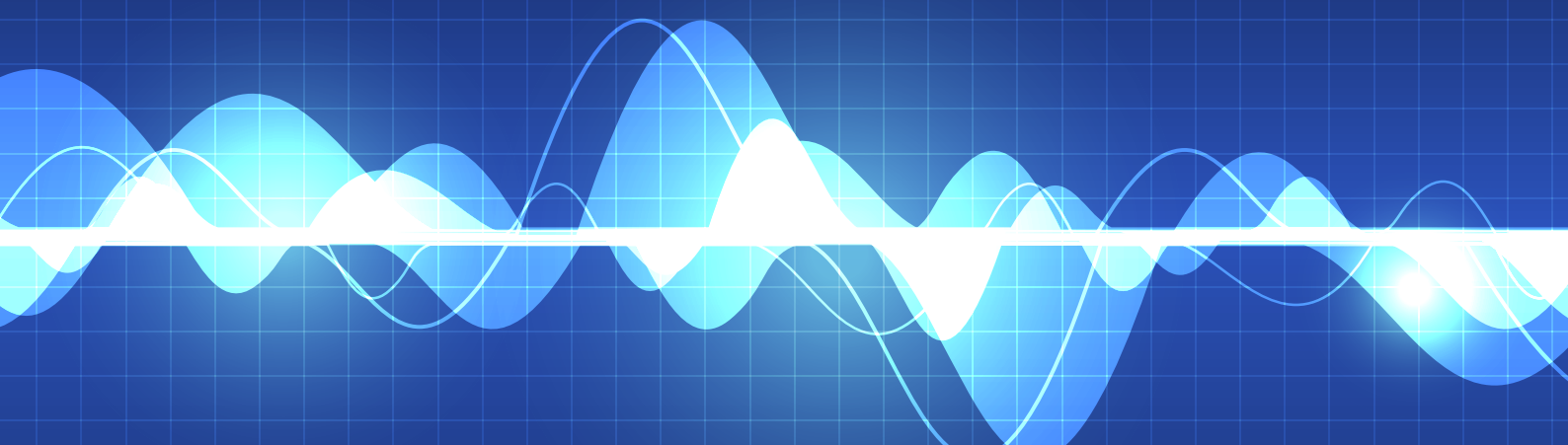


Appendix P – Noise and vibration impact assessment

Newstan Mine Extension Project

Noise and vibration impact assessment

Prepared for Centennial Newstan Pty Ltd
March 2020





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Newstan Mine Extension Project

Noise and vibration impact assessment

Report Number

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Centennial Newstan Pty Ltd

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This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

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Executive Summary

ES1 Existing and proposed development

Newstan Colliery is an existing underground coal mine located in the Lake Macquarie local government area (LGA), approximately 25 kilometres (km) south-west of Newcastle and 140 km north of Sydney, NSW. It is owned and operated by Centennial Newstan Pty Ltd (Centennial Newstan).

Centennial Newstan is seeking approval for the continuation of mining within the West Borehole seam. The Newstan Mine Extension Project proposes to extract up to 25.9 million tonnes (Mt) over a 15-year period at a maximum production rate of 4 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. Bord and pillar mining is proposed using continuous miner methods that will include areas of first workings, partial extraction and total extraction. A mix of metallurgical and thermal coal is proposed to be extracted. ROM coal will be delivered to the Newstan Colliery Surface Site via a series of existing underground conveyors. Once the coal reaches the Newstan Colliery Surface Site, it will be handled in accordance with approved operations for the Northern Coal Logistics Project (SSD-5145), managed by Centennial Coal's Northern Coal Services business unit.

The noise and vibration impact assessment (NVIA) prepared by SLR (2014) as part of the Northern Coal Logistics Project assessed noise emissions from relevant infrastructure at the Newstan Colliery Surface Site. As no new acoustically significant infrastructure is proposed for the Newstan Colliery Surface Site as part of the Newstan Mine Extension Project, only the Awaba Colliery Surface Site has been assessed with respect to potential noise impacts.

ES2 Assessment methodology

EMM has prepared this NVIA in accordance with the Secretary's Environmental Assessment Requirements (SEARs).

Noise and vibration from construction activities associated with the project have been assessed in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECC 2009) and *Assessing Vibration: A Technical Guideline* (DEC 2006). The operational noise assessment has been undertaken in accordance with the *Noise Policy for Industry* (NPfI) (EPA 2017) with reference to the *Industrial Noise Policy* (INP) (EPA 2000) and the *Voluntary Land Acquisition and Mitigation Policy* (VLAMP) (NSW Government 2018), where relevant. Road traffic noise associated with the project has been predicted and assessed in accordance with the *Road Noise Policy* (RNP) (DECCW 2011).

ES3 Construction noise and vibration

Construction noise levels were assessed for ICNG standard hours (daytime period) for standard and noise-enhancing meteorological conditions. Predictions satisfied the relevant noise management levels (NMLs) at all assessment locations and hence proposed construction activities at the Awaba Colliery Surface Site are unlikely to cause noise impacts at any sensitive receivers.

Vibration-generating activities will occur during the construction phase of the project including the operation of mobile equipment. Given the minimum separation distance of approximately 650 m between proposed construction activities and the nearest potentially affected residential locations, ground-borne vibration levels from these activities are expected to be negligible and below levels of human perception at the nearest residential receivers.

ES4 Operational noise and vibration

Operational noise emissions from the project are predicted to comply with the project noise trigger levels (PNTLs) and the noise limits in Awaba Colliery's existing consent (PA 10_0038) at all assessment locations during standard

weather conditions. During noise-enhancing weather conditions, a negligible exceedance of the PNTLs is predicted during the night-time period at assessment location R4. Given that this exceedance is considered to be 'negligible', there is no requirement to consider VLAMP or additional noise mitigation measures.

Maximum noise levels from the project are predicted to be below the sleep disturbance screening criteria. Hence, as per the NPfl requirements, a detailed maximum noise level event assessment was not required.

Notwithstanding the preceding, as Awaba Colliery is currently in care and maintenance, it was not possible to validate the adopted sound power levels or the relevance of modifying factors to account for annoying noise characteristics. Centennial Newstan will undertake noise measurements to validate sound power levels of on-site plant and equipment and off-site noise emissions once the Awaba Colliery Surface Site is operational.

Noise emissions from the project will continue to be managed in accordance with the existing *Noise Management Plan - Northern Region June 2017* (NMP), which describes the short-term and long-term monitoring program for Newstan and Awaba Collieries including both attended and real-time, unattended noise monitoring. The NMP will be updated accordingly if the project is approved.

During operations, the main vibration-generating activities will be from the ventilation fans. Given the minimum separation distance of approximately 650 m between the ventilation fans and the nearest potentially affected residential locations, ground-borne vibration levels from these activities are predicted to be negligible and below levels of human perception at the nearest residential receivers.

ES5 Road traffic noise

Off-site road traffic noise levels are predicted to satisfy the relevant noise limits at the most-affected residential locations for project-related construction and operational traffic.

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1 Introduction

1.1 Overview

Newstan Colliery is an existing underground coal mine located in the Lake Macquarie local government area (LGA), approximately 25 kilometres (km) south-west of Newcastle and 140 km north of Sydney, NSW. It is owned and operated by Centennial Newstan Pty Ltd (Centennial Newstan).

In August 2014, the underground operations at Newstan Colliery were placed onto care and maintenance due to poor market conditions. In recent years, Centennial Newstan has commenced feasibility investigations into the recommencement of mining at Newstan Colliery. The most recent modification to DA 73-11-98 in January 2019, permits first workings mining within the West Borehole seam in the southern portion of the Newstan Colliery mining lease area.

