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Ambient Noise Monitoring

Winu Copper-Gold Project, WA

Reference: 24129774-03 Ambient

Prepared for:
Rio Tinto Winu Pty Ltd

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1. INTRODUCTION

Lloyd George Acoustics was engaged by Rio Tinto to undertake ambient noise monitoring for the proposed Winu Copper-Gold Project (The Proposal). The Proposal is located approximately 320 km East of Port Hedland in Western Australia. The overall mine layout and locality is presented as *Figure 1-1*.

Ambient noise levels were recorded at the site over a 6-day period to determine baseline noise levels prior to commencing a mining operation.

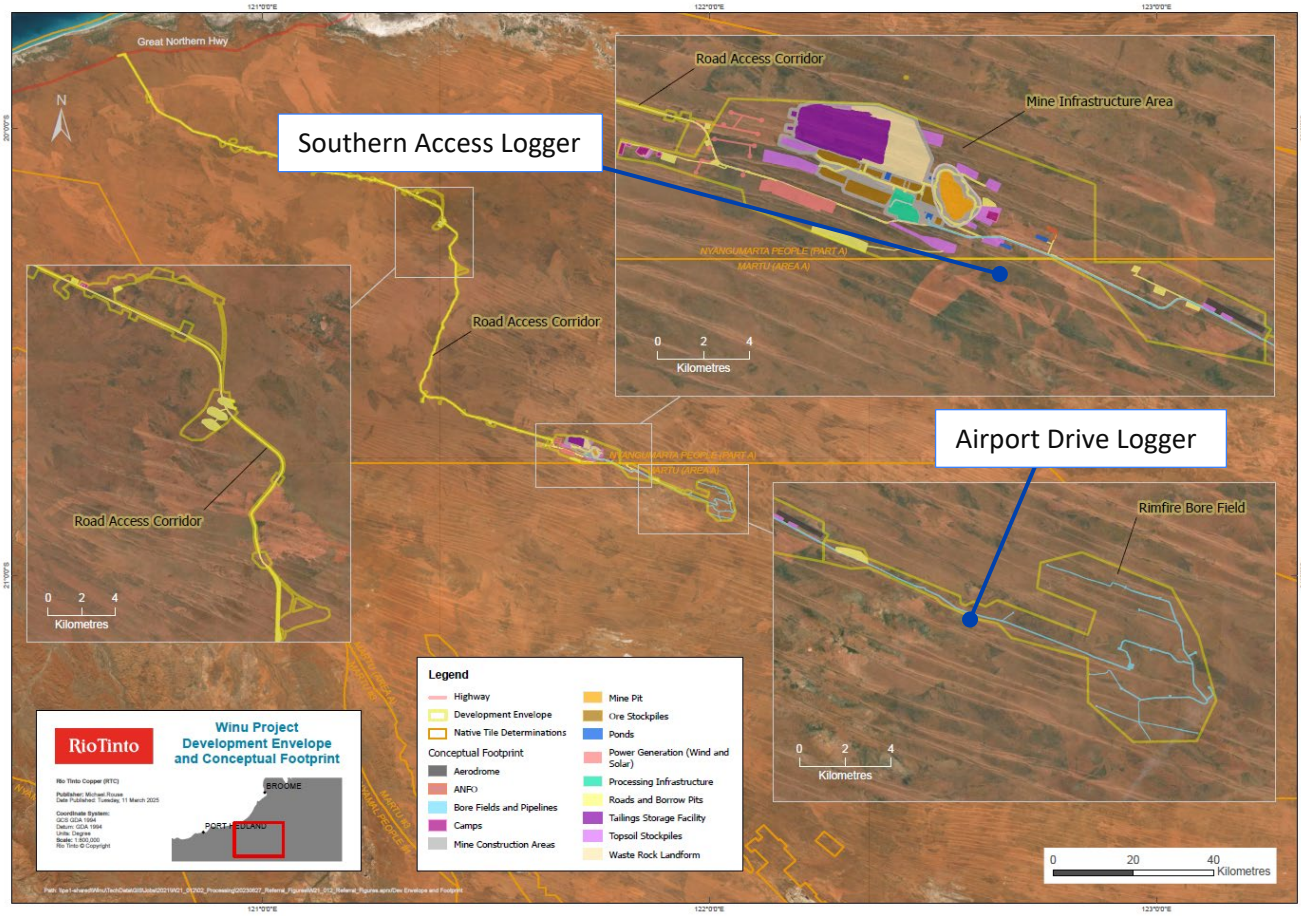


Figure 1-1: Subject Site Location (Source: Rio Tinto)

Appendix A contains a description of some of the terminology used throughout this report.

