-period construction works is presented below.

## 7.2 Construction Noise Criteria

Due to the scale of the proposed development, detailed quantitative assessment of potential construction noise impacts will be undertaken against the management levels presented in the *Interim Construction Noise Guideline* (DECC, 2009).

### 7.2.1 Construction Noise Management Levels

The management noise levels associated with construction for each of the sensitive receivers is presented in **Table 30**. These are the limits with which construction noise impacts would have to comply.

**Table 30: Construction noise management levels, residential receivers**

Receiving Environment	Receiver ID	Management Level, $L_{Aeq,15minute}$		Construction Noise Criteria, dB(A)	
		Std Hours	Non Std Hours	Std Hours	Non Std Hours
Greta	R1			50	37
Mansfield Rd	R2			45	37
Illalong	R2(a)			42	36
Tuckers Lane	R3	RBL + 10	RBL + 5	44	35
North Rothbury	R4			49	37
Branxton	R5			53	38
New England Hwy	R6				
New England Hwy, Greta	R6(a)				

**Table 31: Construction noise management levels, non-residential receivers**

Receiver	Construction Noise Criteria, dB(A)	
	Std Hours	Non Std Hours
Greta Public School	60 <sup>1</sup> (external)	n/a <sup>2</sup>
Greta Community Pre-School	60 (external)	n/a <sup>2</sup>
Greta Arts and Sports Community Hall	60 (external)	60 (external)
Commercial Receivers	70 (external)	70 (external)

1 - The NSW Interim Construction Noise Guideline advises that as a guide, the difference between the internal noise level and the external noise level is typically 10dB with windows open for adequate ventilation. An external indicator of 60 dB (internal amenity level + 10dB) is therefore applied to this receiver as a means of assessing noise impacts.

2 - Construction noise criteria do not apply as these receivers are not considered to be in use during non-standard work hours.

### 7.3 Assessment of Construction Noise

An inventory of the acoustically significant equipment to be utilised during construction works is provided in **Table 32**. Operating Sound Power Levels (SWL) for each item of plant were calculated based on typical operating  $L_{Aeq}$  Sound Pressure Levels published by the UK Department for Environment, Food and Rural Affairs (DEFRA, 2005). Items of construction plant are grouped based on expected utilisation in major components of the construction works.

**Table 32: Construction equipment and typical SWL**

Construction Equipment	Typical Operating SPL <sup>1</sup> , dB(A)
<b>Phase 1: Major Earthworks</b>	
Tracked Excavator	77
Wheeled Backhoe Loader	67
Bulldozer	80
Road Scraper	87 <sup>2</sup>
Dump Truck	81
Water Cart	81
Rock Breaker on Excavator	81 <sup>4</sup>
Crushing Plant	90 <sup>4</sup>
Roller	79
Semi-trailer	80
<b>Phase 2: Rail Sidings and Site Infrastructure</b>	
Mobile Telescopic Crane	67
Concrete Truck and Pump	75
Concrete Truck	80
Wheeled Backhoe Loader	67
Semi Trailer	80
Asphalt Paver	77
Track laying equipment	80 <sup>3</sup>

Note: 1. Typical SPL measured at 10m from the source, DEFRA (2005).

Note: 2. +5dB(A) modifying factor applied for potentially tonal or impulsive noise character

Note: 3. +10dB(A) modifying factor applied for potentially tonal and impulsive noise character

Note 4: Advised SPL for crushing plant at 7m, provided by construction contractor

Construction noise impacts were modelled based on two work phases; major earthworks followed by establishment of site infrastructure. The model assumes that major earthworks are finalised prior to commencing works on site infrastructures. The following construction sources were modelled for the purposes of assessing impacts:

1. works around the provisioning shed and departure road;
2. works around the administration centre, maintenance shed and tank farm;
3. works around the arrival road;
4. works to construct the internal roadway and site entrance; and
5. crushing of blasted rock.

It is considered that this approach is representative of both the mobile nature of construction noise and worst case potential impacts. The location of these sources is provided in **Figure 16**.



Figure 16: Location of construction noise sources

## 7.4 Results

The predicted cumulative  $L_{Aeq,15minute}$  construction noise levels at the nearest sensitive receivers is shown in **Table 33**. **Figure 17 to Figure 19** show the predicted noise level contours for each of the scenarios outlined in **Table 33**. Construction noise impacts were modelled only for neutral conditions as no significant scenarios were identified during assessment of daytime meteorological data in **Section 4**.

**Table 33: Predicted  $L_{Aeq,15minute}$  construction noise level, dB(A)**

Description	R1	R2	R2(a)	R3	R4	R5	R6	R6(a)
Neutral Conditions -Phase 1	50	<b>74</b>	<b>52</b>	<b>43</b>	33	30	52	48
Neutral Conditions -Phase 2	40	<b>63</b>	42	33	30	<30	49	44
Adverse Winter Night - Phase 2 <sup>1</sup>	<b>39</b>	<b>49</b>	<b>42</b>	31	32	32	<b>44</b>	36
Ambient $L_{Aeq(day)}$ Noise Level	53	56	56	50	53	55		
Construction Noise Criteria								
Standard Hours (0700-1800)	50	45	42	44	49	53		
Non Standard Hours(1800-0700)	37	37	36	35	37	38		

Note 1. Works during the night period are unlikely to occur as part of the construction phase

Analysis of impacts under adverse night time Winter conditions is also presented for the purposes of assessing potential worst case impacts only where 24 hour operations are required. It is not anticipated at this stage of the assessment that 24 hour operations will be required. Results in bold text indicate a predicted impact greater than the PSNL for that receiving environment.

Care should be taken in interpreting the impact predictions as they represent the worst case  $L_{Aeq,15minute}$  noise impact, and are likely to over-estimate the  $L_{Aeq,period}$  contribution from site operations.

### 7.4.1 Assumptions of the Model

Key assumptions of the construction noise model:

- detailed information relating to the nature of specialist track laying equipment required for the construction works was not available at the time of the assessment. The assumed SWL for these items of plant is based on monitoring data for locomotive pass by at existing Pacific National HBT Kooragang Island Operations. A +10dB modifying factor was then applied to this source to account for potentially annoying noise characteristics such as tonality of impulsiveness that may be generated by this equipment;
- the operating SPL at 7 m from the crushing plant is 90 dB(A) with a source height of RL +2.0 m as advised by the construction contractor;
- the model assumes all equipment is operating at full power continuously during the 15 minute assessment period. This is likely to present a conservative assessment of potential impacts as most items of plant are expected to be mobile in this time period;
- the Phase 1 (neutral) model assumes all earthmoving sources are operational at all locations as shown in **Figure 16**;
- the Phase 2 (neutral) model assumes all equipment used for establishment of site infrastructure are operational at all locations as shown in **Figure 16**;

- the Phase 2 (adverse winter night-time) model assumes only equipment required for, or ancillary to track laying is utilised where the arrival and departure roads join the main northern line;
- the Phase 2 models assume the noise barrier adjacent to sensitive receivers at the site entrance (as discussed in **Section 5.4**) is constructed as part of the Phase 1 works; and
- no assessment of potential overpressure or ground vibration impacts associated with blasting are presented in the construction noise model. These impacts are assessed as part of the Blast and Vibration Impact Assessment for the project;
- predicted noise levels are the contribution from proposed construction operations only and do not include contribution from existing noise sources including road and rail traffic.

#### 7.4.2 Modifying Factor

The results presented in **Table 33** and **Figure 17 to Figure 19** include a +5 dB modifying factor correction for potentially impulsive and tonal characteristics detected during analysis of 1/1 octave sound pressure levels in accordance with Table 4.3 of the *Interim Construction Noise Guideline* (DECC, 2009).

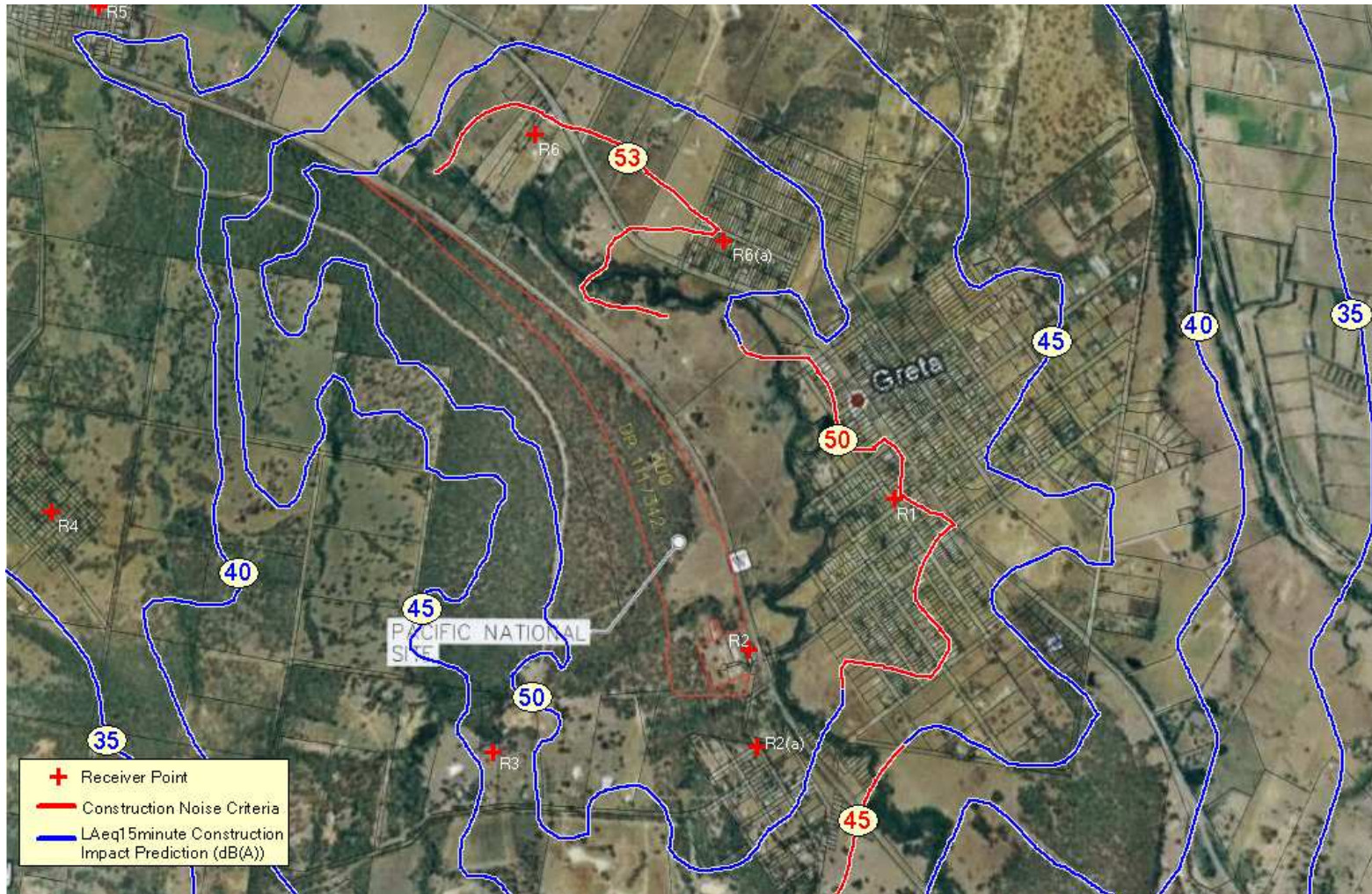


Figure 17: Predicted Phase 1 construction noise impact, neutral conditions

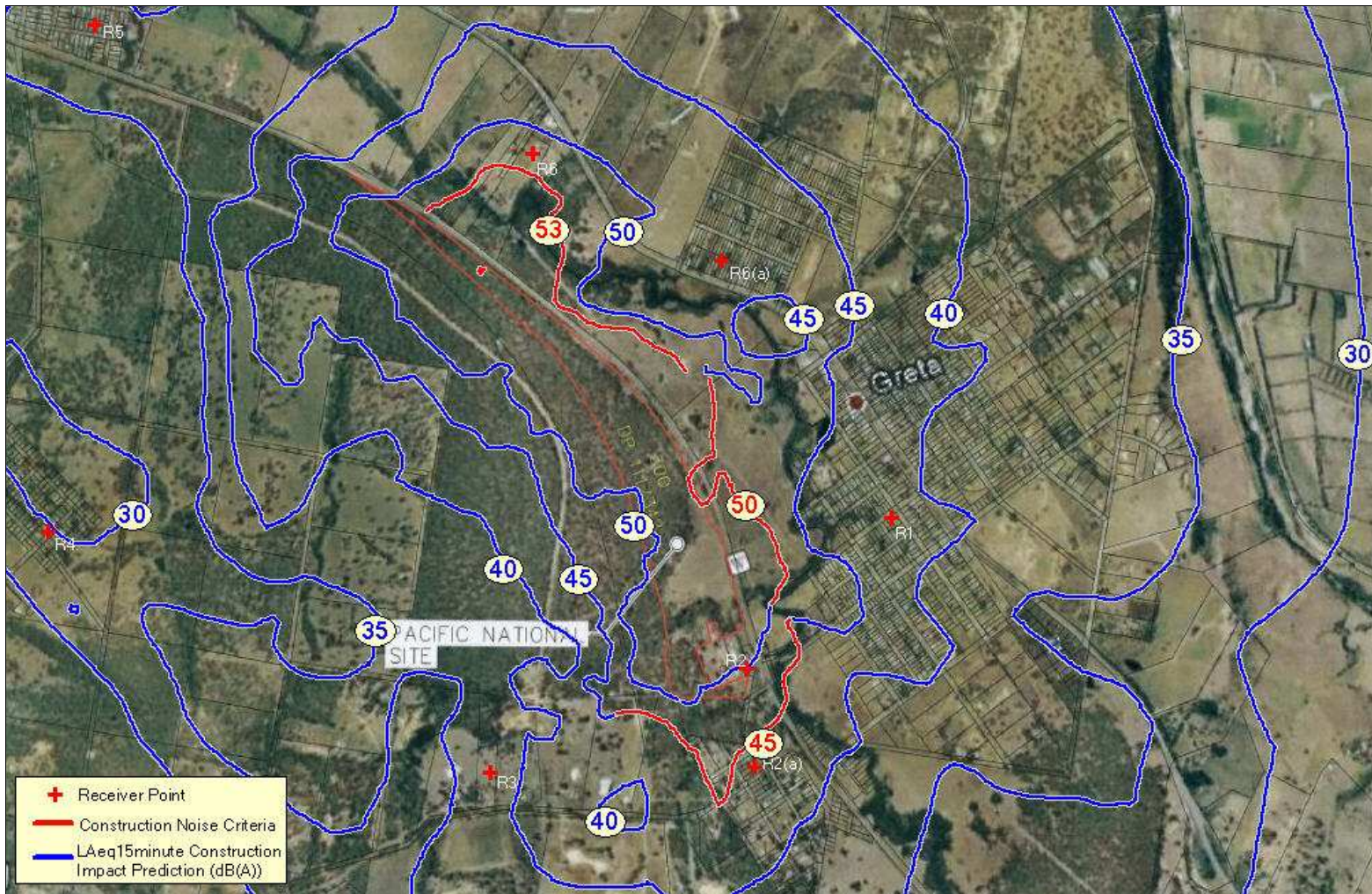


Figure 18: Predicted Phase 2 construction noise impact, neutral conditions

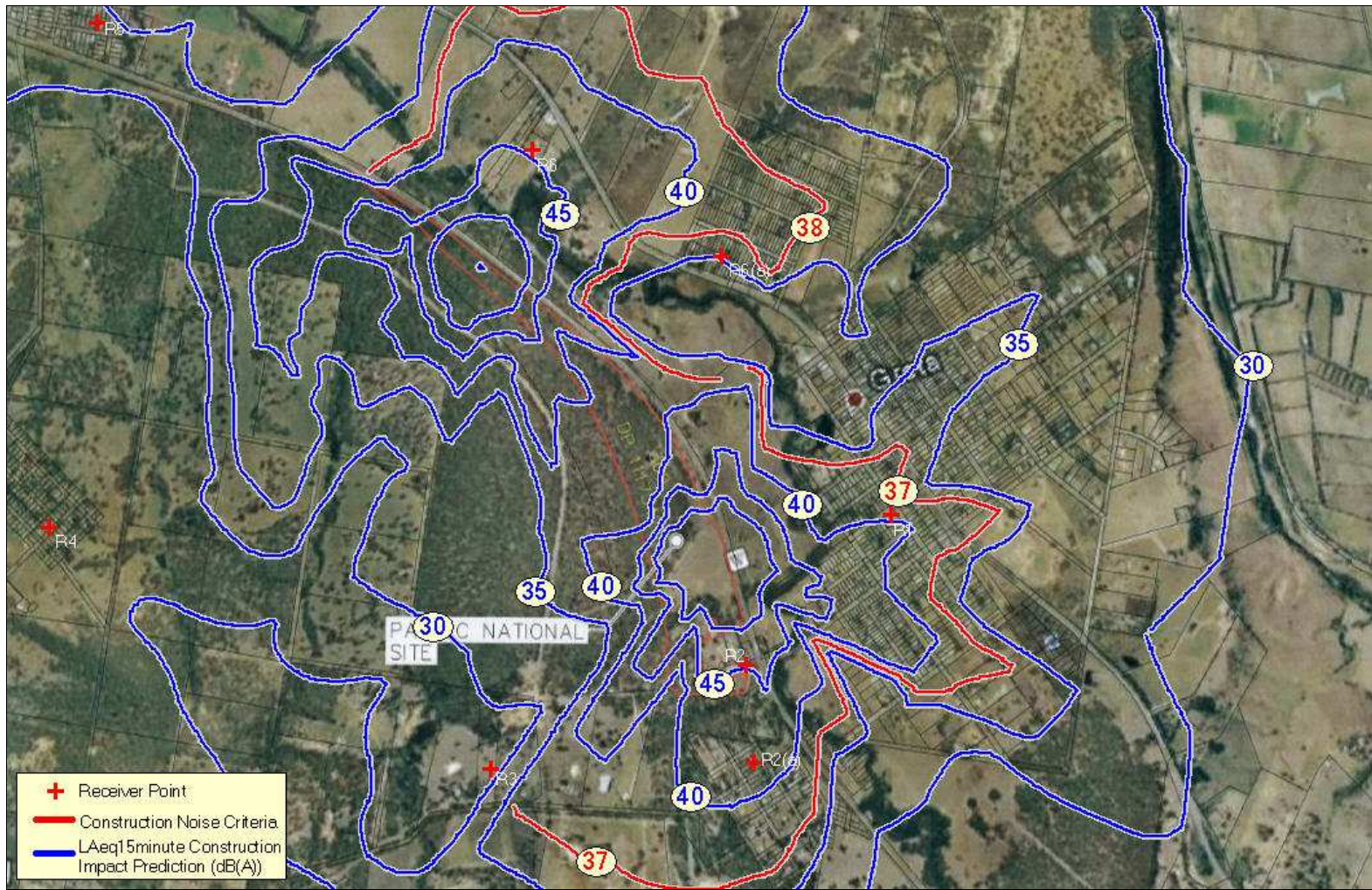


Figure 19: Predicted Phase 2 construction noise impact, Adverse winter conditions

## 7.5 Interpretation of Modelled Impact Predictions

Proposed construction activities will be restricted to the standard hours of construction (7am to 6pm) as detailed in the *Interim Construction Noise Guideline (DECC 2009)*. It should be noted that works during the night are not expected during Phase 2 of the construction period, however assessment of these impacts is presented for the purposes of understanding potential impacts should circumstances change. Track possessions on the Main Northern Line are usually of 48 hours in duration, meaning any impact (should these works be required) may occur only in the short term.