Centennial Newstan is now seeking approval for the continuation of mining within the West Borehole seam. The Newstan Mine Extension Project proposes to extract up to 25.9 million tonnes (Mt) over a 15-year period at a maximum production rate of 4 million tonnes per annum (Mtpa) of Run of Mine (ROM) coal (the project).

This Noise and Vibration Impact Assessment (NVIA) has been prepared to accompany the Environmental Impact Statement (EIS).

1.2 Assessment guidelines and requirements

This NVIA accompanies an EIS and development application under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project is classified as State Significant Development (SSD) (SSD 10333) under the *State Environmental Planning Policy (State and Regional Development) 2011*. The NSW Department of Planning, Industry and Environment (DPIE) issued revised Secretary's Environmental Assessment Requirements (SEARs) for the project on 3 September 2019.

This assessment addresses the SEARs in relation to noise and vibration impacts. The NSW Environment Protection Authority (EPA) and Lake Macquarie City Council have also provided details of key issues requiring assessment for the project in supplementary correspondence on the SEARs. Table 1.1 provides the relevant assessment requirements and the section of the NVIA report relevant to the specific requirement.

Pursuant to the requirements of the SEARs and the requests of the EPA, the NVIA has been completed with reference to the following guidelines and policies:

- NSW Department of Environment and Climate Change (DECC) (2009), *Interim Construction Noise Guideline* (ICNG);
- NSW Department of Environment and Climate Change and Water (DECCW) (2011), *Road Noise Policy* (RNP);
- NSW Department of Environment and Conservation (DEC) (2006), *Assessing Vibration: a technical guideline*;
- NSW Environment Protection Authority (EPA) (2017), *Noise Policy for Industry* (NPfI); and
- NSW Government (2018), *Voluntary Land Acquisition and Mitigation Policy* (VLAMP).

A number of technical terms have been utilised throughout the report for the discussion of noise. These are explained in Appendix A.

Table 1.1 Noise and vibration related matters in SEARs and agency requirements

Relevant authority and assessment requirement	Relevant section of this report
DPIE	
a detailed assessment of the likely construction, operational and off- site transport noise impacts of the development in accordance with the Interim Construction Noise Guideline, NSW Noise Policy for Industry and the NSW Road Noise Policy respectively, and having regard to the Voluntary Land Acquisition and Mitigation Policy	This report.
Lake Macquarie City Council	
The applicant is required to evaluate the existing and projected acoustic amenity to the surrounding areas, which may be affected by surface infrastructure such as heavy vehicle movements, plant and equipment, conveyor belt operation, exhaust fans and any increased traffic movements to public roads. In this regard, the applicant must provide a detailed Acoustic Report, prepared by a qualified and experienced Acoustic Consultant to determine whether the mine can operate in accordance with:	-
The NSW EPA Noise policy for Industry 2017 for ongoing operational noise from mechanical plant and equipment, including on-site vehicle movements.	Sections 3.1 and 3.2 Chapters 6 and 8
NSW Department of Environment, Climate Change and Water publication "Interim Construction Noise Guideline" July 2009.	Section 3.4 and Chapter 7
Vibration from construction site operations on surrounding land shall comply with the NSW Department of Environment, Climate Change and Water publication "Assessing Vibration: a technical guideline" February 2006.	Section 3.6
NSW Road Noise Policy to evaluate any potential effect to public roads, and the amenity of residential premises along those roads.	Section 3.5 and Chapter 9
Rail noise and vibration if that forms part of the new infrastructure proposal.	Not applicable. Rail infrastructure not proposed as part of the project.
Any proposed blasting to be carried out as part of infrastructure construction.	Not applicable. Blasting activity is not proposed as part of the project.
EPA	
The following matters should be addressed in relation to noise and vibration impacts associated with the proposal. This includes identification of the hours of operations, assessment of all activities where proposed, and impacts on sensitive receivers associated with the proposed hours of operation. The following matters should be addressed as part of the EIS.	-
Construction noise associated with the proposed development should be assessed using the Interim Construction Noise Guideline (DECC 2009).	Section 3.4 and Chapter 7
Vibration from all activities (including construction and operation) to be undertaken on the premises should be assessed using the guidelines contained in the Assessing Vibration: a technical guideline (DEC 2006).	Section 3.6
Blast impacts should be demonstrated to be capable of complying with the guidelines contained in Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC 1990).	Not applicable. Blasting activity is not proposed as part of the project.
Operational noise from all industrial activities (including private haul roads) to be undertaken on the premises should be assessed using the guidelines contained in the NSW Industrial Noise Policy (EPA 2000) and Industrial Noise Policy Application Notes.	Sections 3.1 and 3.2 Chapters 6 and 8

Table 1.1 **Noise and vibration related matters in SEARs and agency requirements**

Relevant authority and assessment requirement	Relevant section of this report
Noise on public roads from increased road traffic generated by land use developments should be assessed using the guidelines contained in the NSW Road Noise Policy (DECCW, 2011).	Section 3.5 and Chapter 9
Noise from new or upgraded public roads should be assessed using the NSW Road Noise Policy (DECCW, 2011).	Not applicable New or upgraded roads do not form part of the project.
Detail monitoring that will be conducted to assess the impacts of the proposal.	Section 8.4

Note: EPA reference to the INP has not been addressed in this report as the NPfl transitional arrangements have been followed.

2 Project and site description

2.1 Project overview

Newstan Colliery is an existing underground coal mine located in the Lake Macquarie LGA, approximately 25 km south-west of Newcastle and 140 km north of Sydney, NSW (see Figure 2.1). It is owned and operated by Centennial Newstan.

Mining operations at Newstan Colliery began in 1887 and upon the introduction of the EP&A Act operated pursuant to continuing use rights in accordance with Part 4, Division 10 of the EP&A Act (continuing use rights).

Newstan Colliery has at various times mined the upper coal seams (Great Northern and Fassifern seams) and lower coal seams (West Borehole, Borehole, Young Wallsend and Yard seams) and produced both semi-soft coking coal and thermal coal for domestic and export markets. In the lower seams, workings to date have been concentrated to the west of the seam split, which is a defining geological feature of the mine. Mining has been undertaken using a combination of bord and pillar and longwall mining.

In August 2014, the underground operations at Newstan Colliery were placed onto care and maintenance due to poor market conditions. In recent years, Centennial Newstan has commenced feasibility investigations into the recommencement of mining at Newstan Colliery. The most recent modification to DA 73-11-98 in January 2019, permits first workings mining within the West Borehole seam in the southern portion of the Newstan Colliery mining lease area. The first workings aim to improve Centennial Newstan's understanding of the geology within the West Borehole seam, including the presence, throw and strike of a major fault zone projected from the historic Newstan workings.

Centennial Newstan is now seeking approval for the continuation of mining within the West Borehole seam. The Newstan Mine Extension Project proposes to extract up to 25.9 Mt over a 15-year period at a maximum production rate of 4 Mtpa of ROM coal. Bord and pillar mining is proposed using continuous miner methods that will include areas of first workings, partial extraction and total extraction. A mix of metallurgical and thermal coal is proposed to be extracted. ROM coal will be delivered to the Newstan Colliery Surface Site via a series of existing underground conveyors. Once the coal reaches the Newstan Colliery Surface Site, it will be handled in accordance with the approved operations for the Northern Coal Logistics Project (SSD-5145), managed by Centennial Coal's Northern Coal Services business unit. The development consent boundaries for Newstan Colliery and Awaba Colliery are shown in Figure 2.1.