2. METHODOLOGY

Two noise monitors were deployed to site east of the mining area. The purpose of this monitoring was to characterise baseline noise levels in the vicinity of the proposed Mining Development Envelope. *Figure 2-1* shows each noise logger deployed, with details provided in *Table 2-1*.

Table 2-1: Noise Monitoring Equipment Summary

Logger S/N	Location	Coordinates	Dates of Monitoring Assessed
87802F	Airport Drive	-20.809502, 121.931489	7 to 12 May 2025
8780F4	Southern Access	-20.757612, 121.766514	7 to 12 May 2025

Under the Regulations, there are certain requirements that must be satisfied when undertaking measurements and are defined in Regulations 19, 20, 22 and 23 and Schedule 4. In undertaking the measurements, these have been satisfied, specifically noting the following:

- All loggers used were ARL type Ngaras setup to record A-weighted noise levels and audio.
- All equipment holds current laboratory certificates of calibration that are available upon request. The equipment was also field calibrated before and after the session and found to be within +/- 0.5 dB.
- Each microphone was fitted with a standard wind screen.
- The microphone was at least 1.2 metres above ground level and at least 3.0 metres from reflecting facades (other than the ground plane).
- Meteorological conditions during the ambient noise survey were taken from the Rio Tinto's Winu Weather Station.

Southern Access

Airport Drive

Figure 2-1: Ambient Noise Logging Equipment Installed

3. RESULTS

The logged noise data over the duration of the survey (6 days) are shown in *Figures 3-1* and *Figure 3-2*. These are the L_{A10} and L_{A90} noise levels measured over 1-hour periods and matched to logged weather data for the same period.

The wind directions are shown in graphs for the All-day, Night-time and Daytime periods in *Figure 3-3* to *Figure 3-5*, respectively. Generally speaking, wind direction during the survey period is weighted towards the east, east southeast and east northeast directions. Wind speeds were relatively calm at <4m/s wind speed on all days.

The measurements show that the L_{A90} noise levels are below 35 dB for the majority of the night period. During the evening, noise levels were consistently up to 55 dB L_{A90} between 6pm and 8pm. This was observed in the digital audio recordings as being caused by prevailing noise from insects in the vicinity of the equipment.