### 7.5.1 Greta Receiving Environment (R1)

The results indicate that predicted construction noise impacts may exceed the criteria for sensitive receivers in Greta:

- Phase 1 works would likely exceed the construction noise criteria for the majority of receivers to the south of the New England Highway. Construction noise impacts up to 53 dB(A) may be experienced at these receivers under worst case operational conditions;
- Phase 2 works would likely comply with the construction noise criteria at all receivers in the village of Greta; and
- Phase 2 works would likely exceed the criteria under adverse winter night-time conditions where 24 hour operations may be required during track possessions. Construction noise levels would be likely to exceed the criteria for most receivers south of the New England Highway, with impacts expected to approach 45 dB(A) under these operational and meteorological conditions.

It should be noted the Stage 2 (24hr operations) scenario is not expected to occur as the current proposal limits works to the standard hours of construction. While the assessment indicates the construction noise criteria may be exceeded during Phase 1 construction works, these results should be interpreted in the context of the ambient noise environment. Analysis of background monitoring data presented in **Section 3.2** and **Appendix I** indicates that predicted construction noise impacts are consistent with ambient  $L_{Aeq,period}$  noise levels of from existing noise sources.

Additionally, while predicted impacts do exceed the construction noise criteria, they remain below the amenity criteria noise levels for the receiving environment of 60 dB(A) (daytime). Given the temporary nature of construction noise impacts and the potential for masking by existing transportation noise sources, the impact may be effectively managed by on-site work practices.

### 7.5.2 Illalong Receiving Environment (R2)

The results indicate that predicted construction noise impacts are likely to exceed the criteria for sensitive receivers to the south-east of the site in Illalong:

- Phase 1 works present the most significant construction noise impact, with noise levels expected to approach the Highly Noise Affected management level of 75dB(A) at receivers adjacent to the site entry during construction of the site access road and noise barrier.  $L_{Aeq,15minute}$  noise levels during this stage of Phase 1 works may reach 74dB(A) at receivers closest to construction works, however it should be noted that the duration of these construction works will be significantly shorter than for major earthworks on the remainder of the site.

- Phase 2 works would likely comply with the construction noise criteria at receivers to the south-east of the site in Illalong but may exceed the criteria by up to 5 dB(A) at receivers on Mansfield Road during standard work hours; and
- Phase 2 works would be likely to exceed the criteria under adverse winter night-time conditions if 24 hour operations were required. Construction noise levels would likely exceed the criteria for receivers adjacent to the site access road and in the village of Illalong, with impacts up to 49 dB(A) under these operational and meteorological conditions at receivers on Mansfield Road and 42 dB(A) at receivers in Illalong.

### 7.5.3 Tuckers Lane Receiving Environment (R3)

The results presented in **Section 7.4** indicate that noise impact may exceed the construction noise criteria by 1 dB(A) at receivers in the Tuckers Lane receiving environment during Phase 1 earthworks. Predicted noise impacts are expected to comply at these receivers during the construction Phase 2 scenario.

### 7.5.4 North Rothbury Receiving Environment (R4)

The results presented in **Section 7.4** indicate that noise impact will comply with the construction noise criteria for all receivers in the North Rothbury receiving environment under all meteorological conditions at all stages of the construction program.

### 7.5.5 Branxton Receiving Environment (R5)

The results presented in **Section 7.4** indicate that noise impact will comply with the construction noise criteria for all receivers in the Branxton receiving environment under all meteorological conditions at all stages of the construction program.

### 7.5.6 New England Highway Receiving Environment (R6)

The results indicate that predicted construction noise impacts may exceed the criteria for sensitive receivers to the north of the development along the New England Highway under adverse winter night-time conditions, only where if 24 hour construction works occur. It should be noted however that this scenario is not expected to occur as the current proposal limits works to the standard hours of construction.

Modelling results indicate impacts generated by construction works undertaken during standard work hours may result in only minor exceedence of the construction noise criteria at a small number of receivers to the south of the New England Highway

### 7.5.7 Assessment of Impacts at Non-Residential Receivers

Review of impact predictions presents in **Figure 17** to **Figure 19** indicates construction noise impacts are likely to be below the construction noise management level for all non-residential receivers identified in **Section 3.3.1**.

### 7.5.8 Assessment of Impacts above the Construction Noise Management Level

**Table 34** provides an assessment of the number of receivers likely to experience noise impacts above the noise management levels listed in **Table 30** during the construction phase of the project.

**Table 34: Quantification of Impacts above the Construction Noise Management Level**

Receiving Environment	Neutral Phase 1	Neutral Phase 2
Greta	275	0
Mansfield Rd (at access road)	10	10
Illalong	90	10
Tuckers Lane	10	0
North Rothbury	0	0
Branxton receiving	0	0
New England Highway (Greta)	5	0
<b>Total</b>	<b>390</b>	<b>20</b>

Note 1. Works during the night period are not proposed to occur as part of the construction phase

**Table 34** indicates receiving environments in Greta and adjacent to the New England Highway are likely to be most affected by noise levels exceeding that of the PSNL under worst case conditions. The results also suggest impacts at up to 100 receivers in the receiving environment at Illalong; this impact will be limited to the construction around the site access road; hence these impacts are unlikely to persist for the duration of the 12month construction program.

This analysis should be interpreted in the context of monitoring and modelling results presented in **Section 3.2** and **Table 33** that indicate ambient  $L_{Aeq}$  noise levels associated with existing transportation sources exceed impact predictions by a minimum 3 dB(A) in these receiving environments. Hence, while TSF noise impacts above that of the construction noise management level may affect up to 320 receivers under worst case operational conditions, this:

- impact is likely to be consistent with the level of impact associated with existing transportation sources;
- assessment may overestimate the number of receivers affected, as no detailed assessment of receiver types or occupancy of individual lots has been undertaken.

Quantification of impacts during periods of track possession works that coincide with worst case meteorological impacts (Adverse Winter Night Phase 2) was not undertaken as this scenario is not proposed to occur as part of the construction program as discussed in **Section 7.1.1**.

### ***7.5.8.1 Assumptions of the Assessment***

Receivers were identified from cadastral data overlain on aerial photography of the receiving environment adjacent to the proposed TSF. Discrete receivers were considered to be any lot (developed or undeveloped) located in areas zoned either 1(a) Rural, 1(c) Rural Residential and 2(b) Village under provisions established in the Cessnock LEP 1989. The counts are considered to provide a conservative estimate of the actual number of receivers likely to experience impacts exceeding the construction noise management level, as this assessment:

- assumes all identified lots have been, or are to be developed;
- applies no corrections to account for lots that contain commercial, open space or other non-residential land-use activities;
- considers only the contribution from the TSF and applies no corrections for localised noise impacts that may mask noise imissions from the TSF; and
- applies no corrections for barrier effects generated by building structures that may locally attenuate noise levels at receivers.

## 8. ROAD TRAFFIC NOISE

### 8.1 Traffic Routes

Access to the site for road traffic will typically be via the New England Highway and Nelson Street. While it is expected that the Hunter Expressway will reduce vehicle numbers on the New England Highway following completion of its construction in 2014, it is considered that location of an interchange to the west of Illalong will continue generate steady traffic flows along Nelson St as residents are likely to access Greta via this route.

Any changes to site access routes following construction of the Hunter Expressway reduce traffic noise impacts associated with the development, as access to the site via the approved F3 alignment south of the site will reduce exposure to receivers in Greta.

### 8.2 Environmental Criteria for Road Traffic Noise

Traffic generated by the proposed development should comply with the EPA *Environmental Criteria for Road Traffic Noise* (ECRTN)  $L_{Aeq,period}$  day time and night time traffic noise levels (the relevant section is reproduced in Table 35) for traffic moving through Greta via Nelson Street.

**Table 35: Road traffic noise criteria**

Type of Development	Criteria, dB(A)	Where Criteria is already Exceeded
7. Land use developments with potential to create additional traffic on existing arterial roads	Day time $L_{Aeq(15hr)}$ 60 Night time $L_{Aeq(9hr)}$ 55	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria.  In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.
8. Land use developments with potential to create additional traffic on collector roads	Day time $L_{Aeq(1hr)}$ 60 Night time $L_{Aeq(1hr)}$ 55	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria.  In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

Source: *Environmental Criteria for Road Traffic Noise Table 1 (1999)*

In accordance with Guidelines established in Section 2.2 of the ECRTN, Nelson Street is identified as a collector road as it is the corridor along which traffic travels south from Greta to Kurri Kurri.

### 8.3 Assessment of Road Traffic Noise

#### 8.3.1 Existing Traffic Noise Impacts

Assessment of attended and unattended noise monitoring data indicates that ambient 95<sup>th</sup> percentile  $L_{Aeq,1hour}$  noise levels (the  $L_{Aeq,1hour}$  noise level observed 95% of the time) for receivers on the Nelson Street and Mansfield Street corridor is on the order of 58 dB(A). Review of unattended monitoring data presented in **Figure 20** indicates there is no significant diurnal change in  $L_{Aeq,1hour}$  noise levels, potentially due to the influence of rail traffic during the night period. Road and rail traffic are the dominant sources in this receiving environment and review of attended monitoring results presented in **Figure 21**, indicates that typical Sound Exposure Levels (SEL) for pass by events are on the order of 55 to 57 dB(A) and 66 to 67 dB(A) for road and rail traffic respectively.

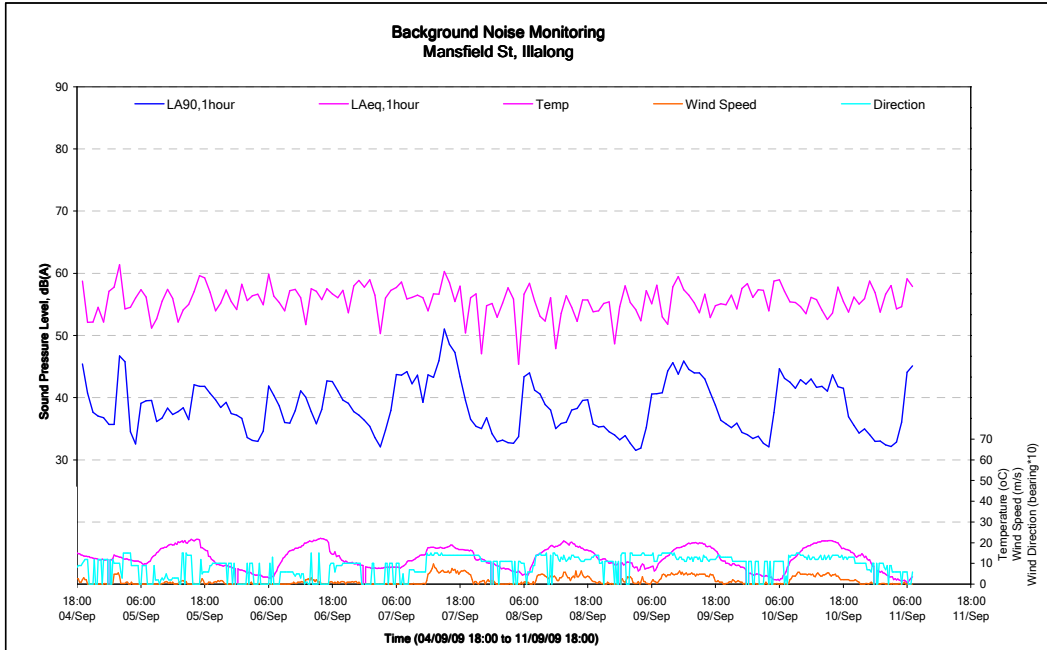


Figure 20: Ambient  $L_{Aeq,1hour}$  noise levels, Mansfield St Illalong

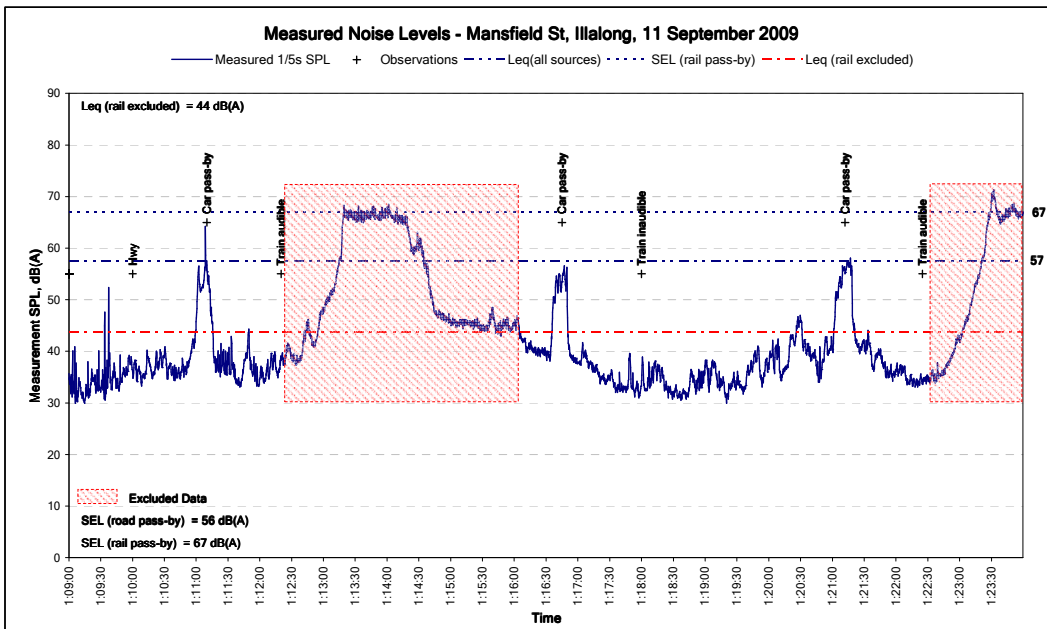


Figure 21: Assessment of road noise contribution, Mansfield Street Illalong

### 8.3.2 Future Traffic Noise Impacts

Information available at the time of the assessment indicates site operation will generate approximately 110 in and out vehicle movements per day, with the majority of these movements expected to occur via the New England Highway and Nelson Street access. Peak times for vehicle movements are expected to be as follows:

- morning peak: 6:00am to 8:00am (38 cars accessing the site); and
- afternoon peak: 2:30pm to 6:00pm (38 cars accessing the site).

Maximum vehicle flow rates of up to 17 vehicles per hour are expected from 7:00am and 5:00pm.

The project Traffic Impact Assessment provides information relating to current peak vehicle movements on proposed access routes for the development, reproduced in **Table 36**. These results indicate traffic generated by the proposed development may increase traffic movements on Nelson Street by up to 5.5% during peak periods.

**Table 36: Propsoed changes to peak traffic flow**

	Existing Peak Flow (vehicles per hour)	TSF Contribution	Percent change
New England Highway	1422	17	+1.2 %
Nelson Street	312	17	+5.5 %

A simple model was established to assess the impact of road noise based on pass by SEL and traffic count data on Nelson St. Predicted  $L_{Aeq,15minute}$  road noise impacts were found to be consistent with the assessed  $L_{Aeq,15minute}$  noise level following exclusion of rail impacts presented in **Figure 21**. The results presented in **Table 37** are considered to sufficiently validate the road noise model.

**Table 37: Road noise model validation**

Pass-by Event (3 Vehicles)	$L_{Aeq,15minute}$
Predicted Impact	45.0
Measured Impact	43.8

The model was used to characterise existing impacts of road traffic noise generated during times of peak flow and offer an analysis of potential changes following commencement of operations at the proposed TSF. The results of this assessment are presented in **Table 38**.

**Table 38: Road noise impact prediction**

Peak Impact	Existing		Future	
	Vehicles / hr	$L_{Aeq,1hour}$	Vehicles / hr	$L_{Aeq,1hour}$
New England Highway	1422	66.7	1439	66.8
Nelson St / Mansfield St	312	60.1	329	60.4

Based on the assumptions of the model presented in **Section 8.3.3**, it must be noted that the impact predictions provided in **Table 38** are for noise levels at the road verge. Decay due to increasing separation distances means noise levels at the façade of receiver structures will be lower than the impact predictions.

These predictions indicate that traffic generated by the proposed development may increase  $L_{Aeq,1hour}$  noise levels by 0.1 and 0.3 dB(A) at receivers adjacent to the New England Highway and Nelson Street respectively. While impact predictions indicate existing noise levels exceed the criteria, guidelines presented in the ECRTN indicate that road noise levels may be considered acceptable where the increase is less than 2dB(A). Hence, it is considered the impact of road noise generated by the proposed development is acceptable in accordance with guidelines presented in the ECRTN.

### **8.3.3 Assumptions of the Road Traffic Noise Model**

Key assumptions of the modelled sleep disturbance noise impacts include:

- the model is based on measured SEL at the road verge on Mansfield Street and is likely to overestimate the road noise impact:
  - received at the façade of residences as the separation distance to these receivers is greater than to the measuring point in which the model is based; and
  - the monitoring location on which the model is based is adjacent to the Mansfield Street rail overpass. Pass by SELs from this location are likely to be greater than for a straight section of road due to longer pass by times as vehicles negotiate the poor road alignment of the overpass.
- assessment of changes to peak flows only are presented as it is considered this provides an assessment of worst case  $L_{Aeq,1hour}$  noise impacts; and
- the impact predictions are for the contribution from road traffic only and do not include contribution from existing noise sources including rail traffic.

## 9. ASSESSMENT OF CUMULATIVE NOISE IMPACTS

### 9.1 Methodology and Reference Material

The NSW Department of Planning (DoP) provides the following Director General's Requirements for the assessment of cumulative noise impacts associated with the proposed TSF and other transportation infrastructure currently approved or under assessment at in the Greta locality:

*The noise assessment must consider the impact from the project in isolation and in a cumulative context with relevant existing and approved development, including development of the Hunter Expressway and the third railway line between Maitland and Minimbah.*

This assessment is based on guidelines established in the INP and publically available information relating to the assessment of noise impacts associated with the aforementioned infrastructure projects.

It should be noted that at the time of this assessment no information relating to noise impacts associated with the Maitland to Minimbah third rail line was publically available. Hence, the cumulative impact assessment is based on typical rail noise impacts presented in the noise assessment for upgrade of the Minimbah to Singleton section of the northern line. The following documents are referenced for the purposes of this assessment:

- Atkins Acoustics (2007). *F3 Freeway to Branxton Link: Noise Assessment (Revision 3)*, NSW Roads and Traffic Authority, Newcastle;
- Masson, Wilson & Twiney (2001). *Review of Traffic Modelling and Project Justification (Draft Report): Proposed Highway Link DF3 Freeway to Branxton*; and
- GHD (2008). *Report on ARTC Minimbah Third Track Environmental Assessment: Noise and Vibration Impact Assessment (Revision 1)*, Australian Rail and Track Corporation.

In the absence of DoP or DECCW issued guidelines on quantitative assessment of cumulative noise impacts, this assessment presents as a qualitative review of potential noise impacts on the amenity of the receiving environment associated with the three major proposed developments. Where noise impacts are not provided for discrete receptors in the referenced noise impact assessments, general extrapolation of impacts was undertaken based:

- the distance from the source to receiving environments; and
- the assumption that both rail and road corridors presents as a line noise source.

### 9.2 Assessment of Cumulative Noise Impacts

#### 9.2.1 Tuckers Lane, North Rothbury and Branxton Receiving Environments

Review of impact predictions presented in **Section 5** to **Section 7** indicates the following receiving environments will experience negligible noise impacts:

- Tuckers lane (south of the development);
- North Rothbury (west of the development); and
- Branxton (north-west of the development).

As the impact of the proposed TSF on these receiving environments is considered negligible, no further assessment of cumulative noise impacts is presented for these locations.

## 9.2.2 Greta Receiving Environment (R1)

Review of operator attended monitoring results presented in **Appendix II** indicates the ambient noise environment at this location is dominated by relatively equal contributions from road and rail noise. In the absence of any other significant industrial or environmental noise sources, it is conservatively assumed that these sources provide an equal contribution to the measured  $L_{Aeq,night}$  ambient noise level in this receiving environment of 50 dB(A). These sources are therefore assumed to each contribute 47 dB(A) at this monitoring location.