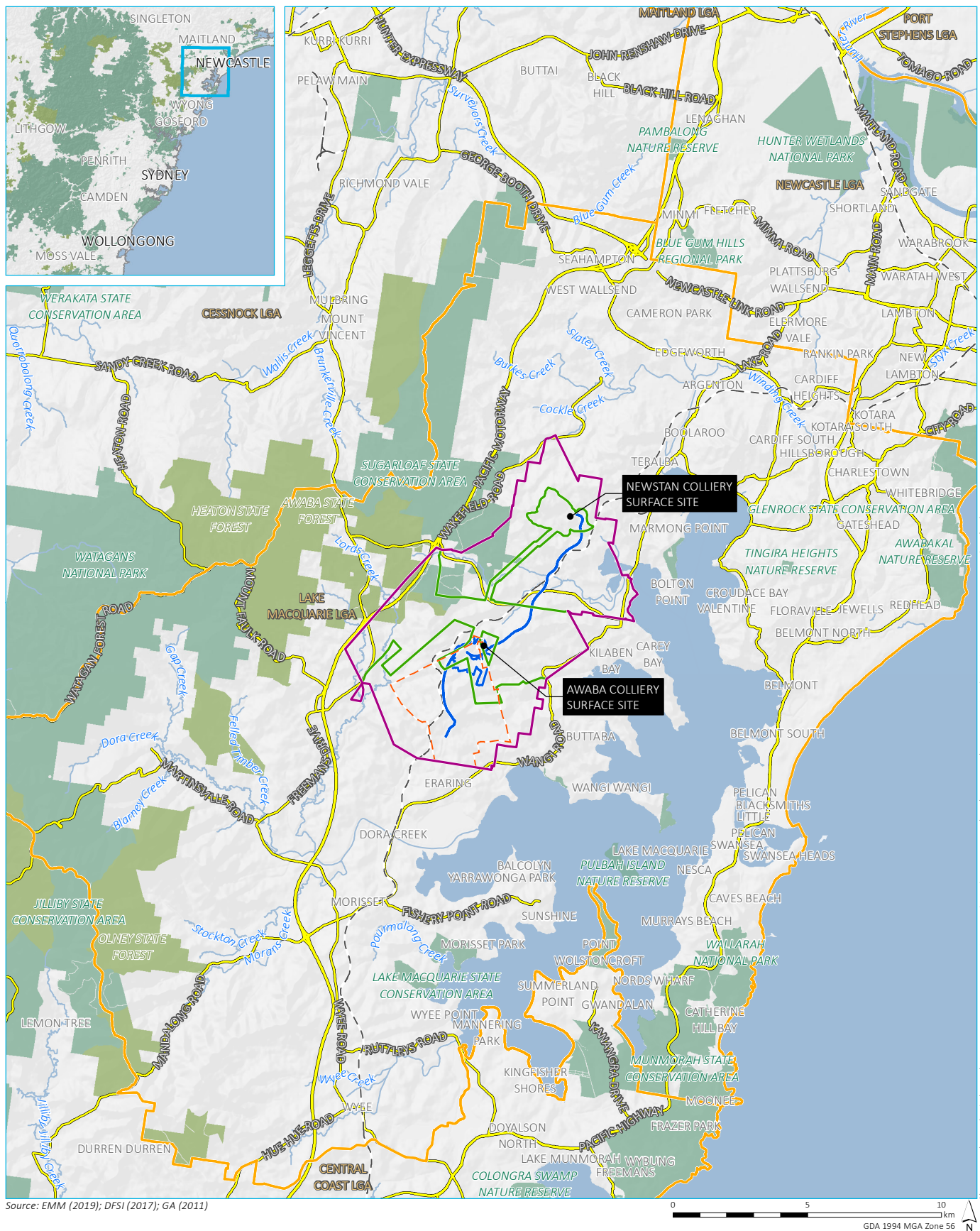
Other key features of the project include:

- Utilisation of the Newstan Colliery Surface Site to provide parking, bathhouse, administration and workshop facilities for the underground workforce. A small number of administrative, maintenance and monitoring personnel will also be located at Awaba Colliery Surface Site.
- Transportation of personnel and materials to and from the underground mining area via the existing men and materials drift at Newstan Colliery Surface Site.
- Continued operation of the two existing ventilation fans at Newstan Colliery Surface Site until the installation and operation of three new ventilation fans at the existing ventilation shaft at Awaba Colliery Surface Site. The Newstan fans will be decommissioned after the installation of the Awaba fans.
- In-seam gas drainage, with gas transferred to a new gas flaring facility to be located within the existing disturbance footprint of Awaba Colliery Surface Site.

- Extraction of underground water via the existing Fassifern Pump Station at Newstan Colliery Surface Site and ongoing groundwater management in accordance with Centennial Coal's Northern Operations Water Management Plan.

The project is aligned with the broader Centennial Coal business strategy in that it facilitates the development of a new semi-soft coking coal product stream and a thermal coal product for both the domestic and export markets. The project will enable supply of export coal products while meeting contractual coal supplies to the domestic markets. Over time, the project can potentially replace the coal product currently supplied to the domestic market by other Centennial operations as these other resources become depleted. This will ensure ongoing security of supply for domestic electricity generation.

If approved, the project will allow for the optimisation of resource recovery from Newstan Colliery while providing ongoing direct and indirect employment opportunities. In addition, the project will provide several positive flow-on effects to the local, regional and state economies through additional wages and royalties.



KEY

- Project application area
- Extension of mining area
- Newstan Colliery development consent boundary
- Awaba Colliery development consent boundary
- Rail line
- Main road
- Watercourse/drainage line
- NPWS reserve
- State forest
- Local government area

Regional context

Newstan Mine Extension Project
Noise and vibration impact assessment
Figure 2.1

2.2 Site description and assessment locations

Newstan Colliery is an underground mining operation located 25 km south-west of Newcastle. The mine is situated in the Lake Macquarie LGA. Collectively, existing land uses in the vicinity of the mine include underground coal mining, power generation and environmental conservation/management.

The NVIA prepared for the Northern Coal Logistics Project (SSD-5145) was prepared by SLR Consulting Pty Ltd (SLR) in April 2014. Of relevance to this assessment, the NVIA prepared by SLR (2014) assessed noise emissions from relevant infrastructure at the Newstan Colliery Surface Site. As no new acoustically significant infrastructure is proposed for the Newstan Colliery Surface Site as part of the project, it has not been assessed in this report. The ongoing operation of the existing infrastructure at the Newstan Colliery Surface Site is approved under SSD-5145 for the Northern Coal Logistics Project. As such, only the Awaba Colliery Surface Site has been assessed with respect to potential noise impacts from the project.

It is also noted that operation of the Newstan-Eraring private haul road, which runs directly south of the Awaba Colliery Surface Site, is approved under the Northern Coal Logistics Project (SSD-5145) (refer Figure 2.2) and does not form part of the project.

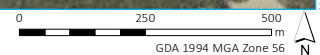
The nearest noise sensitive receptors (herein referred to as assessment locations) are shown in Figure 2.2 and described in Table 2.1.