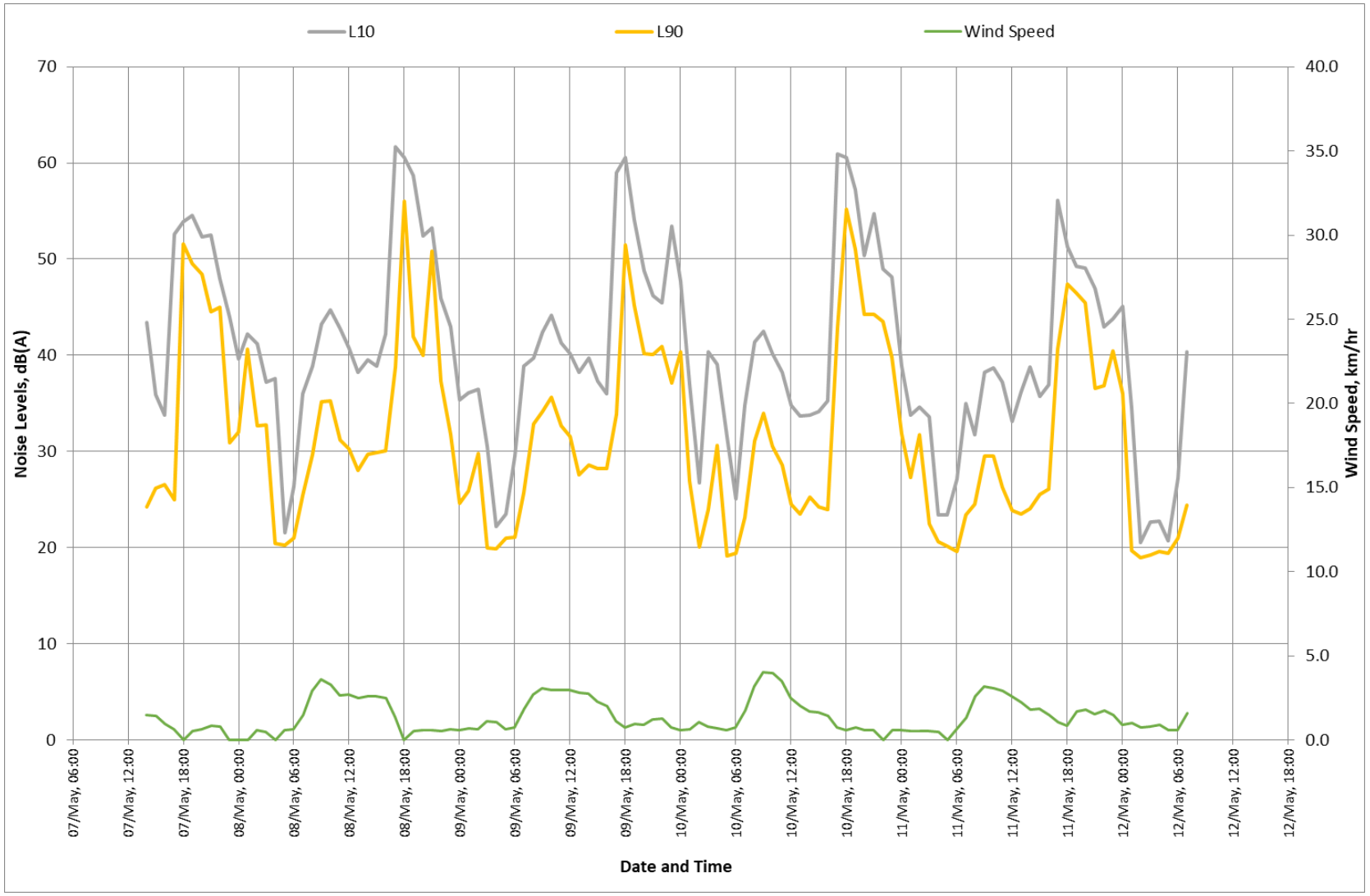


Figure 3-1: Ambient Noise Monitoring – Southern Access Logger

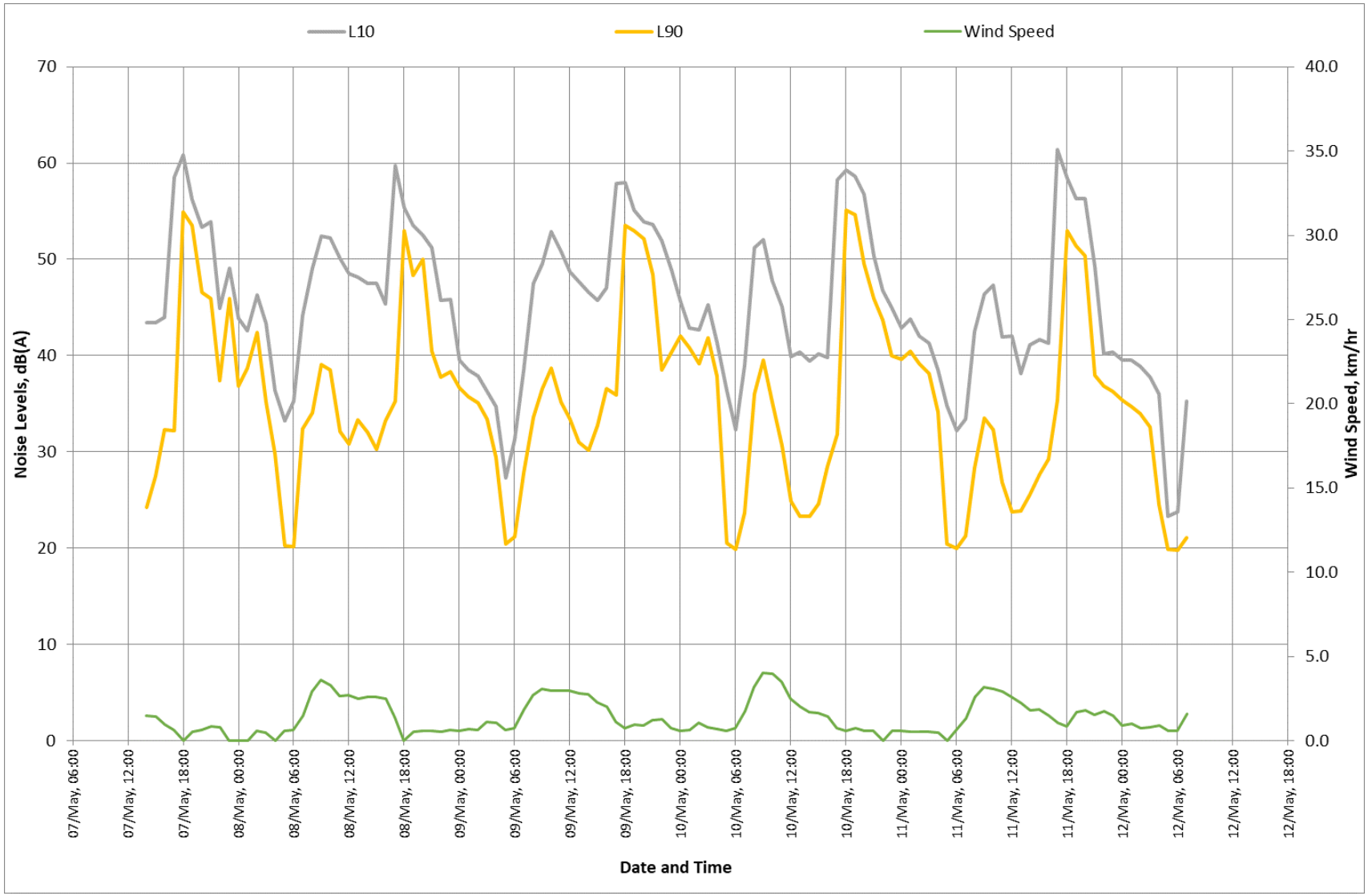


Figure 3-2: Ambient Noise Monitoring – Airport Drive Logger

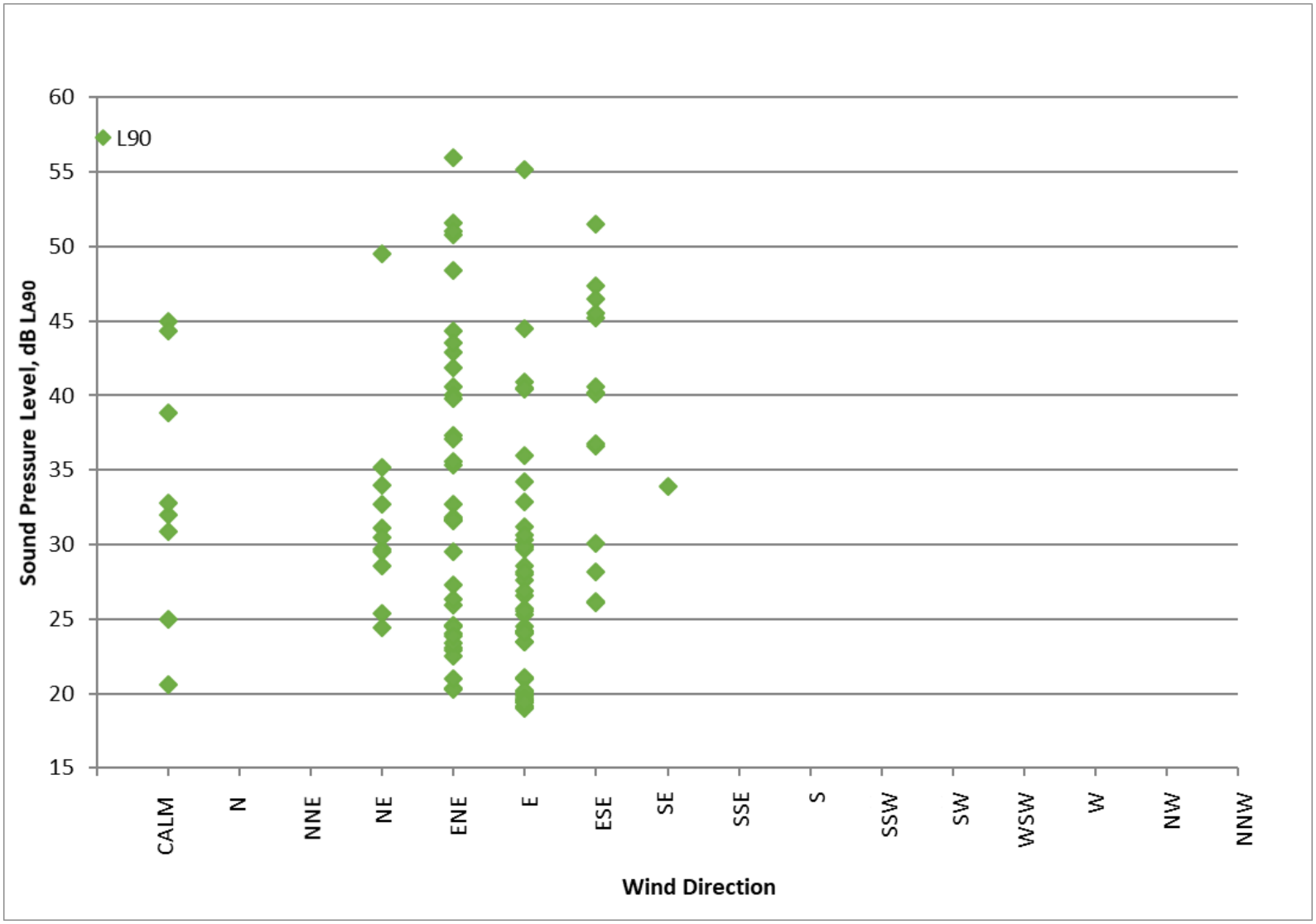


Figure 3-3: All Day Ambient Noise vs Wind Direction

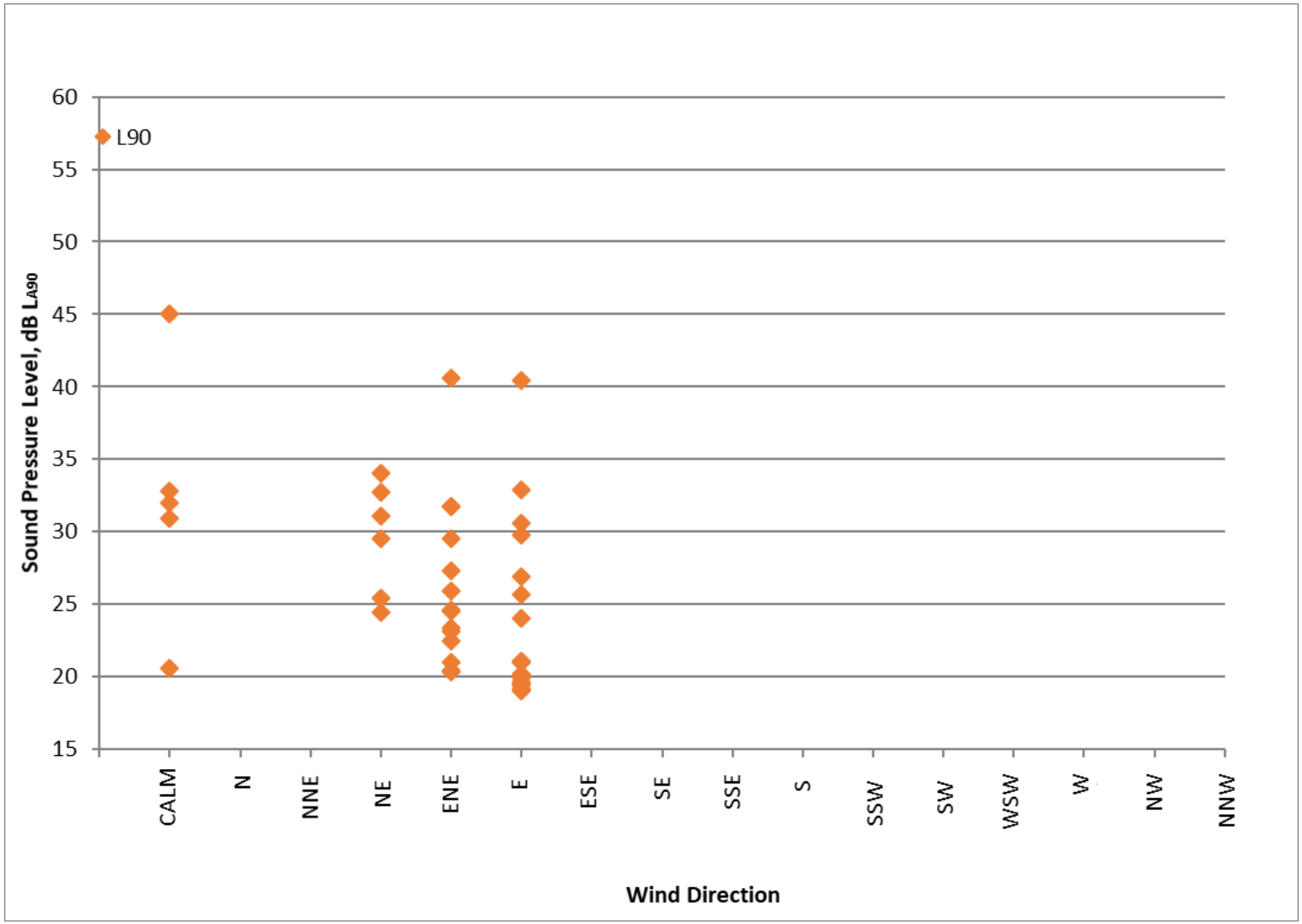


Figure 3-4: Night-Time Ambient Noise vs Wind Direction

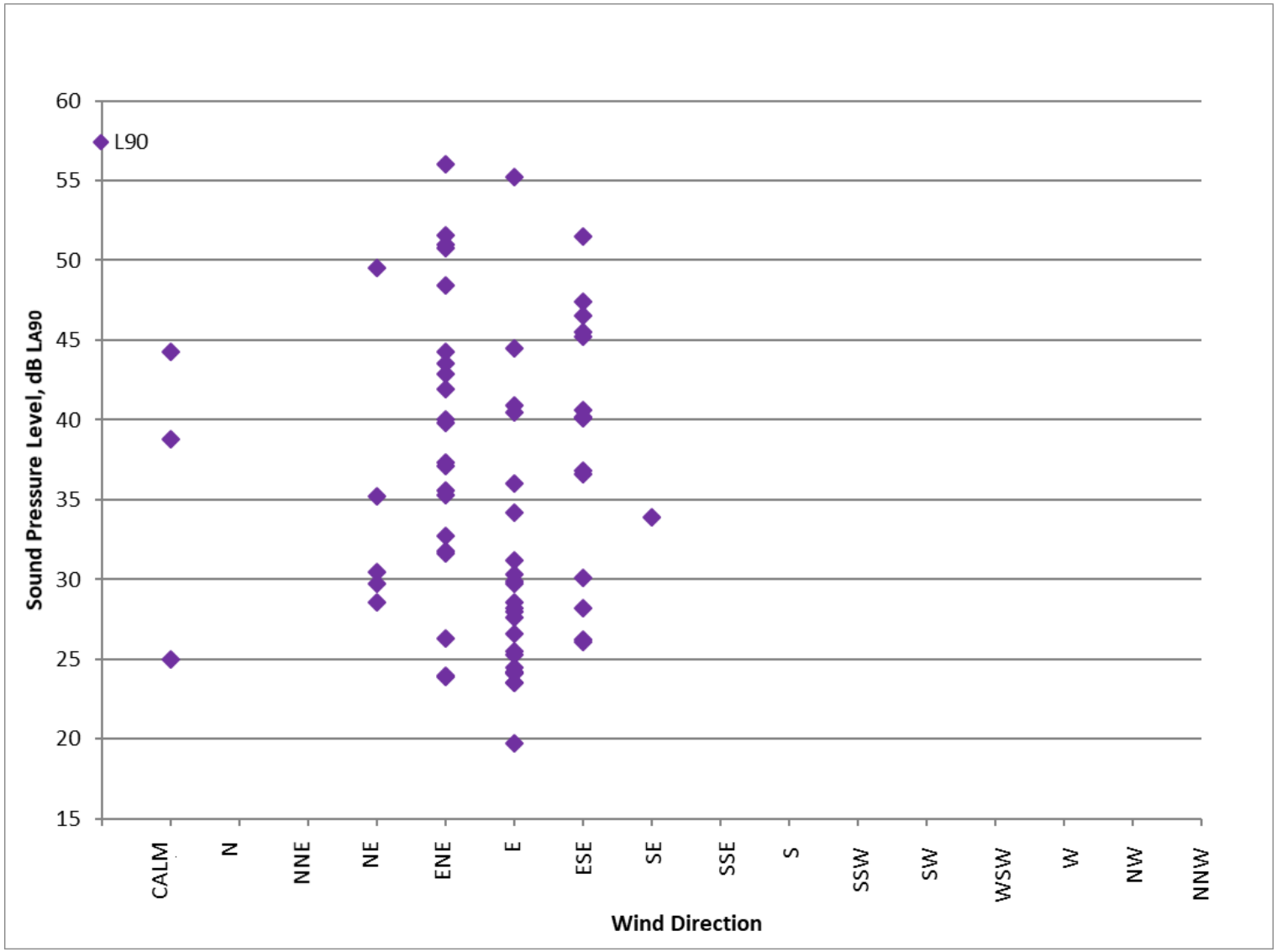


Figure 3-5: Day-time Ambient Noise vs Wind Direction

Appendix A – Terminology

The following is an explanation of the terminology used throughout this report:

- **Decibel (dB)**

The decibel is the unit that describes the sound pressure levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

- **A-Weighting**

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A, dB.