### 9.2.2.1 Hunter Expressway Noise Impacts

Review of the NIA for the Hunter Expressway indicates that mitigated  $L_{Aeq,9hr}$  noise levels will comply with the night period ECRTN criterion of 55 dB(A) for all receivers in Greta. General extrapolation of the prediction for mitigated 2026  $L_{Aeq,9hr}$  impacts indicates road noise levels associated with the Hunter Expressway may approach 41 dB(A) during the night period.

### 9.2.2.2 New England Highway Noise Impacts

Review of the EA for the Hunter Expressway indicates that traffic volumes on the New England Highway are expected to decrease by up to 60% following completion of the Newcastle to Branxton link. Assuming a 60% reduction vehicle pass by events,  $L_{Aeq,period}$  noise levels generated by the New England Highway at this location are likely to reduce to a level in the order of 43 dB(A).

### 9.2.2.3 Potential Third Rail line Noise Impacts

The Minimbah Third Track Environmental Assessment (GHD 2008) indicates receivers more than 500m from the rail line on the Minimbah to Whittingham section of the line may experience an increase in current  $L_{Aeq,9hr}$  noise levels from rail sources by up to 2dB(A). The monitoring location in Greta is approximately 1000m from the rail corridor, so the impact is conservatively assessed as a potential +1dB(A) increase.

### 9.2.2.4 Cumulative Noise Impact

Data presented in **Table 39** provides an assessment of potential cumulative noise impacts associated with the Hunter Expressway, third rail line and Train Support Facility.

**Table 39: Cumulative noise impact**

	Assessed Contribution, dB(A)
Hunter Expressway	41
New England Highway	43
Third Rail	48
Train Support Facility	36
Ambient $L_{Aeq,night}$	50
Cumulative $L_{Aeq,night}$ (all sources)	50
Cumulative $L_{Aeq,night}$ (without TSF)	50
Amenity Criteria	45

The results presented in **Table 39** indicate the cumulative noise impacts associated with the three developments will not generate cumulative noise impacts exceeding ambient night period noise levels. It should be noted however the contribution from the TSF is not significant in comparison to existing levels of transportation noise, and will have negligible influence on cumulative  $L_{Aeq,period}$  noise levels.

## 9.2.3 Illalong Receiving Environment (R2)

### 9.2.3.1 Hunter Expressway Noise Impacts

Review of the NIA for the Hunter Expressway link indicates that mitigated  $L_{Aeq,9hr}$  noise levels will comply with the night period ECRTN criterion of 55 dB(A) for all receivers in Illalong. General extrapolation of the prediction for mitigated 2026  $L_{Aeq,9hr}$  impacts indicates road noise levels associated with the Hunter Expressway may approach 53 dB(A) during the night period at receivers on Mansfield Road, adjacent to the TSF site access.

### 9.2.3.2 Potential Third Rail line Noise Impacts

Review of operator attended monitoring results presented in **Appendix II** indicates  $L_{Aeq,15minute}$  noise impacts associated with the passage of coal trains on the northern line may reach levels of 57 dB(A) at receivers in Mansfield Street adjacent to the TSF site access. This impact is based on the passage of 1 train in the 15 minute assessment period, or (on average) 4 per hour. Review of predicted rail movements in the Minimbah Third Track Environmental Assessment (GHD 2008) indicates the rail corridor will handle approximately 140 train movements per day by the year 2018, equating to approximately 6 train movements per hour. Assuming the measured rail contribution presented in the attended monitoring results is representative of the long term impact, a conservative assessment of future rail noise impact is made based on extrapolated impacts presented in the GHD report.

The assessment indicates that receivers between 100m and 300m from the rail line on the Minimbah to Whittingham section of track may experience an increase in current  $L_{Aeq,9hr}$  noise levels from rail sources between 1 and 4 dB(A). Receivers closest to the site access road are approximately 250m from the rail corridor, so the future impact is conservatively assessed as a potential +2 dB(A) increase.

### 9.2.3.3 Cumulative Noise Impact

Assessment presented in **Table 40** provides an assessment of potential cumulative noise impacts associated with the Hunter Expressway, third rail line and Train Support Facility.

**Table 40: Cumulative noise impact**

	Assessed Contribution
Hunter Expressway	53
Third Rail	59
Train Support Facility	42
Ambient $L_{Aeq,night}$	57
Cumulative $L_{Aeq,night}$ (all sources)	60
Cumulative $L_{Aeq,night}$ (without TSF)	60
Amenity Criteria	40

The results presented in **Table 40** indicate the cumulative noise impacts associated with the three developments may generate cumulative noise impacts exceeding ambient night period noise levels. Review of the contribution from each of the development sources indicates the cumulative noise impact will be dominated by traffic on the rail corridor. The contribution from the TSF is not considered significant in comparison to either existing or anticipated levels of transportation noise, and will have negligible influence on cumulative  $L_{Aeq,period}$  noise levels.

#### 9.2.4 New England Highway Receiving Environment (R6)

Review of operator attended monitoring results presented in **Appendix II** indicates the ambient noise environment at this location is dominated by the passage of vehicles on the New England Highway, with some observed contribution from rail noise likely at receivers more distant from the road corridor. Analysis of attended monitoring results indicates an  $L_{Aeq,15minute}$  contribution of 57 dB(A) from road noise on the New England Highway. Rail noise contribution from the same dataset were assessed to be 56 dB(A).

It is acknowledged that this data was collected during the early morning peak and may not be representative of long term impacts in this receiving environment, as  $L_{Aeq}$  contributions are greater than ambient  $L_{Aeq,period}$  results presented in **Section 3.2**. To ensure representative assessment, the relative contribution from these source is based on the measured  $L_{Aeq,period}$  result for the night period (presented in **Section 3.2**), adjusted in accordance with the relationship between road and rail contributions presented above.

**Table 41: Cumulative noise impact**

	Measured $L_{Aeq,15minute}$	Ambient $L_{Aeq, night}$	Assessed Contribution
New England Highway	57		50
Rail Contribution	56	53	49
All Sources	60		53

##### 9.2.4.1 Hunter Expressway Noise Impacts

Review of the NIA for the Hunter Expressway link indicates that mitigated  $L_{Aeq,9hr}$  noise levels will comply with the night period ECRTN criterion of 55 dB(A) for all receivers on the New England Highway. General extrapolation of the prediction for mitigated 2026  $L_{Aeq,9hr}$  impacts indicates road noise levels associated with the Hunter Expressway may approach 55 dB(A) at receivers to the south of the highway and 50 dB(A) at receivers to the north during the night period.

##### 9.2.4.2 New England Highway Noise Impacts

Review of the EA for the Hunter Expressway indicates that traffic volumes on the New England Highway are expected to decrease by approximately 60% following completion of the Newcastle to Branxton link. Assuming a 60% reduction vehicle pass by events, noise levels generated by the New England Highway at this location are likely to reduce to a level on the order of 46 dB(A).

### 9.2.4.3 Potential Third Rail line Noise Impacts

The Minimbah Third Track Environmental Assessment (GHD 2008) indicates that receivers approximately 500m from the rail line on the Minimbah to Whittingham section of track may experience an increase in current  $L_{Aeq,9hr}$  noise levels from rail sources by up to 2dB(A). Separation distances to receivers on the New England Highway corridor range from approximately 400m to the south of the highway to more than 600m on the northern side of the highway. The impact is assessed as a potential +1dB(A) increase for receivers to the north of the highway and +2 dB(A) for receivers to the south.

### 9.2.4.4 Cumulative Noise Impact

Assessment presented in **Table 42** provides an assessment of potential cumulative noise impacts associated with the Hunter Expressway, third rail line and Train Support Facility.

**Table 42: Cumulative noise impact**

	Assessed Contribution	
	South of Highway	North of Highway
Hunter Expressway	55	50
New England Highway	46	46
Third Rail	51	50
Train Support Facility	40	42
Ambient $L_{Aeq,night}$	53	
Cumulative $L_{Aeq,night}$ (all sources)	57	54
Cumulative $L_{Aeq,night}$ (without TSF)	57	54
Amenity Criteria	45	

The results presented in **Table 42** indicate the cumulative noise impacts associated with the three developments may generate cumulative noise impacts exceeding ambient night period noise levels. Review of the contribution from each of the development sources indicates the cumulative noise impact will be dominated by road noise from the Hunter Expressway with a moderate contribution from the rail corridor. The contribution from the TSF is not considered significant in comparison to either existing or anticipated levels of transportation noise, and will have negligible influence on cumulative  $L_{Aeq,period}$  noise levels.

## 9.3 Assumptions of the Assessment

- predicted  $L_{Aeq,15minute}$  noise impacts from TSF operations are used as an indicator of potential  $L_{Aeq,period}$  impacts. This is likely to present a conservative assessment of the contribution from TSF operations to cumulative noise levels;
- predicted  $L_{Aeq,15minute}$  noise impacts from TSF operations represent the greatest impact under worst case meteorological conditions specific to the receiving environment;
- assessment of night period impacts only is presented as noise levels generated by the TSF are compliant with the PSNL for the day and evening period;

- interpretation of potential future rail noise impacts is based on single point impact predictions provided for the Minimbah Third Track Environmental Assessment (GHD 2008). While it is understood that these results are subject to influence from intervening topography, for the purposes of this assessment No correction is made for results potentially affected by intervening topography that may enhance or attenuate noise from distance rail sources. Impact predictions are assumed to be influenced only by source to receiver distance attenuation functions; and
- the amenity criteria presented is based assessment of background monitoring data which identified urban receiving environments adjacent to the New England Highway and in Greta and a suburban receiving environment at Illalong. The characteristics that define these receiver types may be subject to change during the operation phase of these developments, with receiving environments along the New England Highway corridor potentially redefined as suburban receivers. Potential changes to the amenity criteria are not considered to impact on the outcomes of this assessment however, as existing and future transportation noise impacts significantly exceed both the existing amenity criteria and the expected contribution from the TSF.

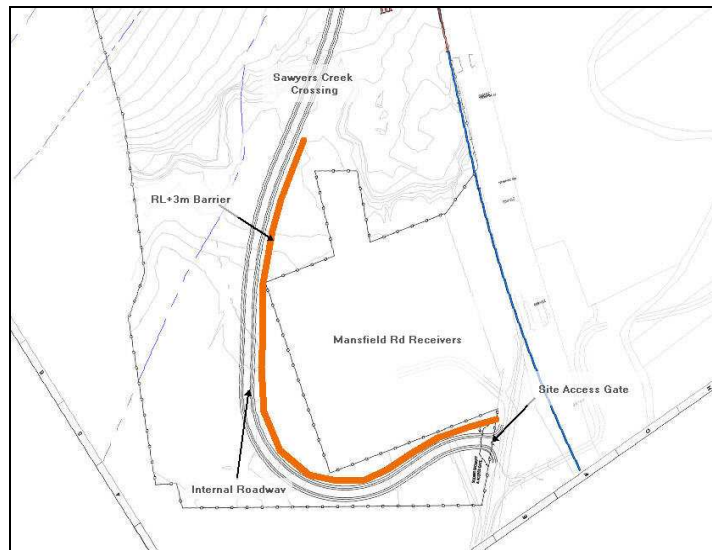
## 10. RECOMMENDED MITIGATION MEASURES

### 10.1 Engineered Noise Mitigation

Modelling results indicate worst case noise impacts for receiving environments in Greta, Illalong and on the New England Highway comply with the day and evening period PSNL under all significant meteorological conditions. As the development is proposed to operate 24 hours a day, the night period PSNL becomes the limiting criterion for the assessment of noise impacts. Predictive modelling indicates:

- receivers in Greta may experience noise levels up to 3dB(A) above the night period PSNL during periods of south-westerly winds and temperature inversion;
- receivers in Illalong may experience noise levels up to 5 dB(A) above the night period PSNL under neutral conditions and during periods of temperature inversion; and
- receivers north of the site on the New England Highway may experience noise levels up to 4 dB(A) above the night period PSNL during periods south-westerly winds.

These results are based on modelling scenarios that apply a noise barrier adjacent to receivers at the site entrance to mitigate noise impact associated with road vehicles accessing the site. This barrier would be approximately 3 metres in height and run parallel to the internal roadway between the roadway and receivers to the east as shown in **Figure 22**.



**Figure 22: Concept design for site access road noise barrier**

It should be noted that detailed design of noise barriers was not undertaken as part of this assessment and the barrier specifications provided are in concept only. Detailed design of noise barriers including a sensitivity analysis should be undertaken prior to construction and following consultation with the affected receivers and NSW Department of Environment, Climate Change and Water (DECCW).

## 10.2 Operational Noise Management

Impact predictions presented in **Section 5** to **Section 7** represent expected worst case operational impacts, with all of sources in the facility operating 100% of the time. This scenario is unlikely to present on a regular basis, particularly during the night period when ancillary site operations such as fuel delivery and peak vehicle movements would not be typical. However, due to the transient nature of noise likely to be generated by site activities and the potential for exceedence of the PSNL, a number of operational controls are recommended for the management of noise impacts:

- restricting heavy vehicle movements during the night period;
- not scheduling noise generating maintenance activities during the night period;
- undertaking maintenance activities on the wagon siding only during the day period;
- utilising operational controls during shunting, coupling, take off and stopping of trains to minimise the generation of impulsive noise associated with impact between empty wagons; and
- ensuring locomotives and wagons are maintained such that they do not generate excessive levels of noise.

## 10.3 Construction Noise Management

Impact predictions associated with the construction stage of the proposed development indicate significant exceedences may be observed at receivers near the site access on Mansfield Road. Noise impacts at this location are expected to approach the *highly affected* management level during construction of the internal access road and noise barrier. While noise levels may be significant at times, the intent of the works (to provide a long term solution for the mitigation of noise from site operations) coupled with the temporary nature of the impact should be considered in evaluating the impact.

It is recommended a Construction Noise Management Plan (CNMP) be developed in conjunction with the detailed construction program such that operational controls may be implemented to minimise potential noise impacts during the construction stage. The *Interim Construction Noise Guideline* (DECC, 2009) provides recommendations for the management of noise from construction works and examples of common mitigation techniques.

## 11. CONCLUSION

Pacific National proposes to construct and operate a maintenance facility at Greta to provide support to its coal haulage business in the Hunter Valley. The site is located between the existing Northern Railway and the approved Hunter Expressway extension to Branxton. The purpose of this assessment was to undertake detailed assessment of potential noise impacts associated with the construction and operation of the facility and identify conflicts with the existing noise environment.

The results of attended and unattended background monitoring indicate that the existing noise environment is dominated by road and rail traffic on the New England Highway and main northern railway. The contribution from these noise sources is unlikely to decrease in the future as increasing traffic volumes utilise these major transportation corridors. The character of the noise environment at this location is likely to experience change following extension of the F3 freeway to Branxton and construction of a third track in the main northern railway corridor.

Review of attended monitoring results indicates the receiving noise environments adjacent to the proposed development are characterised by a mix of Urban, Suburban and Rural receiver types depending on the proximity to transportation corridors. The PSNL were ultimately established on the basis of the intrusiveness criterion due to the distribution of observed background noise levels.

Assessment of potential noise impacts presented in **Section 5** to **Section 7** indicates the following receiving environments will experience negligible noise impacts:

- Tuckers lane (south of the development);
- North Rothbury (west of the development); and
- Branxton (north-west of the development).

The large separation distances between site operations and these receiving environments and intervening topography means the proposed development is likely to be inaudible at these locations except under certain operational and meteorological conditions. In instances where operations may be audible the impact will be below the PSNL at these locations.

Review of modelling results indicates noise impacts will comply with the amenity criteria in all receiving environments adjacent to the TSF. Potential noise impacts above the intrusiveness criteria were observed in the following receiving environments:

- Greta (north-east of the development);
- Illalong (south-west of the development); and
- receivers on the New England Highway (north of the development).

Modelling results indicate worst case noise impacts in these receiving environments will comply with the day and evening period PSNL under all significant meteorological conditions. Exceedence of the night period PSNL may occur for:

- receivers in Greta may experience noise levels up to 40 dB(A) during periods of south-westerly winds and temperature inversion;
- receivers in Illalong may experience noise levels up to 42 dB(A) under neutral conditions and during periods of temperature inversion; and
- receivers north of the site on the New England Highway may experience noise levels up to 42 dB(A) during periods of south-westerly winds.

Analysis of modelling results indicates potential noise impacts will comply with the PSNL for all non-residential sensitive receivers adjacent to the proposed development when these facilities are in use.

Short term noise events associated with transient site activities may exceed the sleep disturbance criteria at:

- receivers in Greta;  $L_{A1}$  noise levels may approach 50 dB(A) during periods of south-westerly winds;
- receivers in Illalong;  $L_{A1}$  noise levels may approach 55 dB(A) during periods of temperature inversion; and
- receivers to the north of the site on the New England Highway;  $L_{A1}$  noise levels may approach 55 dB(A) under inversion conditions.

It should be noted that these results provide an assessment of *95<sup>th</sup> percentile*  $L_{A1}$  noise levels, and compliance with the criteria is likely under all meteorological conditions during periods of *average*  $L_{A1}$  impacts.

Assessment of ambient noise levels indicates predicted impacts will be consistent with the character of existing transportation sources. While the contribution from proposed TSF operations is likely to be masked by ambient road and rail noise, a number of controls are recommended to mitigate noise generated by transient noise sources:

- construction of a noise barrier adjacent to the site access;
- utilising operational controls during shunting, coupling, take off and stopping of trains to minimise the generation of impulsive noise associated with impact between empty wagons;
- restricting heavy vehicle movements during the night period;
- not scheduling noise generating maintenance activities during the night period;
- undertaking maintenance activities on the wagon siding only during the day period; and
- ensuring locomotives and wagons are maintained such that they do not generate excessive levels of noise.

Noise generated during the construction phase of the development is likely to exceed the construction noise criteria in the Greta and Illalong receiving environments and management of potential impacts should be undertaken by development of a construction noise management plan as part of detailed construction planning.

Assessment of cumulative noise impacts indicates that  $L_{Aeq,period}$  noise levels in receiving environments around Greta and Illalong may increase due to proposed changes to transportation infrastructure, however the contribution from TSF operations is negligible in comparison to the contribution from proposed transportation sources.