Table 2.1 **Assessment locations**

Receptor	Address	Type	Easting	Northing
R1	9 Olney Street, Awaba	Residential	363733	6346064
R2	15 Evans Street, Awaba	Residential	363203	6346323
R3	51 Puddy Lane, Awaba	Residential	363220	6346274
R4	1A Olney Street, Awaba	Residential	363547	6346080



Source: EMM (2019); DFSI (2017); GA (2011)



KEY

- Noise monitoring location
- Assessment location
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody
- NPWS reserve
- Project application area
- Extension of mining area
- Newstan Colliery development consent boundary
- Awaba Colliery development consent boundary
- Proposed first workings area
- Proposed partial extraction area
- Proposed total extraction area
- Existing west borehole seam workings

Noise monitoring and assessment locations

Newstan Mine Extension Project
Noise and vibration impact assessment
Figure 2.2

3 Assessment methodology

3.1 Applying the NPfl to existing sites

The NPfl provides a methodology for the assessment of noise from existing industrial sites. The NPfl acknowledges that some industrial sites were designed for higher allowable noise emissions than those outlined in current NSW noise policy and may have been in existence before neighbouring noise-sensitive developments. The range of mitigation options available for such sites can be limited or costly.

Section 6.1 of the NPfl states that, “the project noise trigger levels (PNTLs) should not be applied as mandatory noise limits. The project noise trigger level is the level used to assess noise impact and drive the process of assessing all feasible and reasonable control measures.”

Where noise emissions from the existing site exceed the PNTLs as defined in the NPfl, the relevant regulatory authorities and proponent will determine achievable noise limits for the site through negotiation and discussion with relevant stakeholders as required.

The process for applying the NPfl to existing sites is outlined in Section 6.1.1 of the NPfl and is summarised as follows:

1. Undertake an initial evaluation, including whether approvals/licences include noise limits and whether they are being met.
2. Establish relevant PNTLs, in accordance with the NPfl, to establish a benchmark level to assess the need to consider noise mitigation.
3. Measure/predict the noise levels produced by the source in question, having regard to meteorological effects such as wind and temperature inversions.
4. Compare the measured/predicted noise level with the PNTLs.
5. Where the PNTLs are exceeded, assess feasible and reasonable noise mitigation strategies.
6. Develop and refine achievable noise limits that will become goals for the project. This may involve interaction between the regulator and proponent as well as consultation with the community.
7. Monitor compliance with the agreed noise limits, and review and amend the noise performance of the site as required.

3.2 Operational noise limits - NPfl

Noise from industrial sites or processes in NSW are typically regulated by the local council, DPIE and/or the EPA and usually have a licence and/or development consent conditions stipulating noise limits. These limits are normally derived from operational noise levels applied at assessment locations. They are based on EPA guidelines (ie NPfl) or noise levels that can be achieved at a specific site following the application of all reasonable and feasible noise mitigation.

The reaction to noise is highly subjective. Hence, it is not possible to adopt noise levels that will guarantee that no one will experience an impact. Adherence to the PNTLs should not be interpreted to mean that industrial noise will

be inaudible, or that all members of the community will find the noise acceptable. The PNTLs for industry provide a benchmark for assessing a proposed or existing industrial development.

Both the increase in noise level above background levels (ie the intrusiveness of a source) as well as the absolute level of noise are important factors in how a community will respond to noise from industrial sources. To ensure both of these factors are considered, the EPA provides two separate noise trigger levels: intrusiveness and amenity. The fundamental difference being intrusiveness noise levels apply over 15 minutes in any period (day, evening or night), whereas the amenity noise levels apply to the entire assessment period (day, evening or night).

3.2.1 Assessing intrusiveness

The intrusive noise trigger levels require that $L_{Aeq,15\text{ minute}}$ noise levels from the site during the relevant operational periods (ie day, evening and night) do not exceed the rating background level (RBL) by more than 5 dB. The NPfI recommends that the intrusive noise trigger level for evening be set at no greater than the intrusive noise level for daytime and that the intrusive noise level for night-time should be no greater than the intrusive noise level for day or evening.

Ambient unattended noise monitoring has been undertaken to determine relevant RBL's for the area at locations representative of the nearest potentially affected residences. The results of the noise monitoring are presented in Chapter 5.

Intrusive noise trigger levels are applicable at residential assessment locations only.

3.2.2 Assessing amenity

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail and/or community noise. Where the measured existing industrial noise approaches recommended amenity noise level, it needs to be demonstrated that noise levels from new industry will not contribute to existing industrial noise such that amenity noise levels are exceeded.

To ensure that total industrial noise levels remain within the recommended amenity noise levels for an area, the project amenity noise level for the subject development is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB.

The assessment locations within Awaba village have been categorised in the NPfI 'rural' amenity category as per the definitions provided in the NPfI, since they were deemed to be in "an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels."

An extract from the NPfI that relates to the amenity noise criteria relevant to the project is given in Table 3.1.

Table 3.1 **Amenity noise levels - Recommended L_{Aeq} noise levels from industrial noise sources**

Type of receptor	Noise amenity area	Time of day ¹	Recommended $L_{Aeq,period}$ noise level (dB) ²
Residence	Rural	Day	50
		Evening	45
		Night	40

Notes: 1. Daytime 7 am–6 pm; Evening 6 pm–10 pm; Night-time 10 pm–7 am. On Sundays and public holidays, Daytime 8 am–6 pm; Evening 6 pm–10 pm; Night-time 10 pm–8 am.

2. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

3.2.3 Project noise trigger levels

PNTLs are the lower of the derived intrusiveness and amenity criteria.

It is commonly acknowledged and accepted amongst regulators and industry that average noise levels are typically 3 dB higher over a 15-minute worst case assessment period when compared to an entire day (11 hour), evening (4 hour) and night (8 hour) assessment period. This assumption is outlined in the NPfI and has been used in this assessment to standardise the time periods for the intrusive and amenity noise levels.

3.2.4 Low frequency noise

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 **One-third octave low-frequency noise thresholds**

One-third octave $L_{Zeq,15\text{ minute}}$ threshold level													
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Source: NPfI (EPA 2017).

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or

- where any of the one-third octave noise levels in Table 3.3 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2 dB positive adjustment applies for the daytime period.

3.2.5 Sleep disturbance

The difficulty in establishing an absolute noise level criterion that would correlate to an acceptable level of sleep disturbance is acknowledged by relevant governing authorities.

Historic operations at the mine occurred during the night-time period (10 pm–7 am) as will the proposed operations. Hence, an assessment of the potential for sleep disturbance is required.

The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where night-time noise levels at a residential location exceed:

- $L_{Aeq,15\text{ minute}}$ 40 dB or the prevailing RBL plus 5 dB (whichever is the greater); and/or
- L_{Amax} 52 dB or the prevailing RBL plus 15 dB (whichever is the greater).

Guidance regarding potential for sleep disturbance is also provided in the RNP. The RNP calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The RNP provides the following conclusions from the research on sleep disturbance:

- maximum internal noise levels (L_{Amax}) below 50 to 55 dB are unlikely to awaken people from sleep; and
- one or two noise events per night, with maximum internal noise levels (L_{Amax}) of 65 to 70 dB, are not likely to affect health and wellbeing significantly.

It is commonly accepted by acoustic practitioners and regulatory bodies that a facade including a partially open window will reduce external noise levels by 10 dB. Therefore, external noise levels in the order of 60–65 dB calculated at the facade of a residence are unlikely to awaken people according to the RNP.

If noise levels over the screening criteria are identified, then additional analysis would consider factors such as:

- how often the events would occur;
- the time the events would occur;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current scientific literature available regarding the impact of maximum noise level events at night.