- **Sound Power Level (L_w)**

Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure level at known distances. Noise modelling incorporates source sound power levels as part of the input data.

- **Sound Pressure Level (L_p)**

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc. and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

- **L_{ASlow}**

This is the noise level in decibels, obtained using the A-frequency weighting and the S (slow) time weighting. Unless assessing modulation, all measurements use the slow time weighting characteristic.

- **L_{AFast}**

This is the noise level in decibels, obtained using the A-frequency weighting and the F (fast) time weighting. This is used when assessing the presence of modulation.

- **L_{APeak}**

This is the greatest absolute instantaneous sound pressure level in decibels using the A-frequency weighting.

- **L_{Amax}**

An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

- **L_{A1}**

The L_{A1} level is the A-weighted noise level exceeded for 1 percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

- **L_{A10}**

The L_{A10} level is the A-weighted noise level exceeded for 10 percent of the measurement period and is considered to represent the "intrusive" noise level.

- **L_{A90}**

The L_{A90} level is the A-weighted noise level exceeded for 90 percent of the measurement period and is considered to represent the "background" noise level.

- **L_{Aeq}**

The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

- **One-Third-Octave Band**

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20000 Hz inclusive.

- **Representative Assessment Period**

Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

- **L_{Amax} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded at any time.

- **L_{A1} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded for more than 1 percent of the representative assessment period.

- **L_{A10} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded for more than 10 percent of the representative assessment period.

- **Tonal Noise**

A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

– the presence in the noise emission of tonal characteristics where the difference between -

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

- **Modulating Noise**

A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