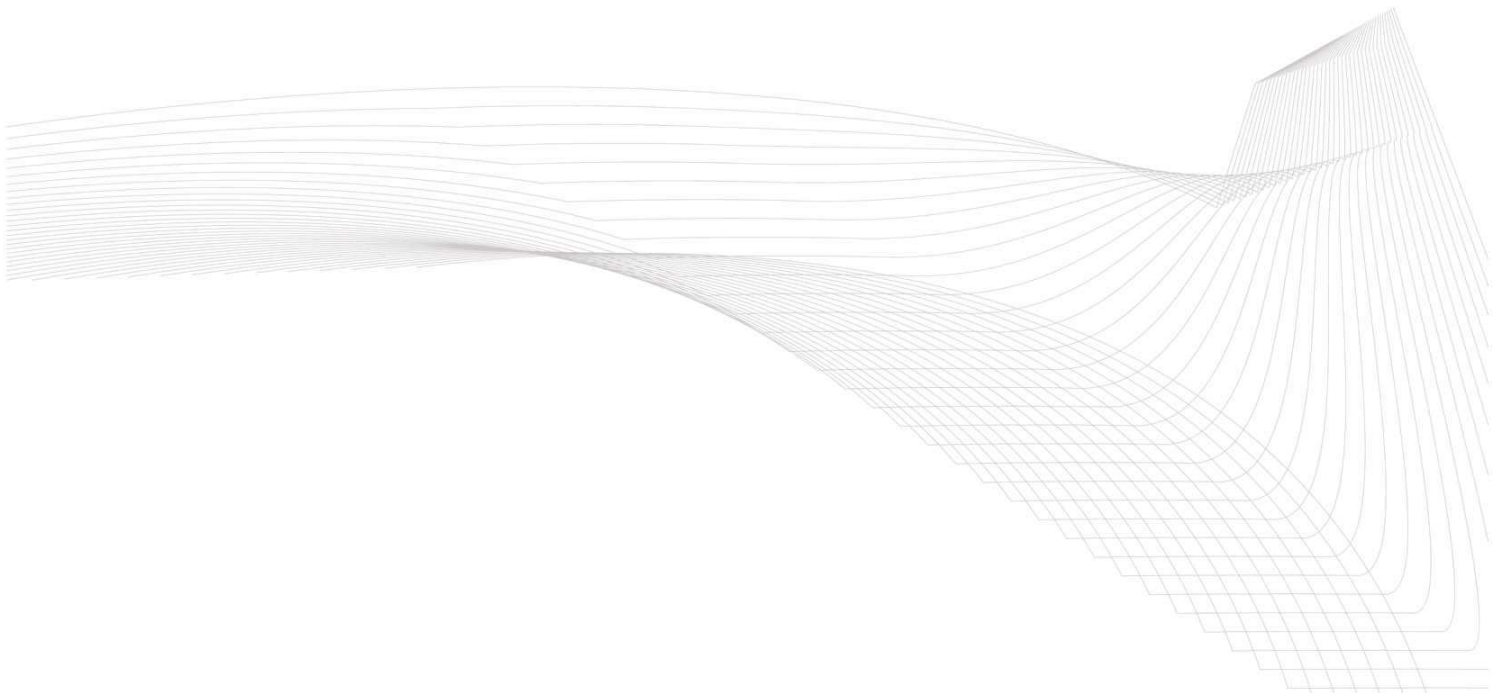
While operations may be audible at times, the character of noise impacts generated by the TSF is considered to be consistent with the character of the existing noise environment at Greta.

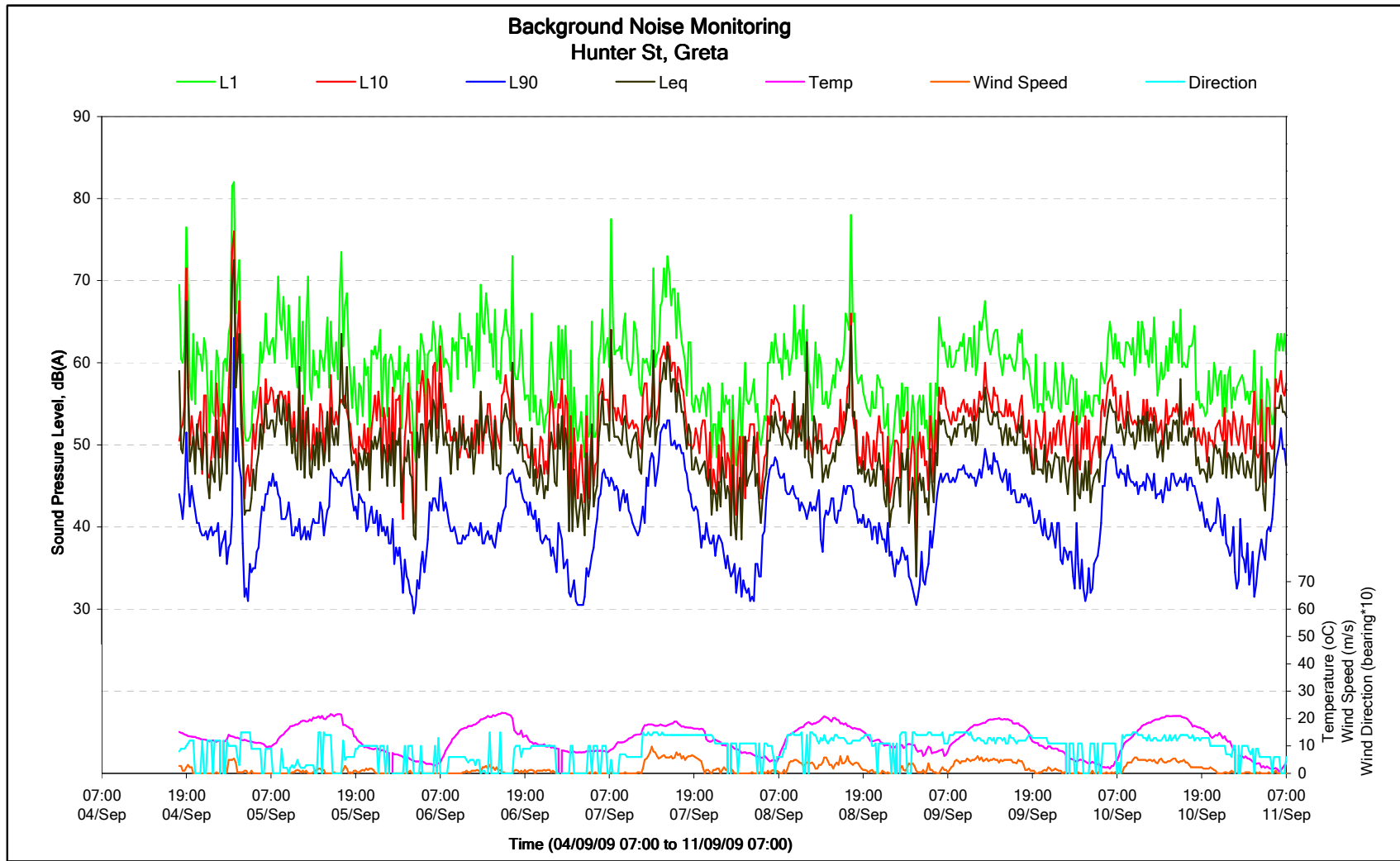


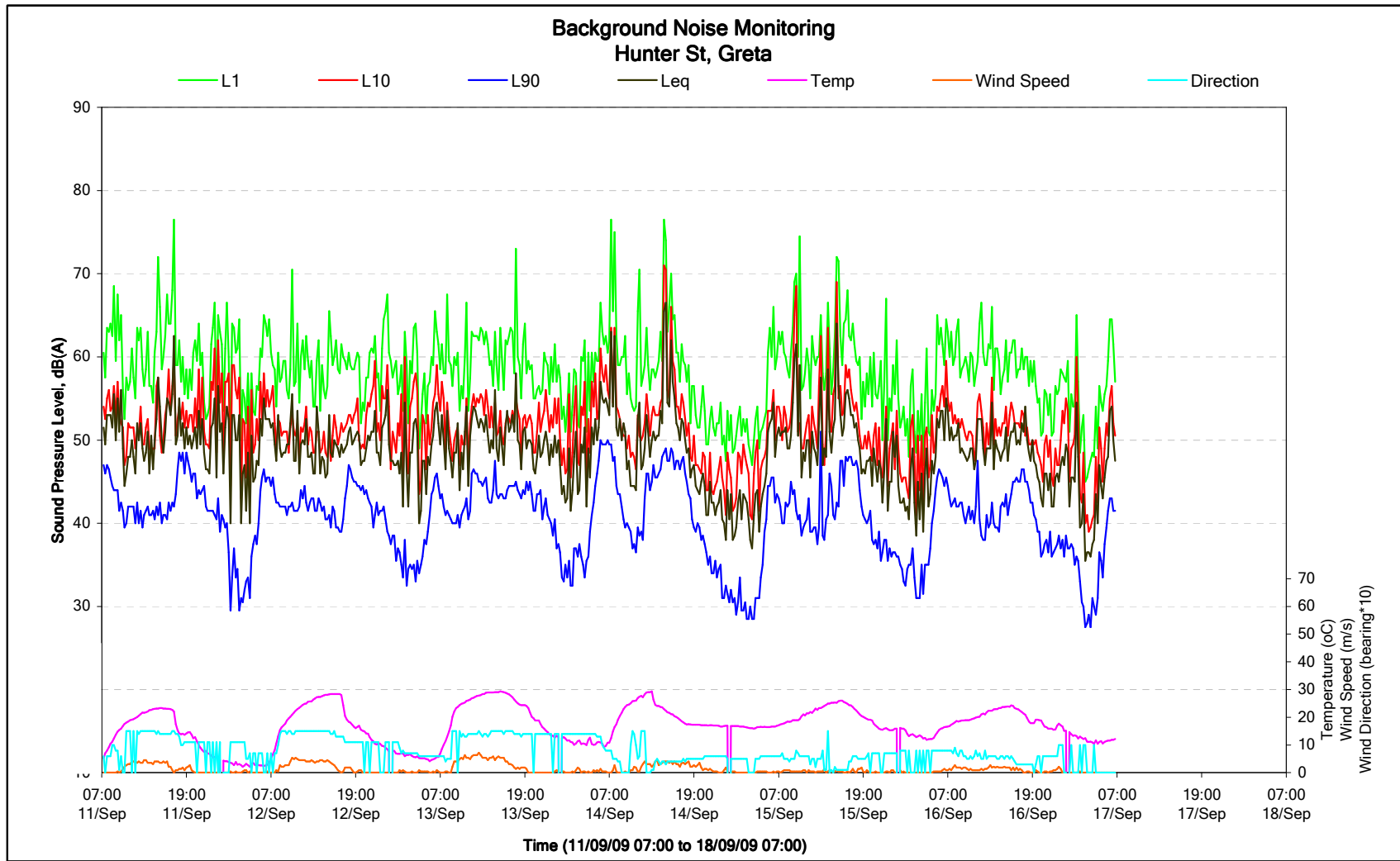
## Appendix I

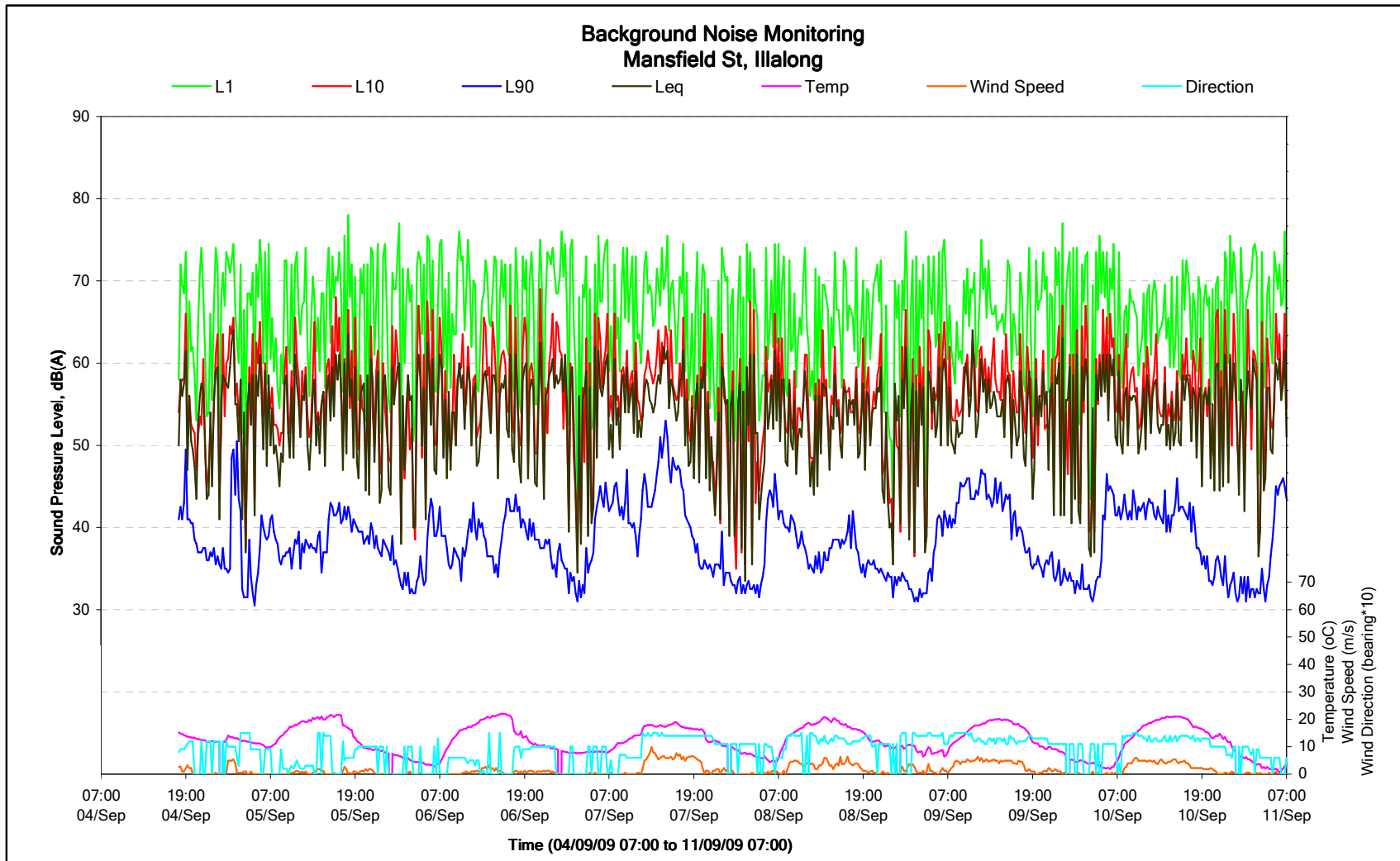
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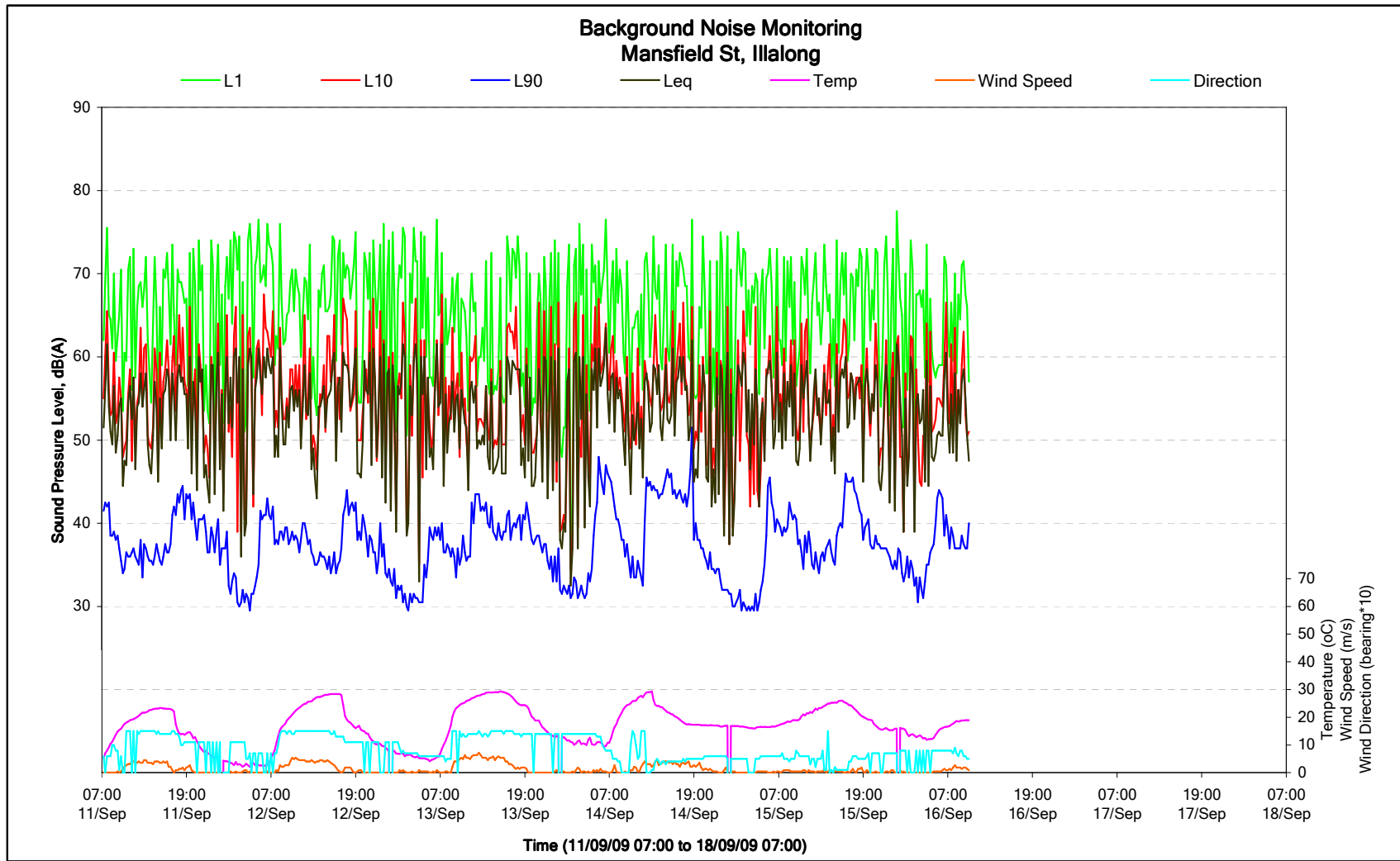
### Background Monitoring: Logger Results