3.3 Voluntary Land Acquisition and Mitigation Policy

VLAMP describes the NSW Government's policy for voluntary mitigation and land acquisition actions undertaken to address noise (and dust) impacts from State significant mining, petroleum and extractive industry developments. The VLAMP states:

The NSW Government has established a range of policies and guidelines to guide the assessment of the potential impacts of mining, petroleum and extractive industry developments in NSW. These policies and guidelines include assessment criteria to protect the amenity, health and safety of people. They typically

require applicants to implement all reasonable and feasible avoidance and/or mitigation measures to minimise the impacts of a development.

In some circumstances, it may not be possible to comply with these assessment criteria even with the implementation of all reasonable and feasible avoidance and/or mitigation measures. This can occur with large resource projects – such as large open cut mines - where the resources are at a fixed location.

However, it is important to recognise that:

- not all exceedances of the relevant assessment criteria equate to unacceptable impacts;
- a consent authority may decide that it is in the public interest to allow the development to proceed, even though there would be exceedances of the relevant assessment criteria, because of the broader social and/or economic benefits of the development; and
- some landowners may be prepared to accept higher impacts on their land, subject to entering into suitable negotiated agreements with applicants, which may include the payment of compensation.

Figure 3.1 provides the general decision-making process that will be applied by consent authorities at the development application stage when assigning voluntary land acquisition and mitigation obligations.

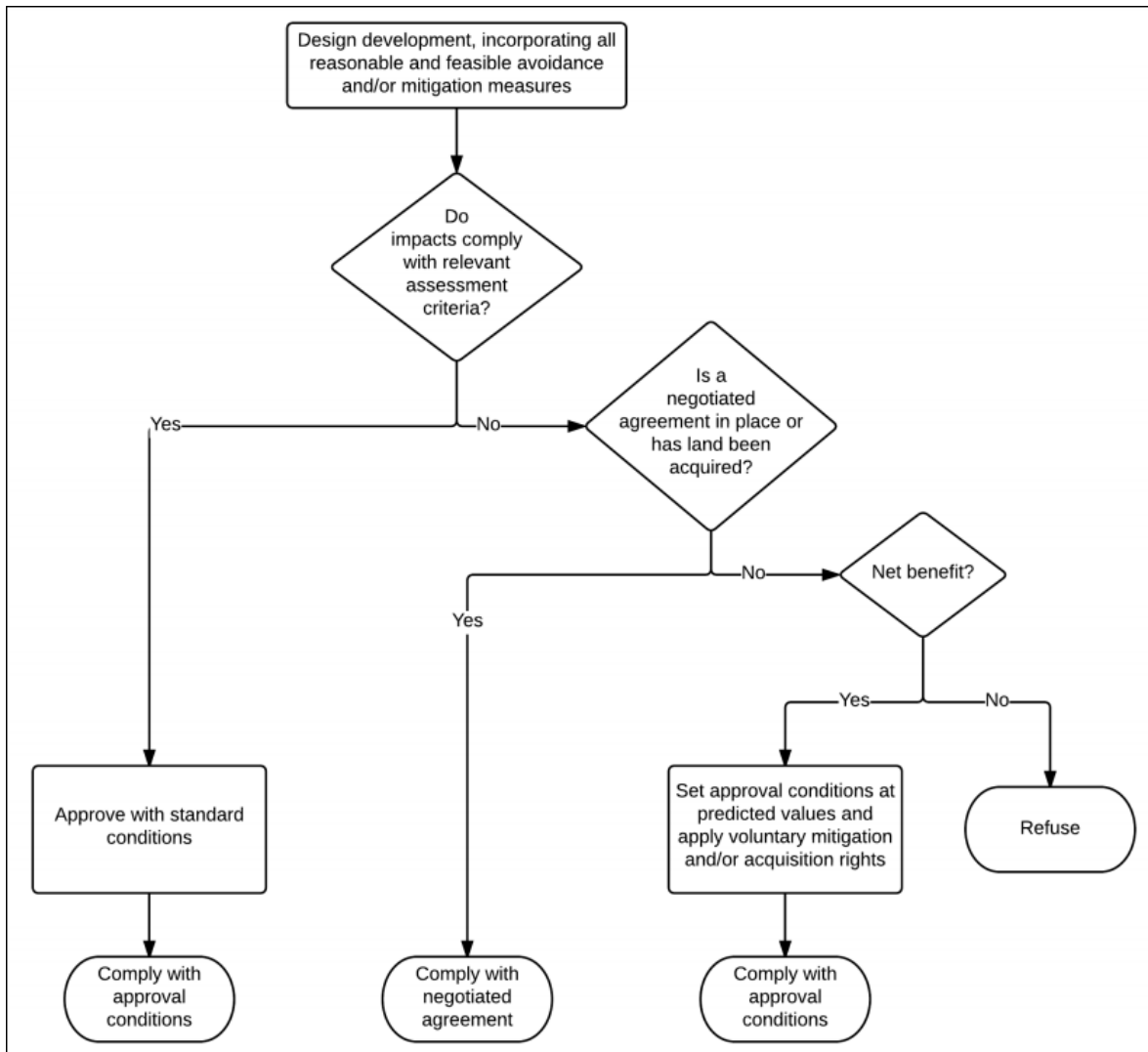


Figure 3.1 VLAMP (Figure 1) – General approach to decision making during the assessment process

Voluntary land acquisition and mitigation rights in VLAMP are assigned to privately-owned dwellings based on the level of predicted noise above the NPfI project noise target (ie the PNTLs).

The characterisation of the noise impacts (as outlined in VLAMP) are generally based around the human perception to changes in noise levels as explained in the glossary of the acoustic terms (refer Appendix A). For example, a change in noise level of 1–2 dB is typically indiscernible to the human ear. The characterisation of a residual noise impact of 0–2 dB above the PNTL is therefore considered negligible. This characterisation of residual noise impacts is outlined further in Table 1 of the VLAMP, reproduced in Table 3.3.

Table 3.3 Characterisation of noise impacts and potential treatments

If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Characterisation of impacts	Potential treatment
All time periods 0-2 dB	Not applicable.	Impacts are considered to be negligible .	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls.
All time periods 3-5 dB	recommended amenity noise level; or > recommended amenity noise level but the increase in total cumulative industrial noise level resulting from development is 1 dB.	Impacts are considered to be marginal .	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
All time periods 3-5 dB	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is >1dB.	Impacts are considered to be moderate .	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening > 5 dB	recommended amenity noise level.	Impacts are considered to be moderate .	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening > 5 dB	> recommended amenity noise levels in Table 2.2 of the NPfI.	Impacts are considered to be significant .	Provide mitigation as for moderate impacts and refer voluntary land acquisition provisions.
Night > 5 dB	Not applicable.	Impacts are considered to be significant .	Provide mitigation as for moderate impacts and refer voluntary land acquisition provisions.

Source: VLAMP (NSW Government 2018).

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management:

- the noise generated by the development would be characterised as significant, according to Table 1 of the VLAMP, at any residence on privately-owned land; or
- the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5 dB in Table 2.2 of the NPfI on more than 25% of any privately-owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls.

3.4 Construction noise

The ICNG (DECC 2009) has been jointly developed by NSW Government agencies including the EPA and DPIE. The objectives of the guideline relevant to the planning process are to promote a clear understanding of ways to identify and minimise noise from construction and to identify ‘feasible’ and ‘reasonable’ management and mitigation measures where required. The guideline recommends standard construction hours where noise from construction activities is audible at residential premises (ie assessment locations):

- Monday to Friday - 7 am–6 pm;
- Saturday - 8 am–1 pm; and
- no construction work is to take place on Sundays or public holidays.