– a variation in the emission of noise that —

(a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band; and

(b) is present for at least 10% of the representative assessment period; and

(c) is regular, cyclic and audible.

- **Impulsive Noise**

An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness means:

– a variation in the emission of a noise where the difference between L_{Apeak} and L_{Amax} is more than 15 dB when determined for a single representative event.

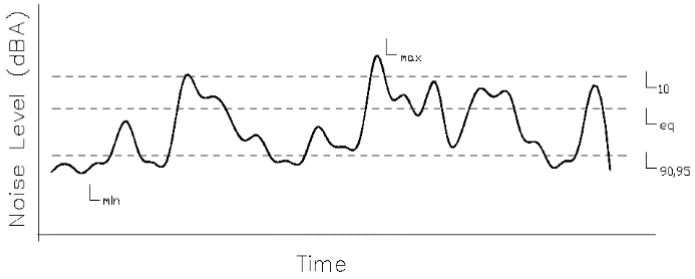
- **Major Road**

Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

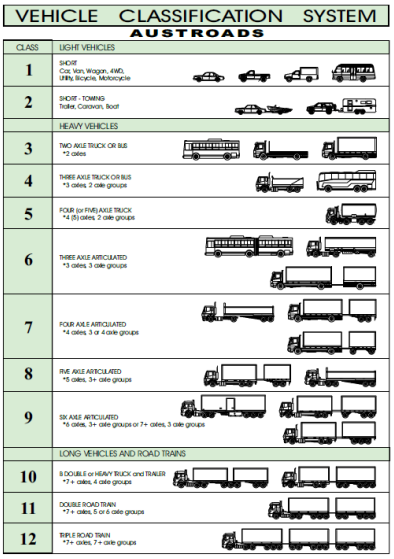
- **Secondary / Minor Road**

Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

- **Chart of Noise Level Descriptors**



- **Austroads Vehicle Class**



- **Typical Noise Levels**