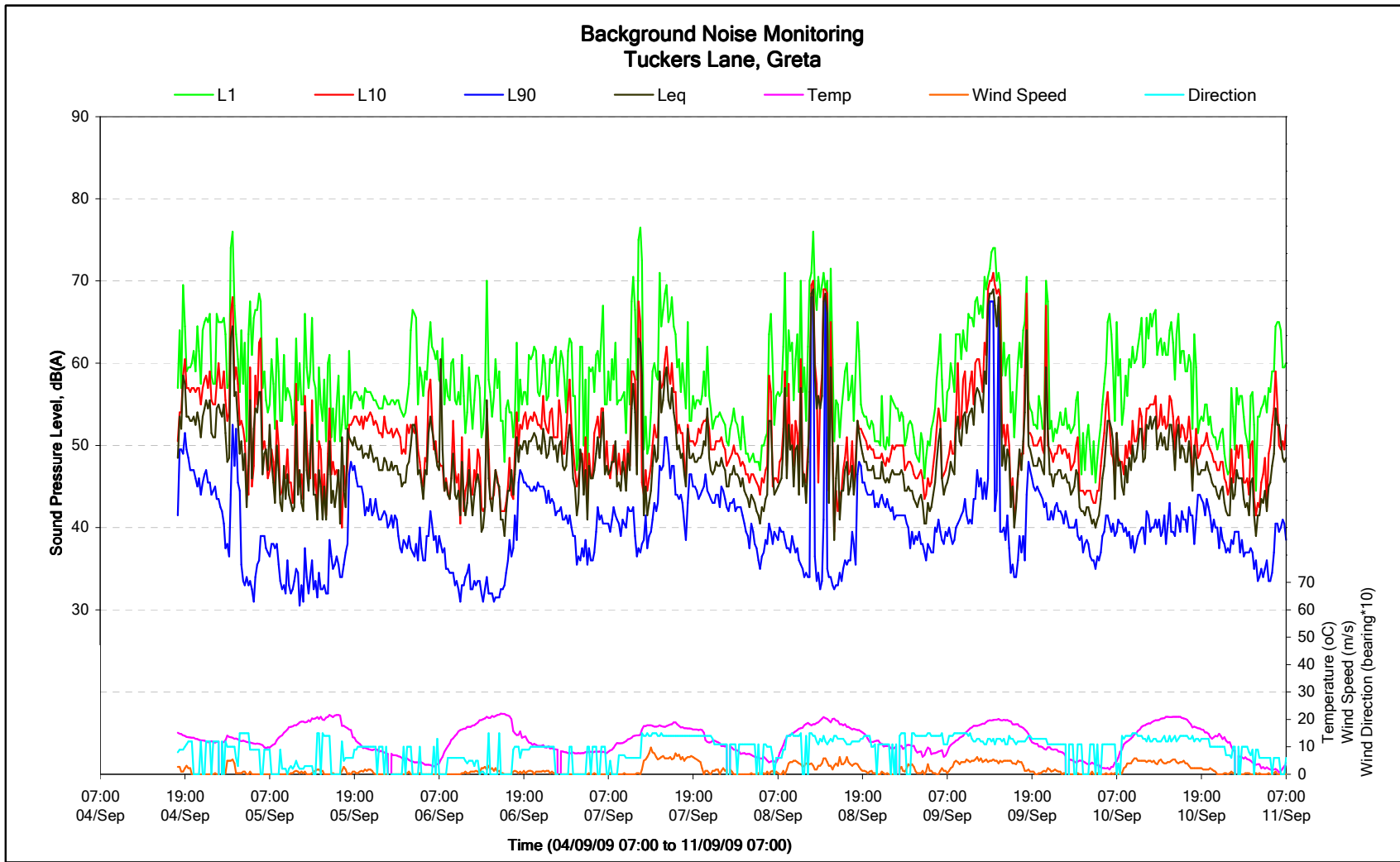


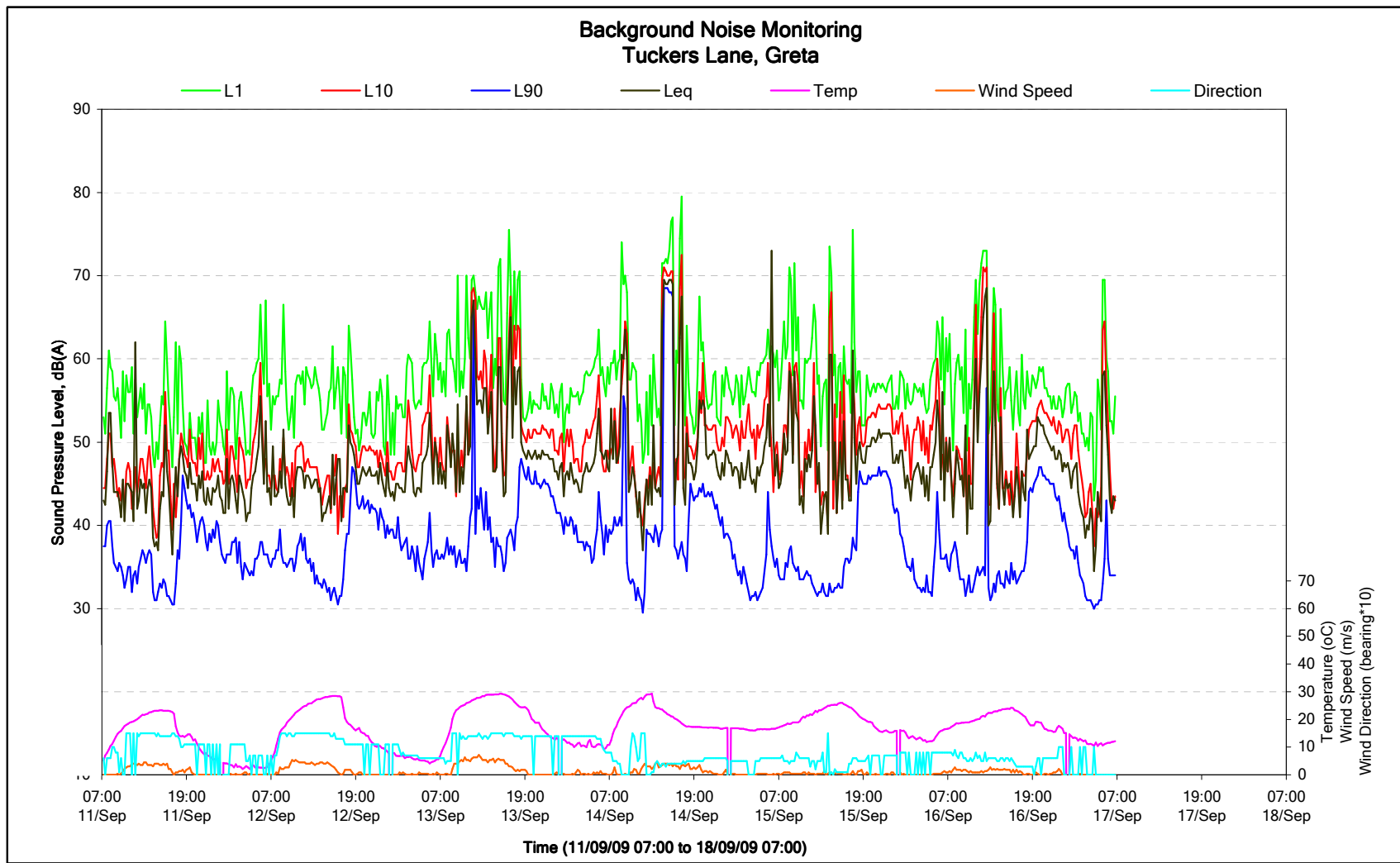


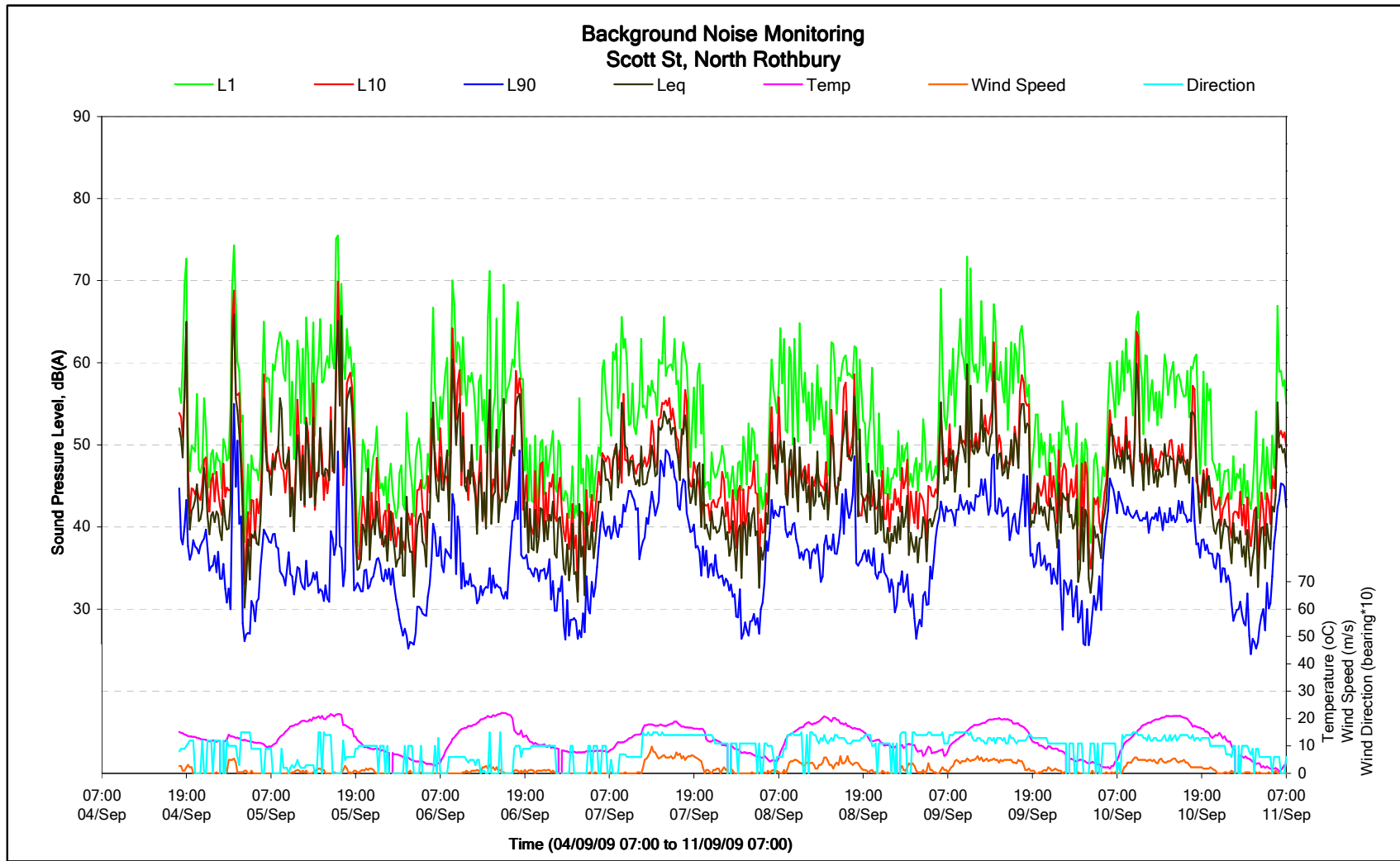


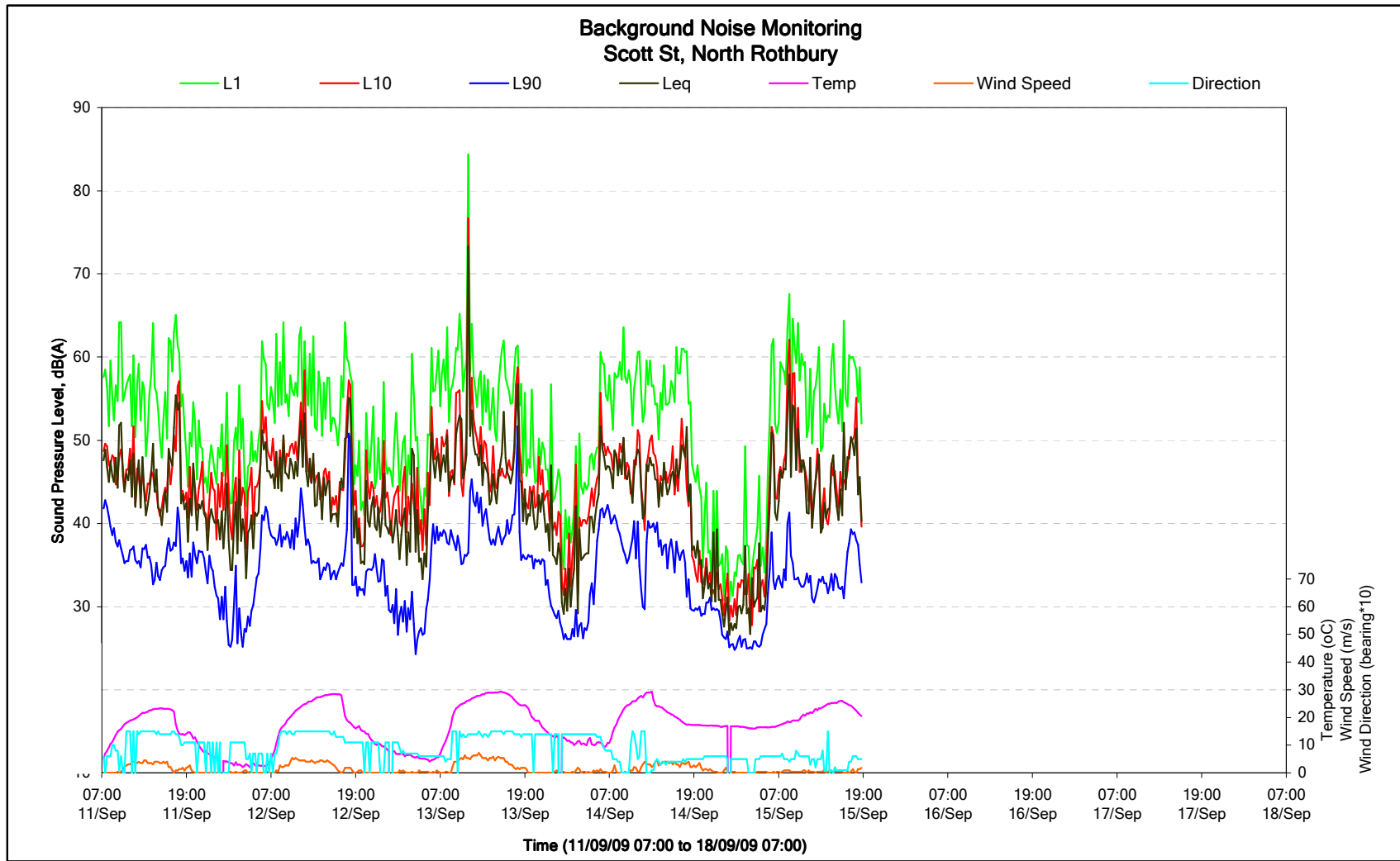


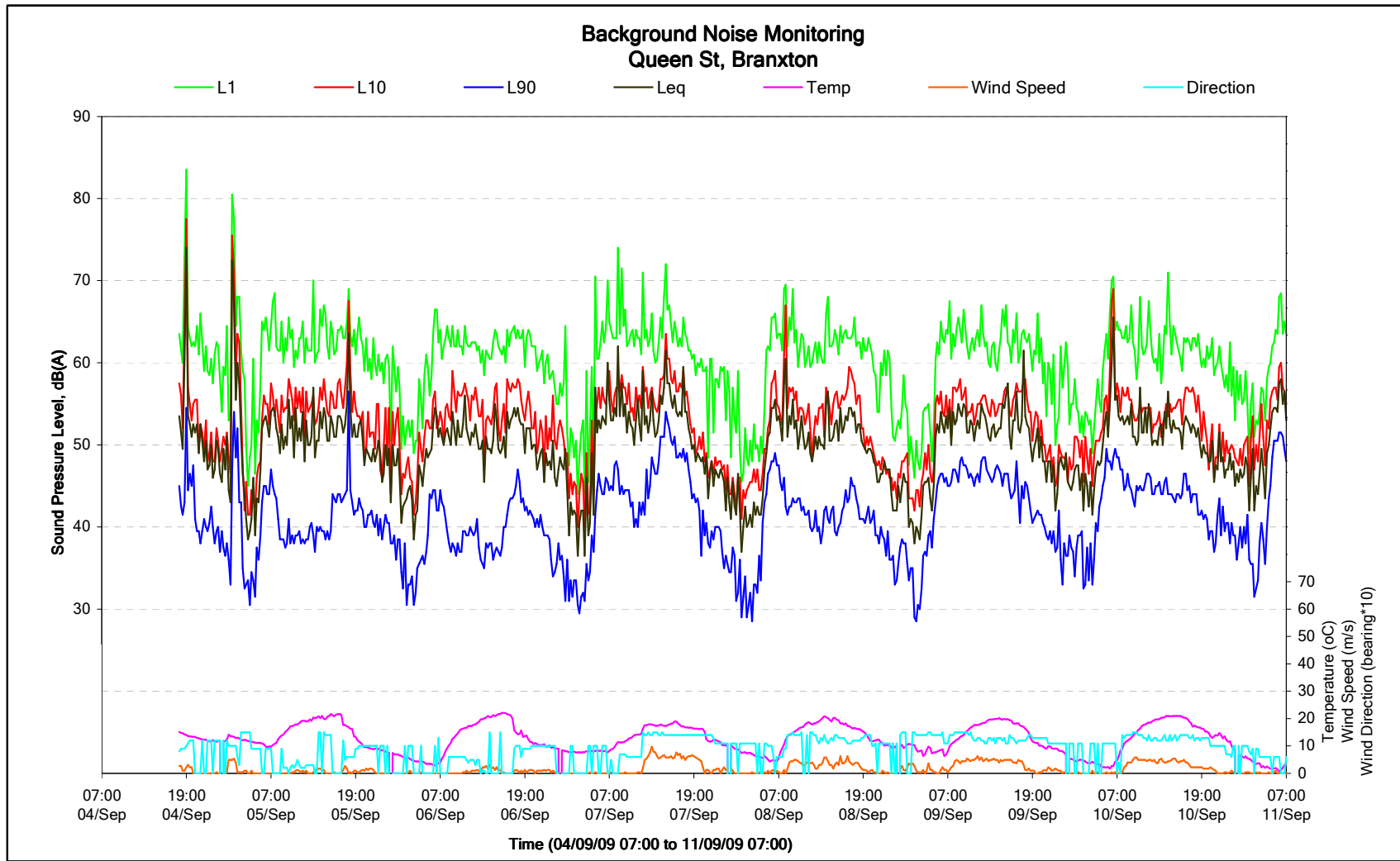


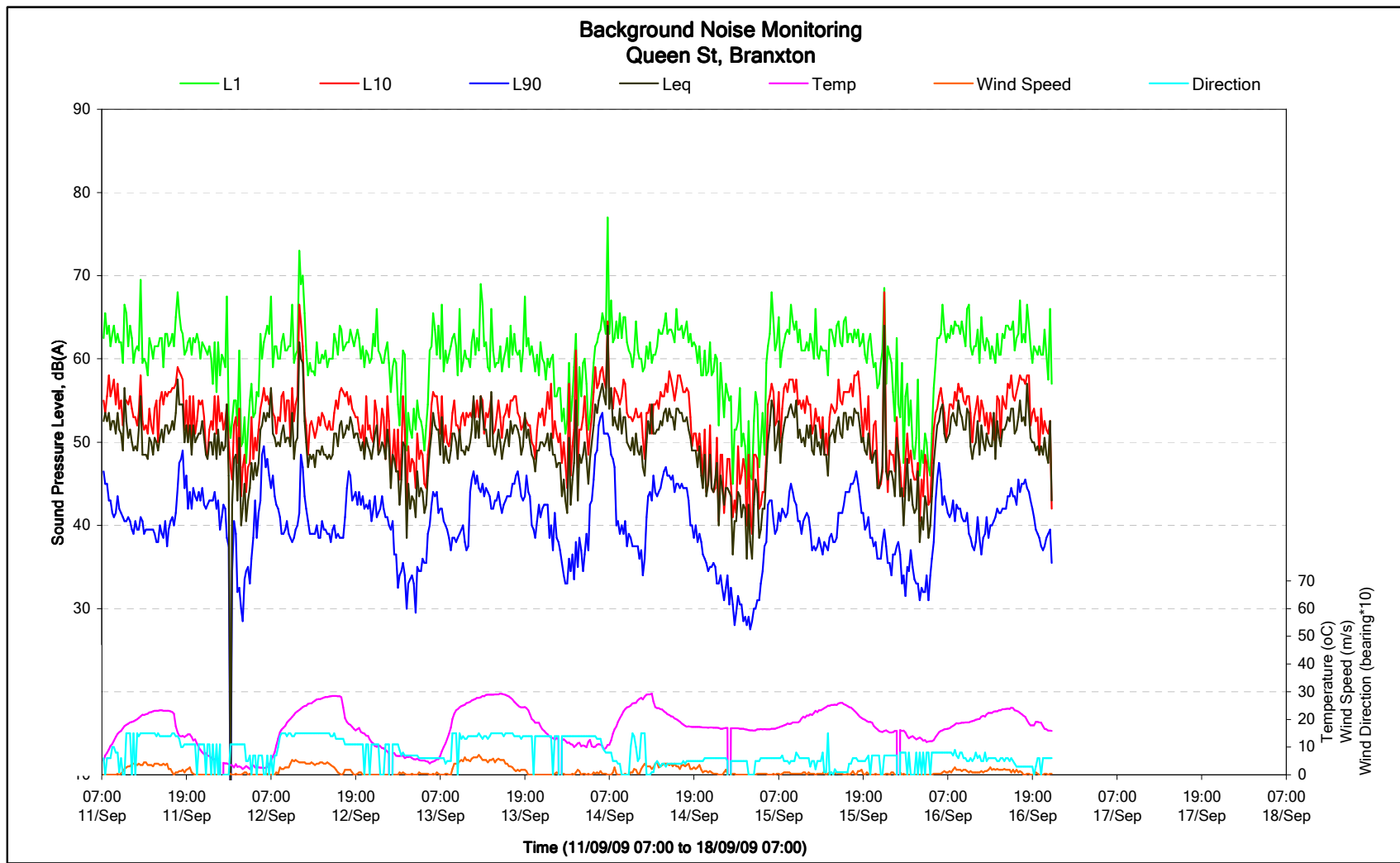