The ICNG acknowledges that works outside standard hours may be necessary; however, justification should be provided to the relevant authorities.

DPIE generally requires that noise emissions from construction associated with mining projects be assessed under the operational noise policy. This is normally because noise from construction activity associated with such projects is similar in nature to that generated by the operation of the project particularly for open-cut mining operations.

In the case of the project, noise from construction activities (ie construction of the ventilation fans, methane flares and ancillary infrastructure) will be different in nature to the operations. Thus, it is considered appropriate to apply construction noise criteria in accordance with the ICNG to those elements.

The ICNG provides a qualitative or quantitative methodology to assess construction noise emissions. The quantitative approach is suited to major construction projects with a typical duration of more than three weeks and has been adopted for the purpose of this assessment. This method requires noise emission predictions from construction activities at the nearest assessment locations and assessment against ICNG recommended noise levels.

Table 3.4 provides noise management levels (NMLs) for residential assessment locations which have been adopted for the quantitative construction noise assessment.

Table 3.4 ICNG construction noise management levels for residential land uses

Time of day	Management level $L_{Aeq,15\text{ minute}}$	Application
Recommended standard hours: Monday to Friday 7 am–6 pm Saturdays 8 am–1 pm No work on Sundays or public holidays.	Noise-affected RBL + 10 dB	The noise-affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq,15\text{ minute}}$ is greater than the noise-affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB	The highly noise-affected level represents the point above which there may be strong community reaction to noise.

Table 3.4 ICNG construction noise management levels for residential land uses

Time of day	Management level $L_{Aeq,15\text{ minute}}$	Application
		- Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: - times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences); - if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise-affected RBL + 5 dB	- A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the noise affected level. - Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise-affected level, the proponent should negotiate with the community. - For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

Source: ICNG (DECC 2009).

Noise from construction activity associated with the project will have the largest potential to impact residences within the Awaba village (refer Figure 2.2).

3.5 Road traffic noise

Assessment of potential noise impact is required from the predicted construction and operational related road traffic. The principle guidance for the assessment of road traffic noise impact on assessment locations is the RNP. Traffic routes for construction and operational traffic related to the project consist of Wilton Road, Wangi Road, Awaba Road and Cessnock Road. These are categorised as arterial/sub-arterial roads as per the categories provided in the RNP.

Table 3.5 presents the road traffic noise assessment criteria for noise sensitive receptors reproduced from Table 3 and Table 4 of the RNP for road categories relevant to the construction and operation of the project.

Table 3.5 Road traffic noise assessment criteria for residential land uses

Receiver type	Road category	Type of project/development	Assessment criteria (dB)	
			Day (7 am–10 pm)	Night (10 pm–7 am)
Residence	Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	L _{Aeq,15 hour} 60 (external)	L _{Aeq,9 hour} 55 (external)
	Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments.	L _{Aeq,1 hour} 55 (external)	L _{Aeq,1 hour} 50 (external)

Source: RNP (DECCW 2011).

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB where all feasible and reasonable noise mitigation is considered.

3.6 Operational and construction vibration

Vibration-generating activities will occur during the construction phase of the project including the operation of mobile equipment. Given the minimum separation distance of approximately 650 m between proposed construction activities and the nearest potentially affected residential locations, ground-borne vibration levels from these activities are expected to be negligible and below levels of human perception at the nearest residential receivers.

During operations, the main vibration-generating activities will be from the ventilation fans. Given the minimum separation distance of approximately 650 m between the ventilation fans and the nearest potentially affected residential locations, ground-borne vibration levels from these activities are predicted to be negligible and below levels of human perception at the nearest residential receivers. Furthermore, vibration levels generated by the project will remain largely unchanged from those generated by existing infrastructure at the Awaba Colliery Surface Site.

Given the preceding, a detailed assessment of vibration has not been provided as part of this report.

4 Existing mine noise

4.1 Existing mine noise criteria

PA 10_0038 was granted on 13 May 2011 for the Awaba Colliery mining project under Section 75J of the EP&A Act by the then Minister for Planning. The ventilation fan site at Awaba is approved under the Newstan Colliery consent (DA 73-11-98 Mod 8).

Development consent for the Northern Coal Logistics Project (SSD-5145) was granted on 29 September 2015 under Section 89E of the EP&A Act by the then Minister for Planning. Subsequently, one modification to this approval has been approved on 25 January 2018.

The Awaba Colliery is also licensed under the NSW *Protection of the Environment Operations Act 1997* (POEO Act) through Environment Protection Licence (EPL) 443. EPL 443 was varied on 16 December 2015 to remove regular noise monitoring from the licence due to minimal activity at the Awaba Colliery Surface Site. The EPA however has added a condition that noise monitoring is to recommence a month before any mining or significant surface operation activities are undertaken on the premises.

4.1.1 Awaba Colliery Project Approval (10_0038)

Schedule 3 Condition 1 contains the current noise limits relevant to the Awaba Colliery site and is reproduced as follows:

1. The Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 1 at any residence on privately-owned land or on more than 25 percent of any privately-owned land.

Table 1: Noise criteria dB(A)

Location	Day	Evening	Night	
	LAeq(15min)	LAeq(15min)	LAeq(15min)	LA1(1min)
R4 – 1A Onley Street, Awaba	37	36	36	46
All other privately-owned residences	35	35	35	45

Schedule 3, Condition 2 contains detailed requirements of the Awaba Colliery Surface Site's noise management plan.

4.1.2 Newstan Colliery Project Approval (DA 73-11-98)

Condition 6.4D of the Newstan Colliery Project Approval DA 73-11-98) contains operational noise criteria for the Newstan ventilation shaft site at Awaba and is reproduced as follows:

6.4D Noise Control – Newstan Ventilation Shaft Site at Awaba

Operational Noise Criteria

The Applicant shall ensure that the noise generated at the Newstan ventilation shaft site at Awaba does not exceed the noise impact assessment criteria in Table 3A for any privately owned residence.

Table 3A: Noise impact assessment criteria dB(A)

Location	Day	Evening	Night
	L _{Aeq} (15minute)	L _{Aeq} (15minute)	L _{Aeq} (15minute)
All privately-owned residences	38	40	36

Notes:

- Noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary, to determine compliance with the L_{Aeq}(15 minute) noise limits in the above table. The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.
- Where it can be demonstrated that direct measurement of noise from the development is impractical, the OEH may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).
- The noise emission limits identified in the above table apply under meteorological conditions of:
 - wind speeds of up to 3 m/s at 10 metres above ground level; or
 - temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.
- In this condition:
 - Day is defined as the period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays;
 - Evening is defined as the period from 6pm to 10pm; and
 - Night is defined as the period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays.

4.2 Existing noise emissions

As previously stated, the Awaba Colliery has been in care and maintenance since August 2014. A review of noise compliance monitoring reports undertaken from February 2013 through to August 2014 was undertaken to gain an understanding of noise emissions from Awaba Colliery prior to it being placed onto care and maintenance.

Results of quarterly noise monitoring show that Awaba Colliery's noise emission levels were at or below (ie complied with) relevant noise limits in accordance with PA 10_0038 and EPL 443 throughout the entire review period.

5 Existing environment

5.1 Existing noise levels

A key element in assessing environmental noise impact from industry is to quantify the existing ambient acoustic environment. To establish the ambient noise levels in the area, both unattended and short-term operator-attended noise surveys were conducted at representative monitoring locations in general accordance with the procedures described in Australian Standard AS 1055-2018 - Acoustics - Description and Measurement of Environmental Noise. Monitoring results are provided in the following sections.

The locations of background and ambient noise monitoring used in this assessment are shown in Figure 2.2.

5.1.1 Unattended noise monitoring

Unattended noise monitoring was undertaken at two residential properties representative of those potentially most-affected by noise from proposed operation and construction of the project. The noise monitoring locations were selected after a desktop review and inspection of the area surrounding the Awaba Colliery Surface Site, giving due consideration to other noise sources which may influence the readings (eg domestic air conditioning units), the proximity of assessment locations to the site, security issues for the noise loggers and gaining permission to access properties from the residents or landowners. Two noise loggers were deployed as follows:

- L1 - Logger 1 (Acoustic Research Laboratories (ARL) Type EL-316 s/n 16207005) was placed at 2 Olney Road, Awaba and is representative of assessment locations R1 and R4; and
- L2 - Logger 2 (NGARA s/n 878113) was placed at 8 Wyong Street, Awaba and is representative of assessment locations R2 and R3.

The loggers were in place from 5–19 September 2019 (ie 14 consecutive days).

The noise loggers were programmed to record statistical noise level indices continuously in 15-minute intervals, including the L_{Amax} , L_{A1} , L_{A10} , L_{A50} , L_{A90} , L_{A99} , L_{Amin} and the L_{Aeq} . Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ± 0.5 dB. All equipment carried appropriate and current NATA calibration certificates.

Weather data for the survey period was obtained from Centennial Coal's on-site weather station located at the Awaba Colliery Surface Site. Wind speed and rainfall data were used to exclude noise data during periods when the average wind speed was in excess of 5 m/s and/or during rainfall events in accordance with NPfI methods.

A summary of existing RBLs and ambient L_{Aeq} noise levels is given in Table 5.1. Results are also provided graphically for each day in Appendix B.

Table 5.1 Summary of existing background and ambient noise levels

Monitoring location	Assessment period ¹	RBL ² (dB)	Measured $L_{Aeq,period}$ noise level ³ (dB)
L1 – 2 Olney Road, Awaba	Day	34	53
	Evening	32	50
	Night	30	49
L2 – 8 Wyong Street, Awaba	Day	35	54
	Evening	33	47
	Night	33	47

Notes: 1. Day: 7 am–6 pm Monday to Saturday; 8 am–6 pm Sundays and public holidays; Evening: 6 pm–10 pm; Morning shoulder: 6 am–7 am Monday to Saturday, 6 am–8 am Sundays and public holidays; Night: remaining periods.
 2. RBL is an NPfI term and is used to represent the background noise level.
 3. The energy averaged noise level over the measurement period and representative of general ambient noise.

5.1.2 Attended noise monitoring

EMM completed 15-minute attended noise measurements on 4 September 2019 at each logger location (L1 and L2) to identify noise sources contributing to the ambient noise environment.

Operator attended measurements were conducted using a Brüel & Kjær (B&K) 2250 integrating sound level meter (serial number 3008201) to both quantify and qualify the existing noise sources. Field calibration of the instrument was completed using a B&K 4230 calibrator. Attended measurements were undertaken in accordance with AS 1055-2018 'Description and Measurement of Environmental Noise'. Meteorological conditions throughout the survey period were relatively calm with no winds above 5 m/s and no rain.

A summary of results of the attended noise monitoring is provided in Table 5.2.

Table 5.2 Summary of attended noise measurements

Monitoring location	Date	Start time	Measured noise levels (15-minute), dB			Comments
			L_{A90}	L_{Aeq}	L_{Amax}	
L1	4/9/19	11:29	34	48	65	Bird noise consistent. Distant traffic frequently audible. Resident noise, industrial noise, wind in trees, car passbys, distant dogs barking and rail noise occasionally audible.
L2	4/9/19	12:11	36	49	65	Distant traffic and bird noise. Wind in trees frequently audible. Distant dogs barking and rail noise occasionally audible.

The ambient noise environment was found to be dominated by natural sounds such as bird noise, wind in trees and dogs barking, with local and distant road traffic as well as occasional rail noise.

5.2 Meteorology

Noise propagation over distance can be significantly affected by meteorological conditions. Of most interest are source-to-receiver winds, the presence of temperature inversions and drainage flow (katabatic winds), as these conditions can enhance received noise levels. To account for these phenomena, the NPfI specifies two options in regard to meteorological data analysis procedures to determine the presence of significant meteorological conditions, as follows:

1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night; or
2. Determine the significance of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30% determined in accordance with the NPfI provisions. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for the assessment.

5.2.1 Winds

The NPfI recommends consideration of wind effects if they are 'significant'. The NPfI defines 'significant' as the presence of source-to-receiver wind speed (measured at 10 m above ground level) of 3 m/s or less, occurring for 30% of the time in any assessment period and season.

This is further clarified by defining source-to-receiver wind direction as being the directional component of wind. The NPfI states that where wind is identified to be a significant feature of the area then assessment of noise impacts should consider the highest wind speed up to 3 m/s, which is considered to prevail for at least 30% of the time.

An analysis of the vector components of the five-minute wind data recorded by the on-site weather station located at the Awaba Colliery Surface Site was undertaken for 2018 (one calendar year). No winds were identified to trigger the NPfI 30% threshold in any direction.

5.2.2 Temperature inversions

The NPfI states that the assessment of noise impact with influence from temperature inversions (F or G stability class) be confined to the night-time assessment period when they typically occur.

The frequency of temperature inversions was determined based on sigma-theta data obtained from the on-site weather station located at the Awaba Colliery Surface Site. It was found that F stability class temperature inversions did occur for 30% or greater of the night period.

5.2.3 Drainage winds

The NPfI states that a default drainage wind value should be applied where noise sources at the development are at significantly higher altitude than the assessment location(s) and no intervening topography is present. All assessment locations are at a similar or higher elevation than the Awaba Colliery Surface Site and therefore drainage winds were found not to be relevant to this assessment.

5.2.4 Modelled meteorological conditions

F stability class temperature inversions were identified as being prevailing in the vicinity of the Awaba Colliery Surface Site; however, winds were not. Notwithstanding the preceding, a conservative approach has been adopted for the purpose of predicting noise emissions. This assessment has adopted standard and noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes, in accordance with the NPfI (option 1 approach). Noise levels from the Awaba Colliery Surface Site have been predicted at all assessment locations based on the meteorological parameters shown in Table 5.3.

Table 5.3 Meteorological parameters adopted for the noise modelling

Assessment period ¹	Meteorological condition	Air temperature	Relative humidity	Wind speed	Wind direction	Stability category
Day	Standard	20 C	70%	0.5 m/s	Nil	D class
	Noise enhancing - Wind	20 C	70%	3 m/s	All	D class
Evening	Standard	10 C	90%	0.5 m/s	Nil	D class
	Noise enhancing - Wind	10 C	90%	3 m/s	All	D class
Night	Standard	10 C	90%	0.5 m/s	Nil	D class
	Noise enhancing - Wind	10 C	90%	3 m/s	All	D class
	Noise enhancing - Temperature inversion	10 C	90%	2 m/s	All	F class

Notes: 1. Day: 7 am–6 pm Monday to Saturday; 8 am–6 pm Sundays and public holidays; Evening: 6 pm–10 pm; Night: remaining periods.