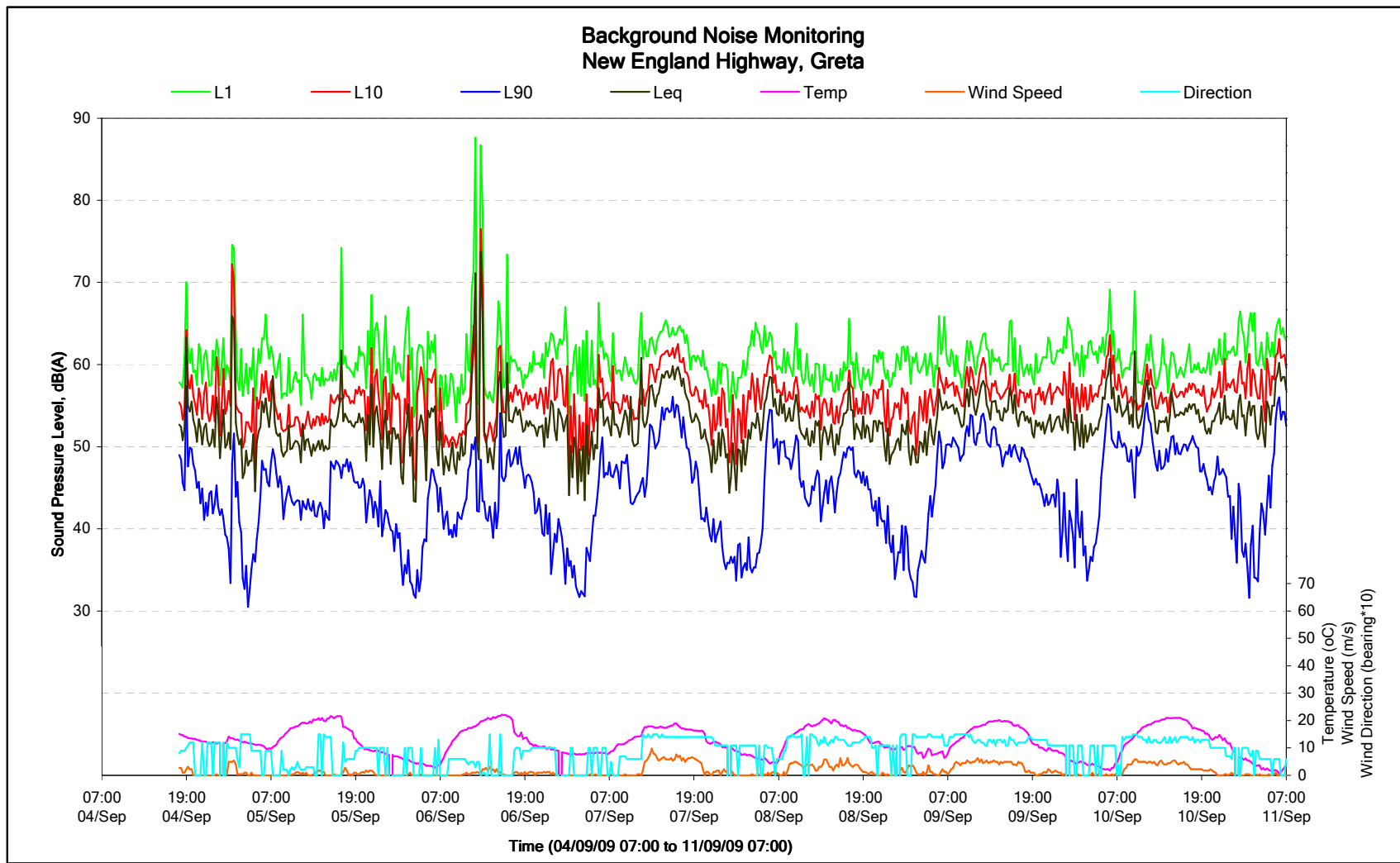


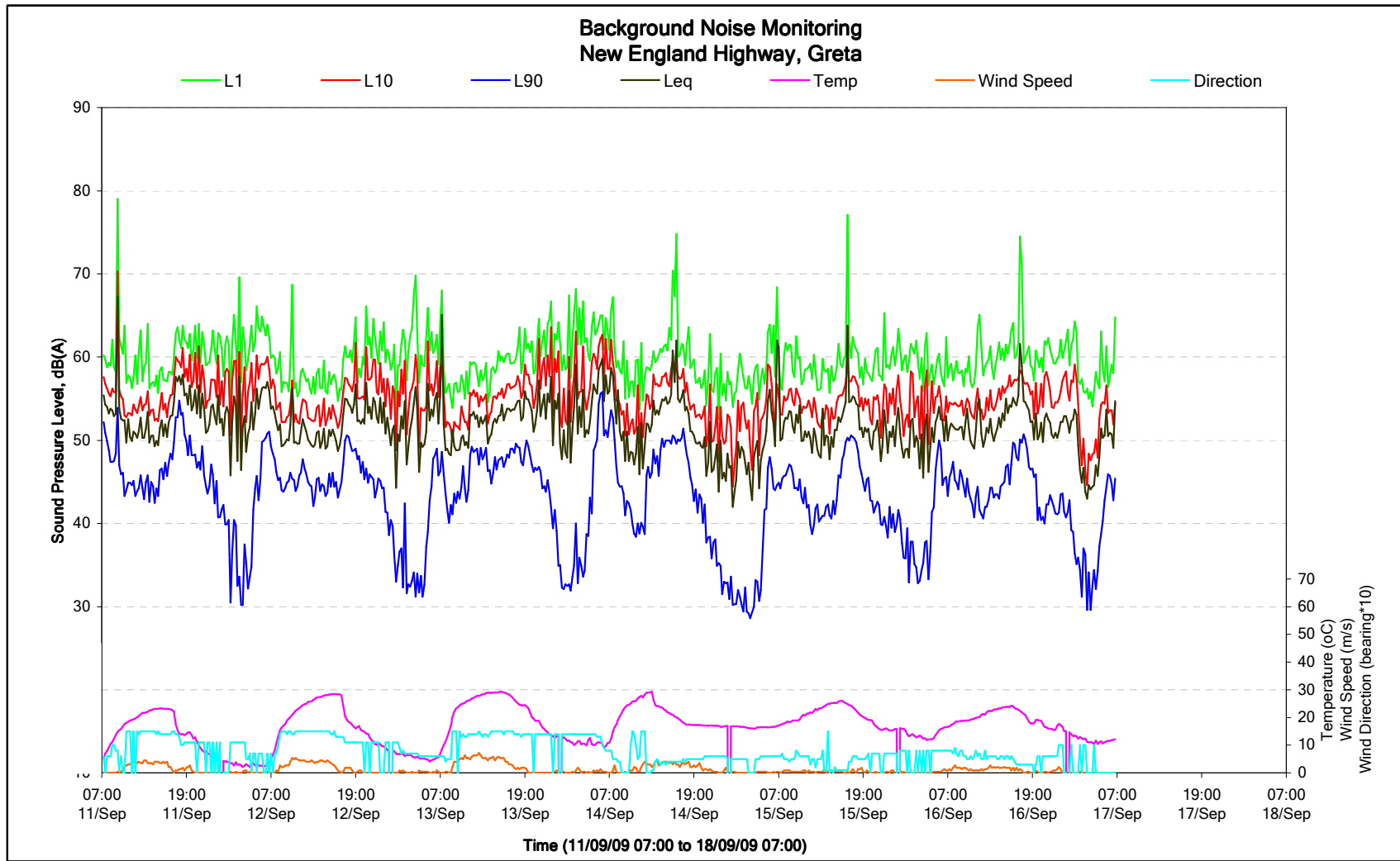










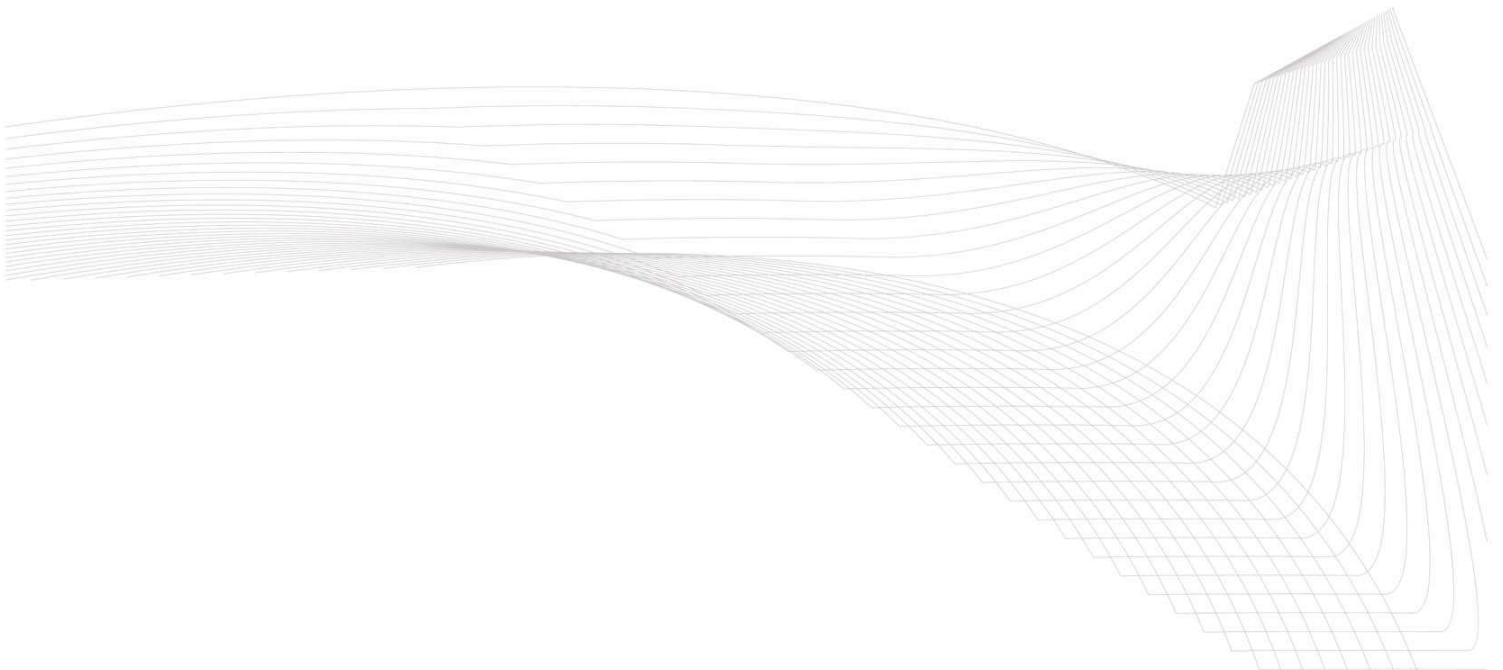




## Appendix II

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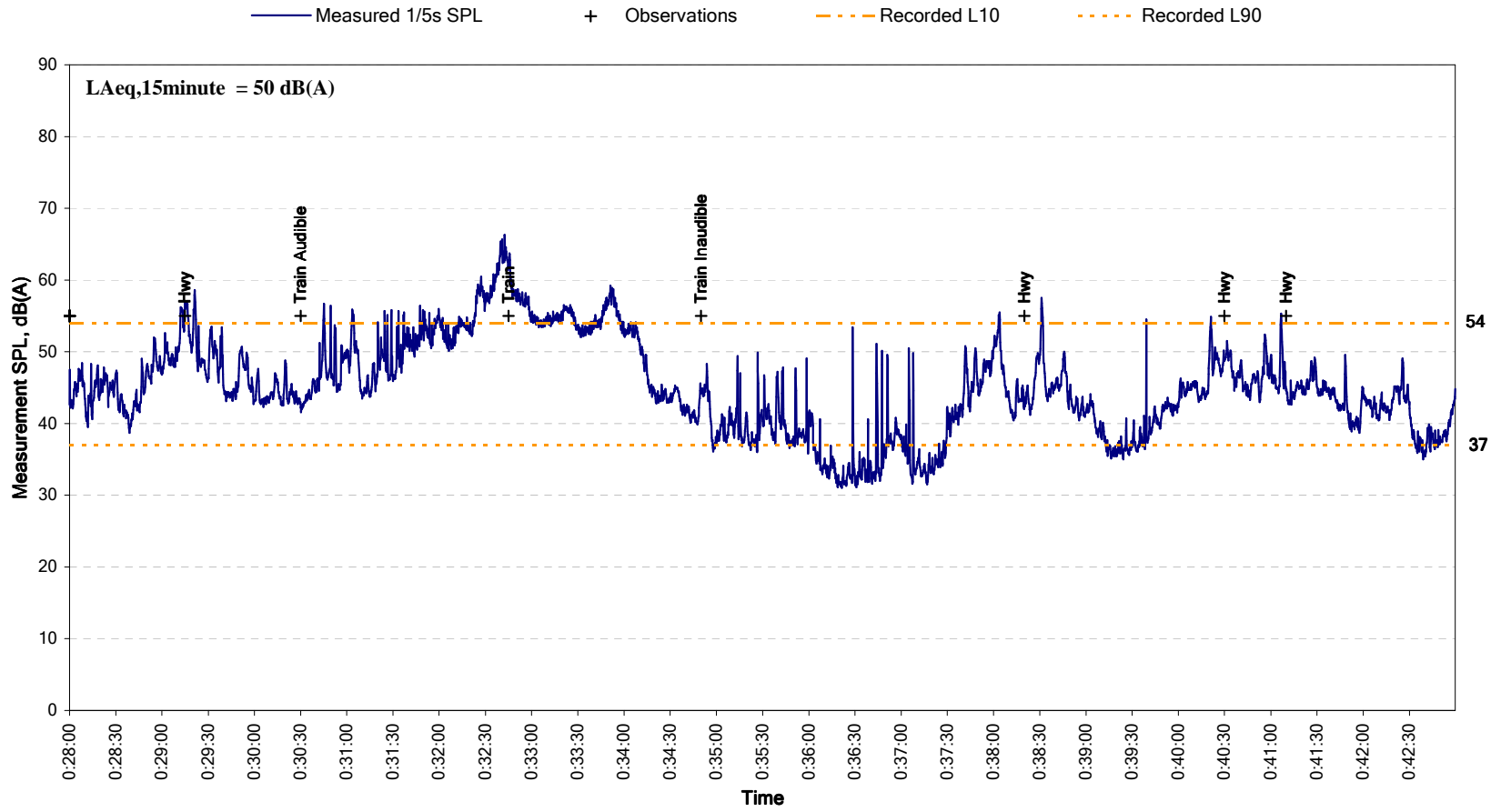
### Attended Monitoring Run Charts

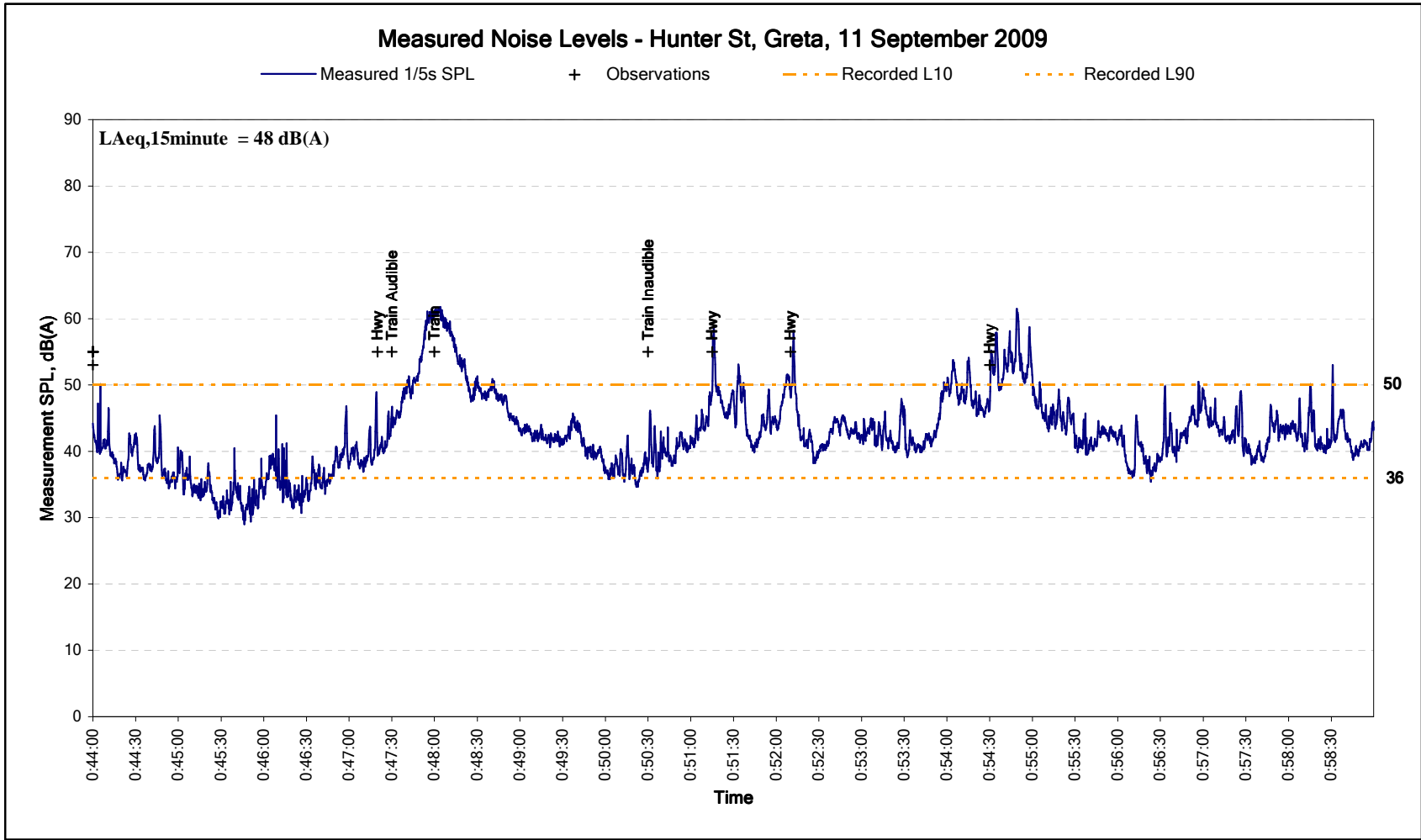


**Table A1: Attended monitoring results**

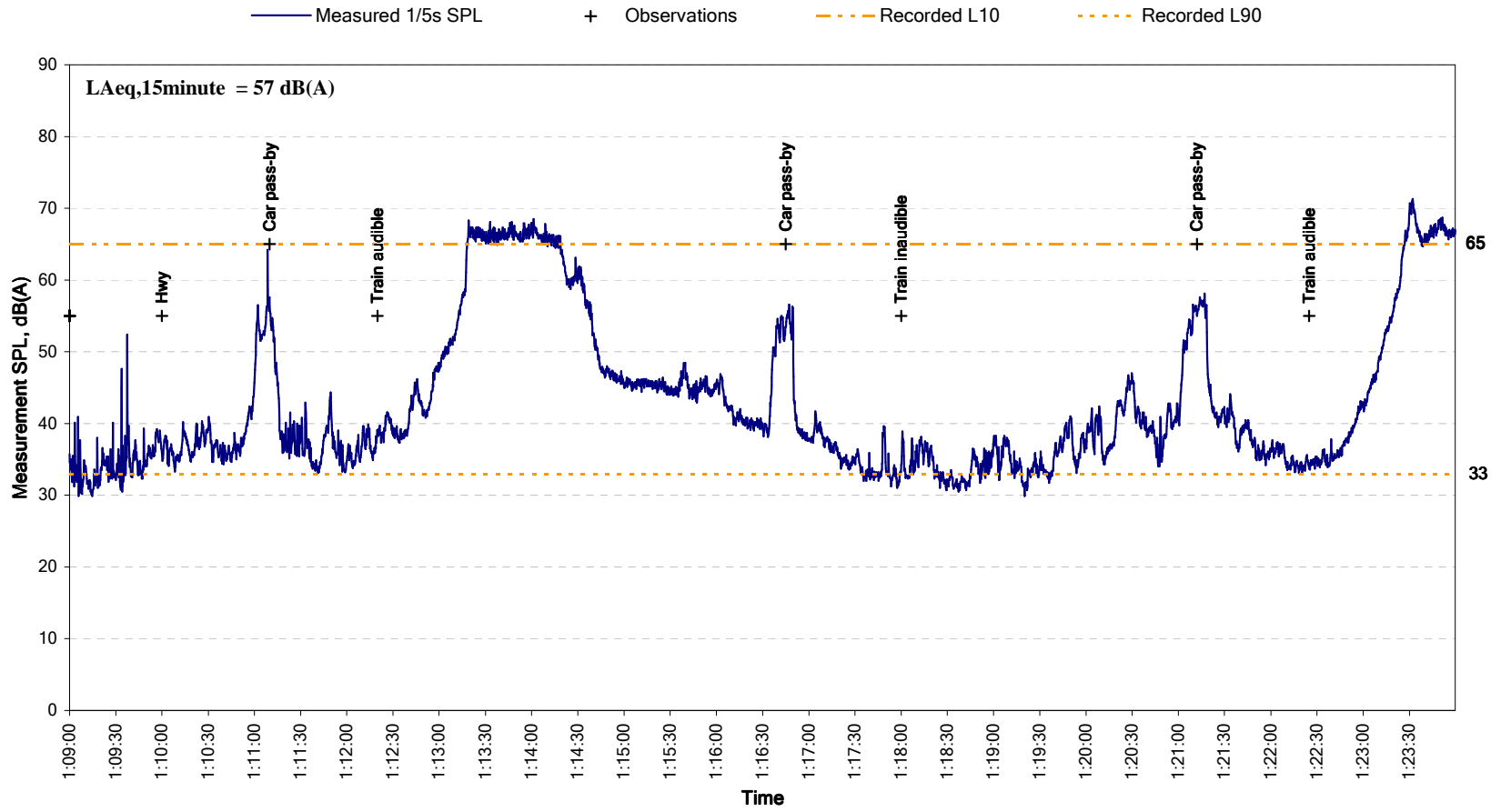
Location	Time	Measured SPL, dB(A)			Description of noise environment
		L <sub>A1</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	
Hunter St, Greta	00:28	61	38	50	Contribution from highway and rail noise is dominant, with L <sub>Aeq</sub> noise levels controlled by contribution from highway. Background noise sources include barking dogs and insect noise. One train pass-by observed in each measurement.
	00:43	60	36	48	
Mansfield St, Illalong	1:09	68	33	57	Contribution from rail pass-by is dominant source at this location. Passage of vehicles on New England Highway is audible on occasion. Background noise sources predominantly insects. One train pass-by in first measurement, 3 trains in second.
	1:24	71	33	60	
Tuckers Lane	1:49	58	31	54	Background noise sources are dominant at this location, with continuous insect and bird noise observed throughout the measurement. Highway noise remains audible however very distant. Trains travelling toward Newcastle (south (s)) are audibly louder at this location with longer resident times. Two trains were observed in each measurement period.
	2:04	44	30	37	
Scott St, North Rothbury	2:55	44	26	36	Road noise from the New England Highway and Wine Country Drive (WCD) is dominant at this location. Background noise sources include barking dogs and insect noise toward the perimeter of the urban area. One train was observed (travelling to Newcastle) in the 3:15 measurement.
	3:15	46	29	39	
Queen St, Branxton	3:56	51	39	45	Road noise is the dominant source at this location, masking contribution from environmental sources. Contribution from rail corridor was dominant during pass-by, however road noise was still audible. Two trains were observed in the 4:12 measurement.
	4:12	60	43	52	
New England Highway, Greta	4:57	64	50	57	Road noise is the dominant source at this location. Local environmental source including barking dogs, birds and insect noise were also audible. The passage of trains makes a significant contribution at this location; however the Highway remains the dominant noise source. Two trains were observed during the 5:14 measurement.
	5:14	65	55	60	

### Measured Noise Levels - Hunter St, Greta, 11 September 2009

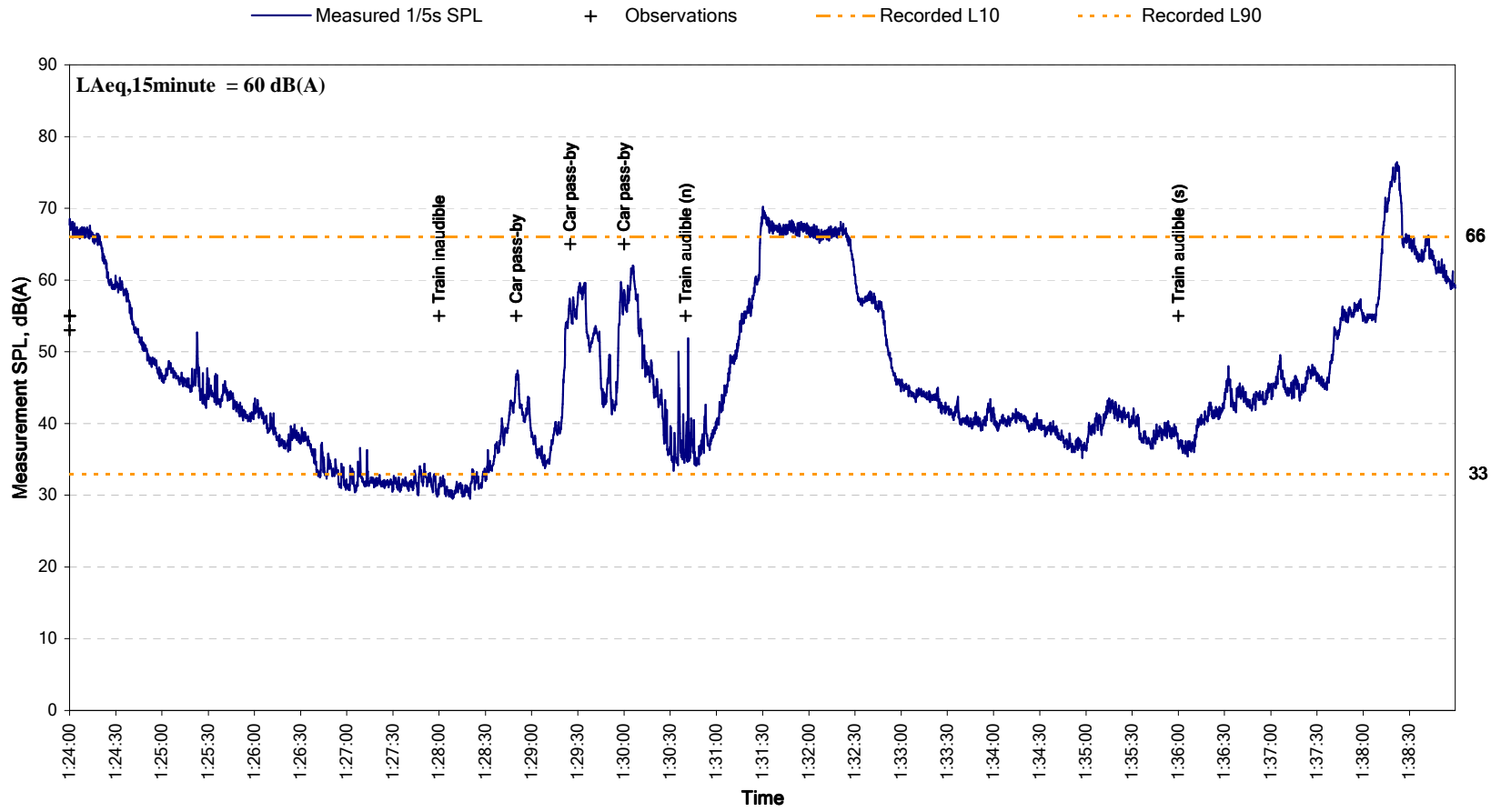




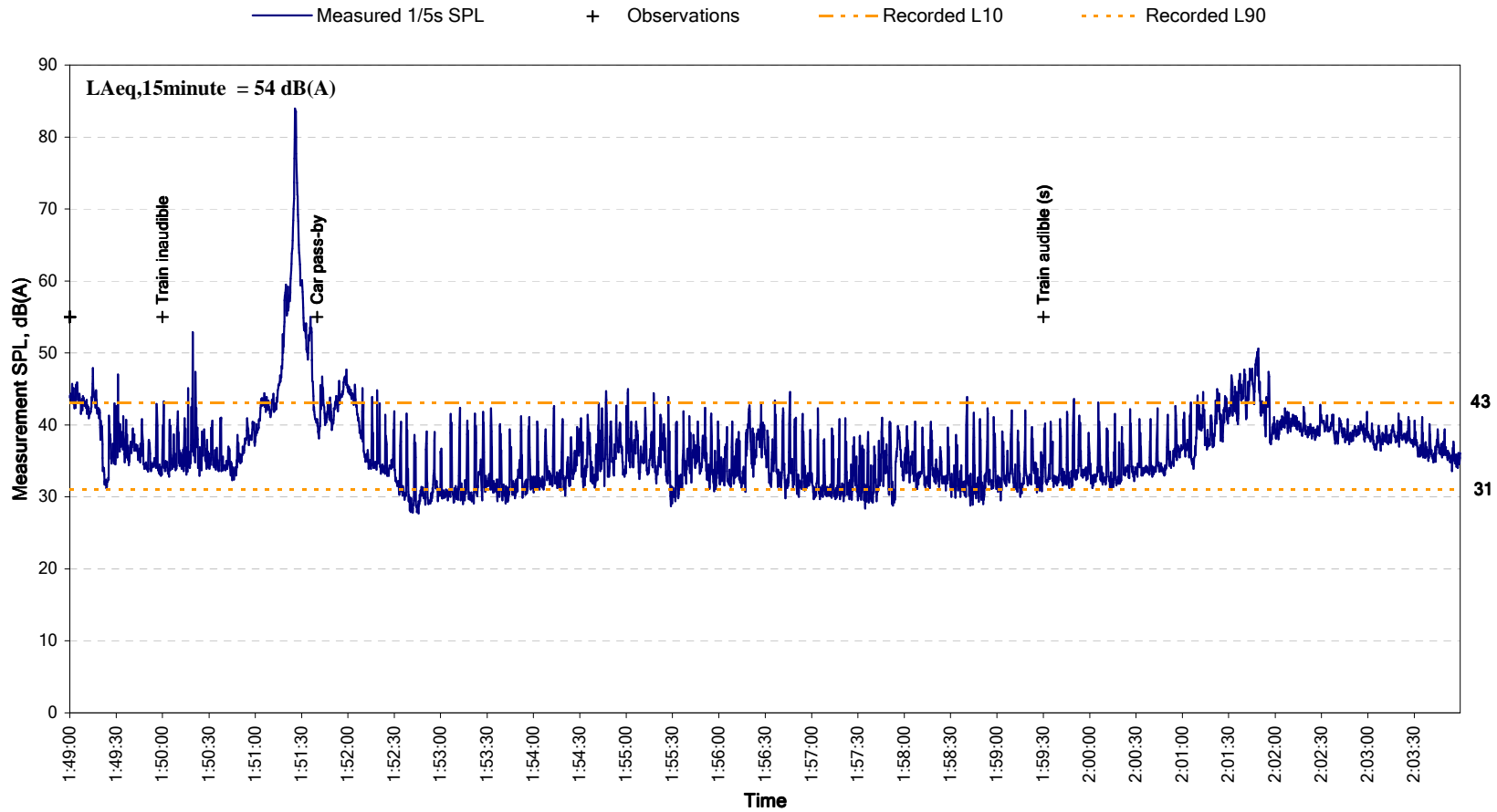
### Measured Noise Levels - Mansfield St, Illalong, 11 September 2009



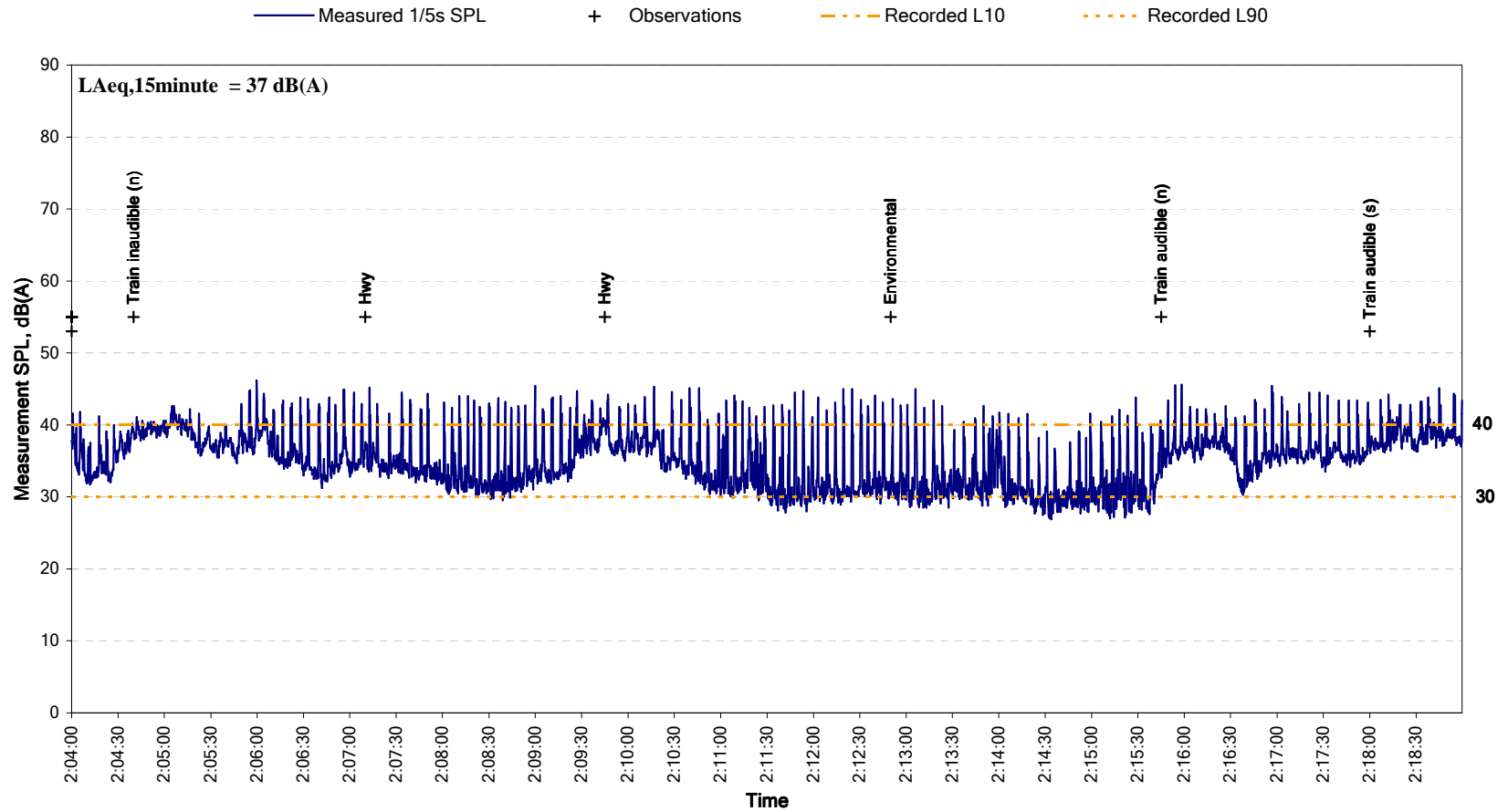
### Measured Noise Levels - Mansfield St, Illalong, 11 September 2009



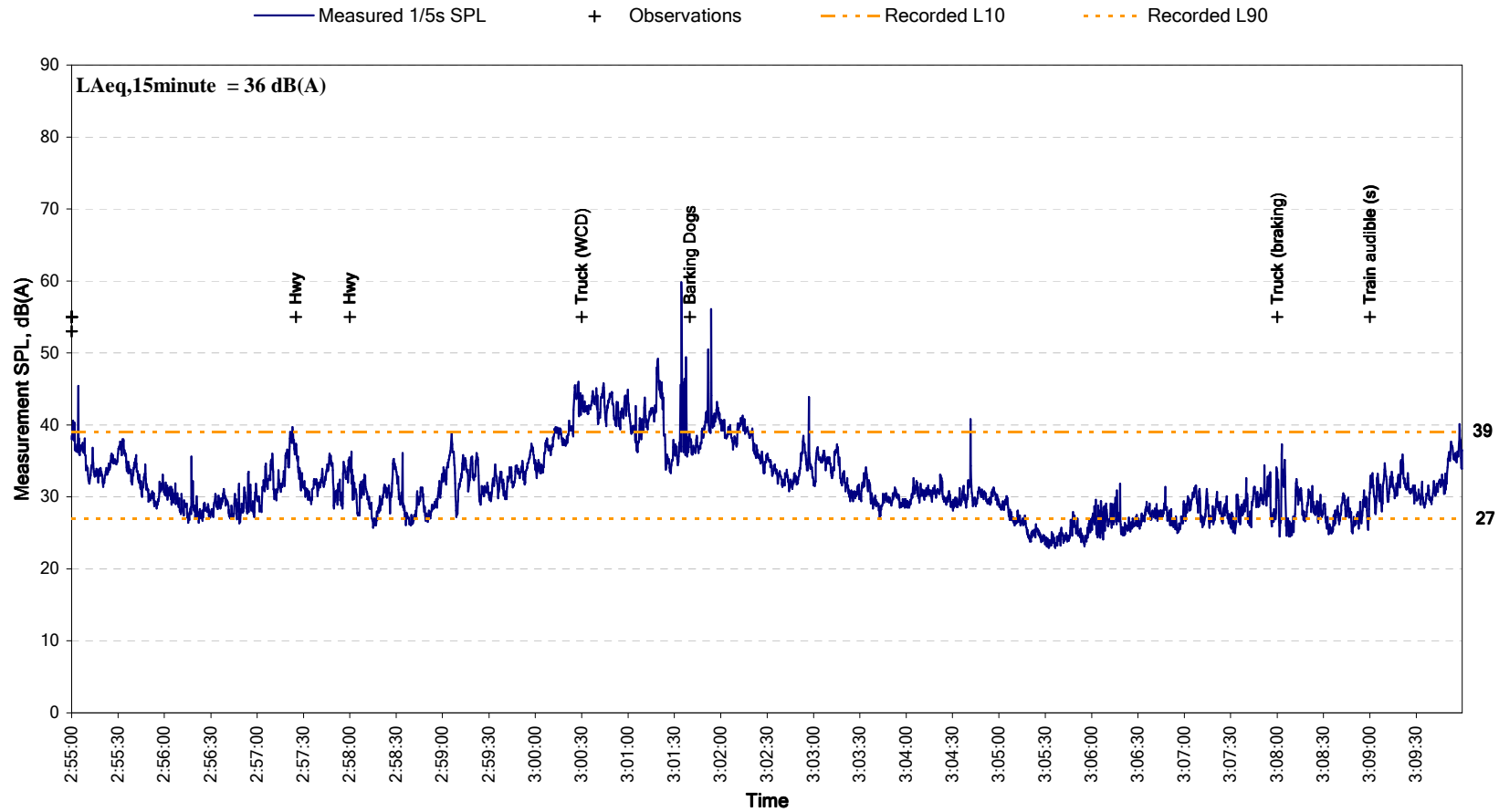
### Measured Noise Levels - Tuckers Lane, Greta, 11 September 2009



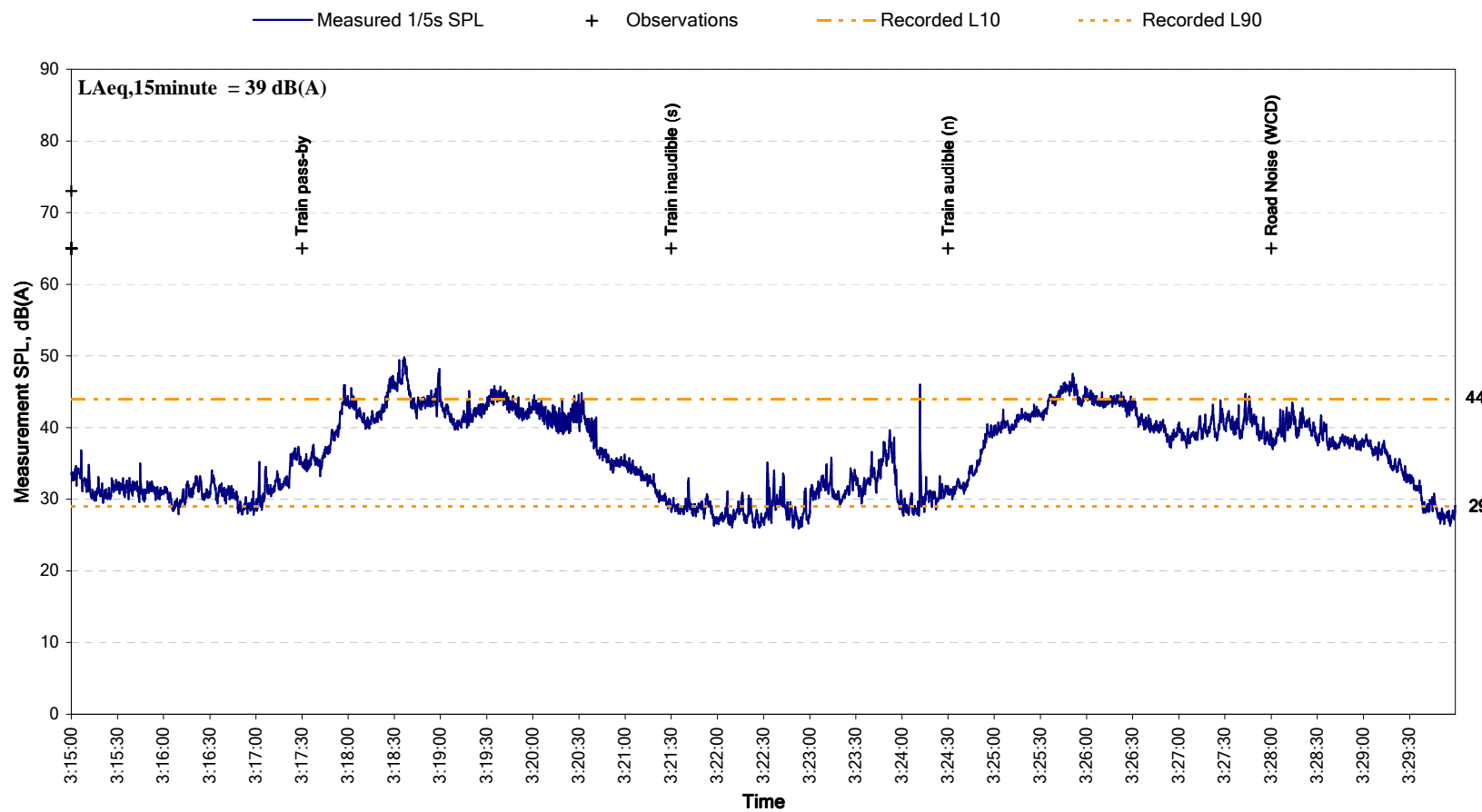
### Measured Noise Levels - Tuckers Lane, Greta, 11 September 2009



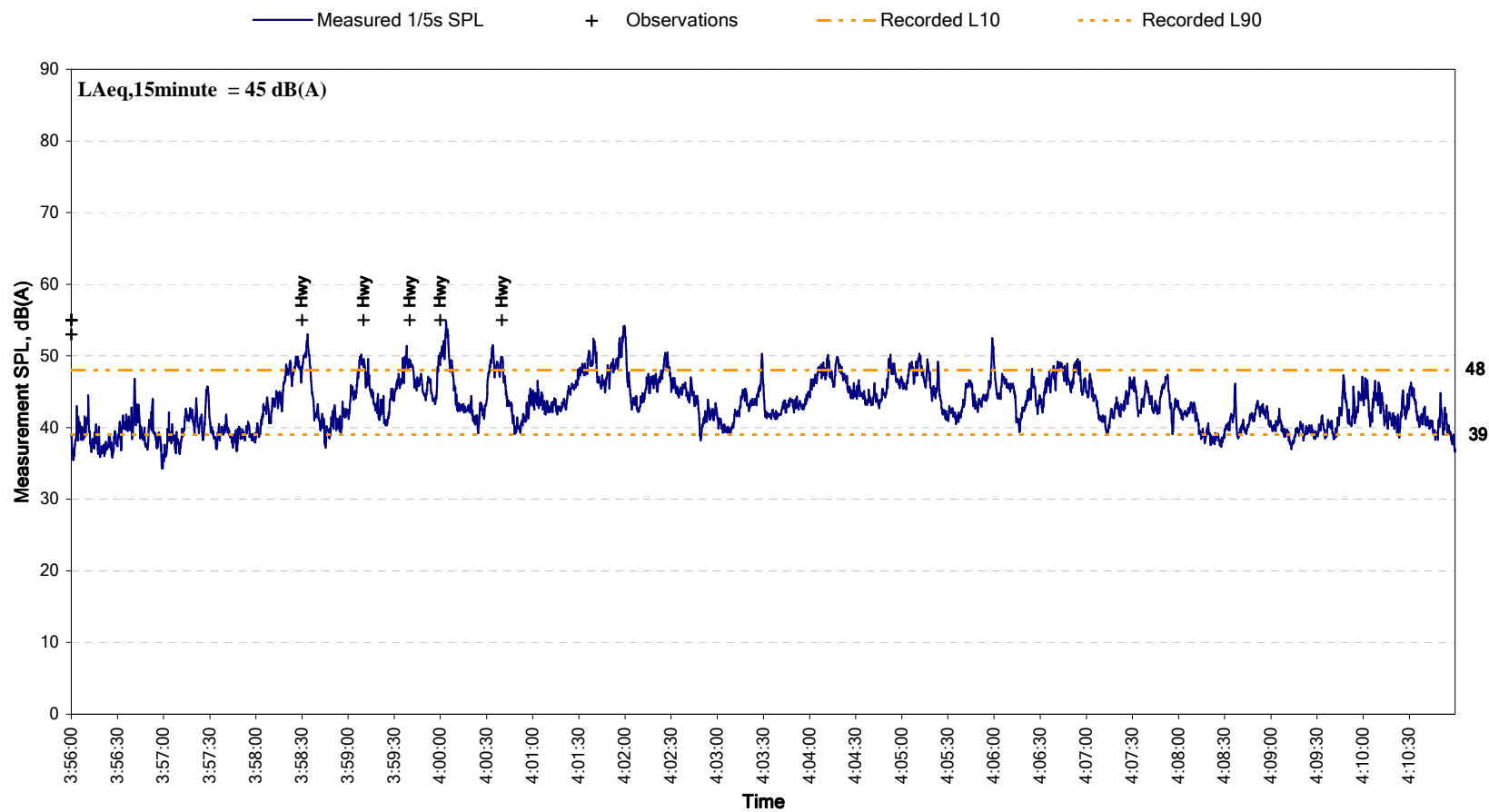
### Measured Noise Levels - Scott St, Nth Rothbury, 11 September 2009



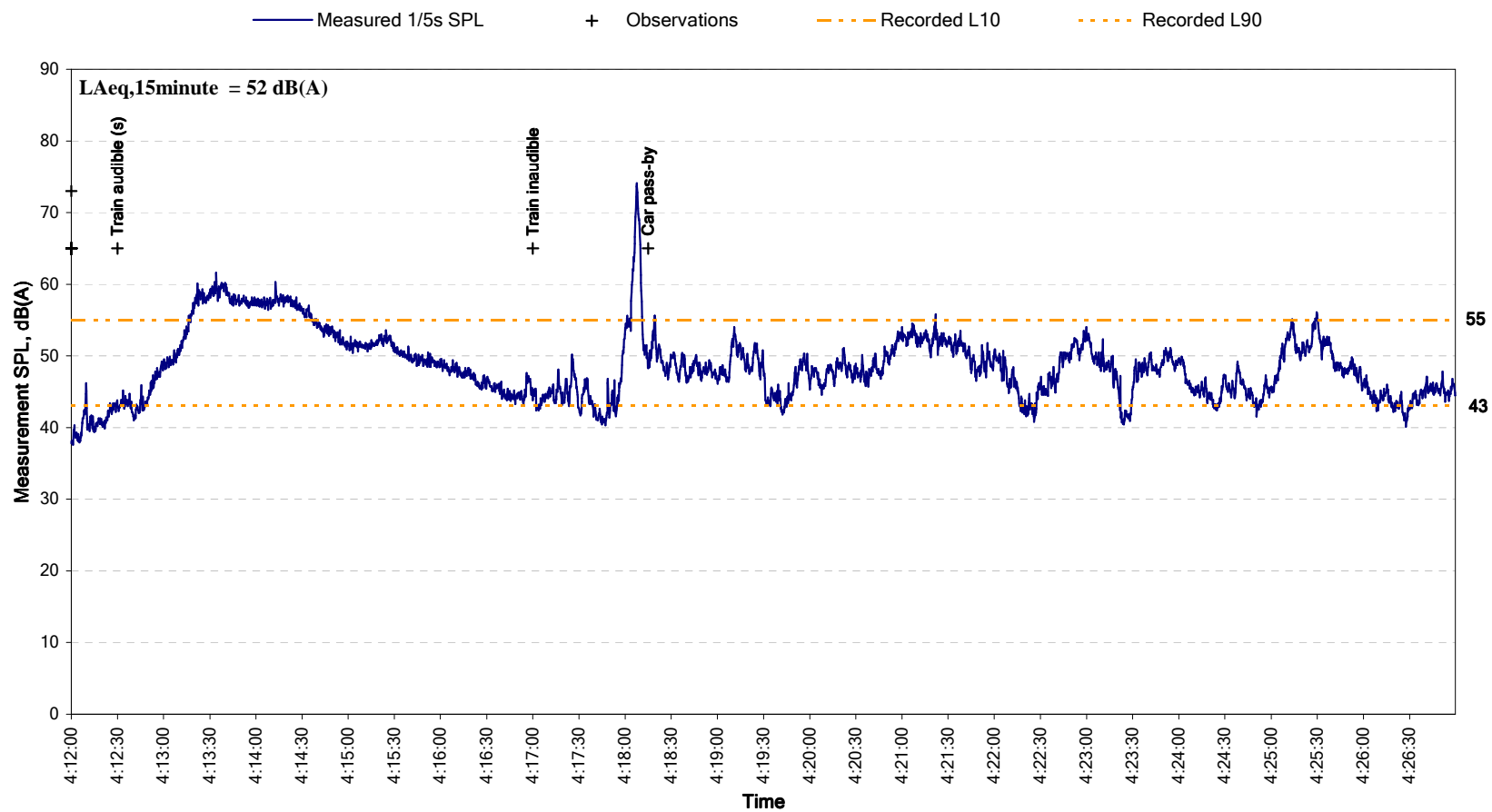
### Measured Noise Levels - Scott St, Nth Rothbury, 11 September 2009



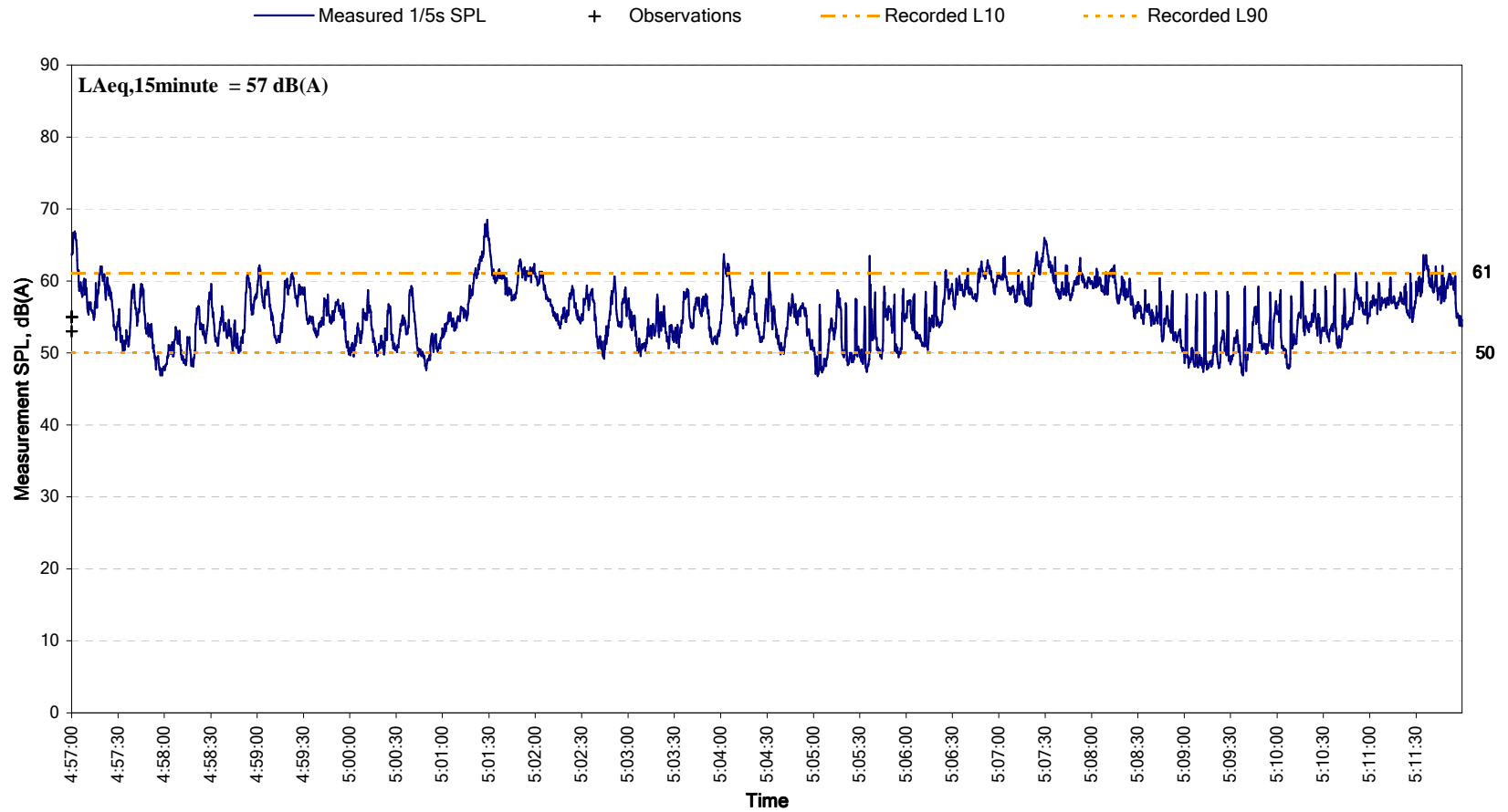
### Measured Noise Levels - Queen St, Branxton, 11 September 2009



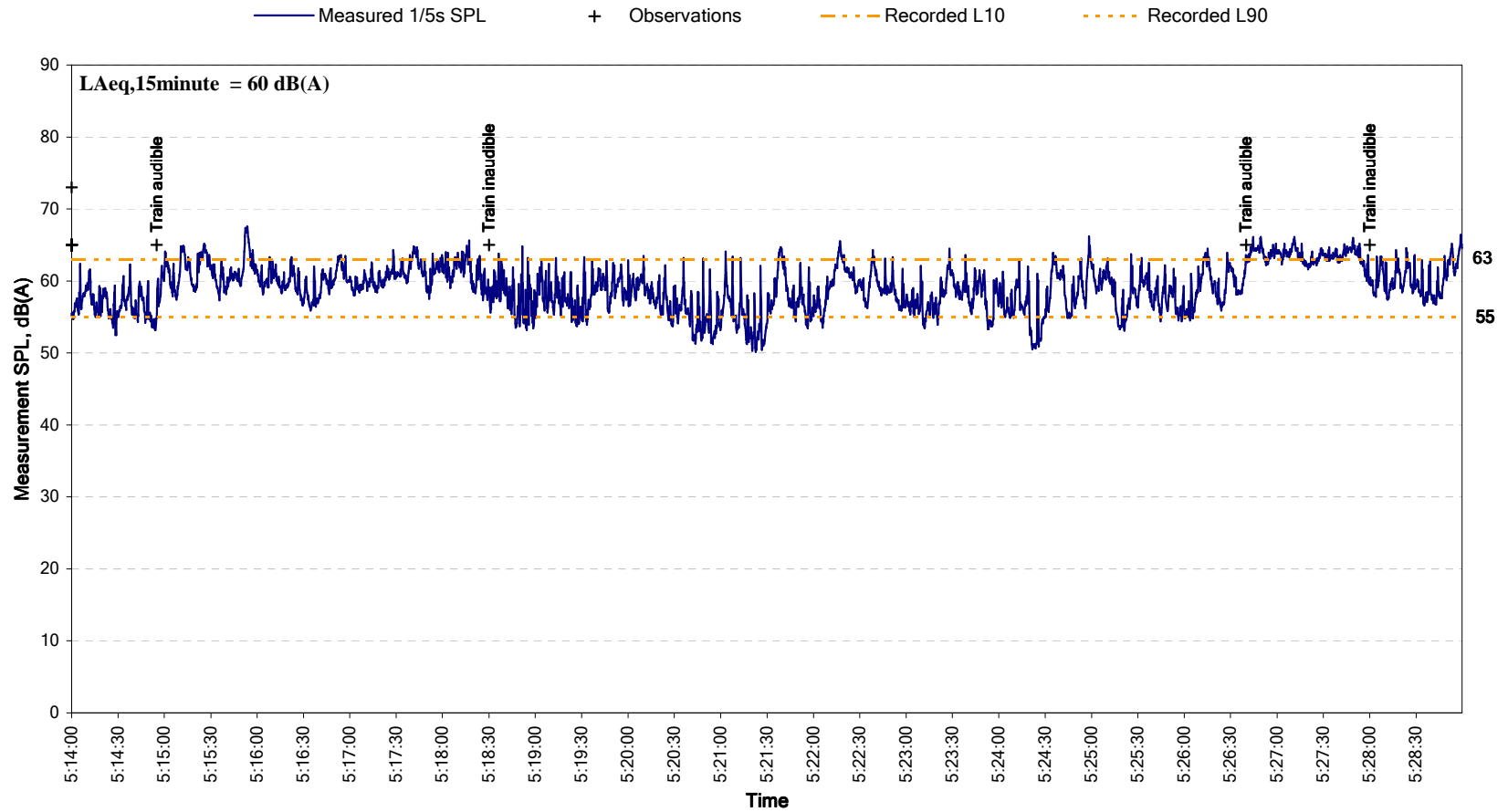
### Measured Noise Levels - Queen St, Branxton, 11 September 2009



### Measured Noise Levels - New England Hwy, Branxton, 11 September 2009



### Measured Noise Levels - New England Hwy, Branxton, 11 September 2009





## Appendix III

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**Seasonal Windroses  
Cessnock AWS**