6 Operational noise criteria

6.1 Project noise trigger levels

6.1.1 Intrusiveness

The intrusiveness criteria require that $L_{Aeq,15\text{ minute}}$ noise levels from industrial sites during the relevant operational periods (ie day, evening and night) do not exceed the relevant RBL by more than 5 dB.

Results of the unattended noise monitoring, as outlined in Section 5.1.1, indicate RBLs ranging from 30 dB to 35 dB in Awaba village (refer Figure 2.2). Results of ambient noise monitoring have been used to establish relevant intrusive noise goals.

6.1.2 Amenity

Assessment locations within Awaba village have been categorised in the rural amenity category in accordance with the NPfI definition of a rural receiver type (ie an area with an acoustical environment that is dominated by natural sounds and generally characterised by low background noise levels).

Due to the potential for other industrial developments to contribute to noise emissions in the area, the project amenity noise level for the subject development is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB.

6.1.3 Summary

The PNTLs determined for the project are summarised in Table 6.1.

Table 6.1 Project noise trigger levels

Receptor	Type	Period ¹	Adopted RBL (dB)	Project intrusive noise level, $L_{Aeq,15\text{ minute}}$ (dB)	Project amenity noise level ² , $L_{Aeq,15\text{ minute}}$ (dB)	Project noise trigger level, $L_{Aeq,15\text{ minute}}$ (dB)
R1, R4	Residential – rural	Day	35	40	48	40
		Evening	32	37	43	37
		Night	30	35	38	35
R2, R3	Residential – rural	Day	35	40	48	40
		Evening	33	38	43	38
		Night	33	38	38	38

1. Day: 7 am–6 pm Monday to Saturday; 8 am–6 pm Sundays and public holidays; Evening: 6 pm–10 pm; Night: 10 pm–7 am.

2. The project amenity noise level has been determined from the recommended amenity minus 5 dB and has also been adjusted by 3 dB, as per the NPfI, to convert from $L_{Aeq,period}$ to $L_{Aeq,15\text{ minute}}$.

6.2 VLAMP

If required, residual noise impacts associated with the project will be characterised in accordance with VLAMP as outlined in Section 3.3 to determine the relevance of voluntary land acquisition and mitigation rights, if any.

6.3 Sleep disturbance

Table 6.2 provides the noise level event screening criteria for the residential assessment locations.

Table 6.2 Sleep disturbance screening criteria at residences

Assessment location	Adopted night RBL, dB	Night-time noise level event screening criteria, dB	
		$L_{Aeq,15\text{ minute}}$	L_{Amax}
R1, R4	30	40	52
R2, R3	33	40	52

7 Construction noise assessment

7.1 Construction noise criteria

The construction NMLs for residential assessment locations have been based on the RBLs provided in Table 5.1. Proposed construction activity will occur during standard construction hours as per the ICNG. The NMLs for standard construction hours adopted for this assessment were derived in accordance with the ICNG for all assessment locations and are presented in Table 7.1.

Table 7.1 Construction NMLs for ICNG standard hours

Assessment location	Representative logging location	RBL, dB(A)	NML, $L_{Aeq,15 \text{ minute}}$, dB
R1, R4 – Rural Residential	L1	35	45
R2, R3 – Rural Residential	L2	35	45

7.2 Proposed construction activity

Proposed construction activities that have been modelled at the Awaba Colliery Surface Site include:

- the installation of three new ventilation fans at the site of the existing approved ventilation shaft;
- the construction of a gas flaring facility within the existing disturbance footprint of the Awaba Colliery Surface Site;
- the drilling of service and gas boreholes into the workings for the supply of bulk materials, gas drainage, infrastructure, electricity, compressed air and water; and
- the construction of a new sediment control dam adjacent to the proposed gas flaring facility.

Proposed activities associated with construction of the ventilation fans, methane gas flares and associated infrastructure at the Awaba Colliery Surface Site are summarised in Table 7.2 together with the sound power level of acoustically significant plant and equipment associated with each construction area. Sound power level data has been obtained from an EMM database of similar equipment. Adopted locations of construction plant and equipment at the Awaba Colliery Surface Site are provided in Appendix C.

Exploration activities will be undertaken within the Newstan Colliery mining lease and exploration licence areas at various times throughout the life of the project. These activities will be undertaken in accordance with the requirements of the ICNG (DECC 2009) and have not been considered further in this assessment.

Table 7.2 Proposed construction activity

Construction area	Equipment	Quantity	Sound power level (dB)
Service borehole area	Mobile drill rig	1	114
	Water truck	1	105
	Generator	1	99
	Pump	1	89
	Area total	-	114
Gas borehole area	Mobile drill rig	1	114
	Water truck	1	105
	Generator	1	99
	Pump	1	89
	Area total	-	114
Ventilation fan area	Generator	1	99
	Mobile crane	1	99
	Telehandler	1	99
	Franna crane	1	99
	Road haul truck	1	103
	Power tools	1	97
	Area total	-	108
Methane flare area	Generator	1	99
	Mobile crane	1	99
	Telehandler	1	99
	Franna crane	1	99
	Road haul truck	1	103
	Power tools	1	97
	Area total	-	108
Sediment dam area	Road haul truck	1	103
	Excavator	1	105
	Area total	-	107

7.3 Construction noise assessment

Predicted noise levels for construction activities at the Awaba Colliery Surface Site are presented in Table 7.3 for all assessment locations during ICNG standard construction hours. These predictions conservatively assume that the worst-case construction activity for each construction area at the Awaba Colliery Surface Site is occurring concurrently. Standard and noise-enhancing weather conditions have been considered as per Section 5.2.

Table 7.3 Predicted construction noise levels

Assessment locations	Period	Predicted $L_{Aeq,15 \text{ minute}}$ noise level (dB)		NML $L_{Aeq,15 \text{ minute}}$ (dB)
		Standard	Noise-enhancing	
R1	Day	<35	36	45
R2	Day	42	45	45
R3	Day	43	45	45
R4	Day	40	43	45

Construction noise emissions are predicted to satisfy the relevant NMLs at all assessment locations under both standard and noise-enhancing meteorological conditions.

8 Operational noise assessment

8.1 Noise modelling methodology and assumptions

This section presents the methods and assumptions used to model noise emissions from the proposed operations at the Awaba Colliery Surface Site including the effects of noise-enhancing meteorological conditions.

Noise predictions were carried out using the iNoise noise modelling software. 'iNoise' calculates total noise levels at assessment locations from concurrent operation of multiple noise sources. The model considers factors such as the lateral and vertical location of plant, source-to-receptor distances, ground effects, atmospheric absorption, topography of the site and surrounding area and applicable meteorological conditions.

Proposed operations that have been modelled at the Awaba Colliery Surface Site include:

- use of three new ventilation fans at the existing ventilation shaft;
- in-seam gas drainage; and
- a new gas flaring facility to be located within the existing disturbance footprint.

Acoustically significant fixed and mobile equipment items considered in the noise model are provided for expected day, evening and night operations in Table 8.1. Indicative locations for the plant and equipment listed in Table 8.1 are shown in Appendix D. Equipment sound power levels have been adopted from those provided in the previous *Northern Coal Logistics Project - Noise and Vibration Impact Assessment* prepared by SLR (2014) or the *Mandalong Mine Access Methane Flare Noise Impact Assessment* prepared by Heggies Australia (2006) which were based on measurements undertaken at the respective sites.

Since Awaba Colliery is currently in care and maintenance it was not possible to validate the adopted sound power levels or the relevance (or not) of modifying factors to account for annoying noise characteristics. Centennial Newstan has made a commitment to validate sound power levels of on-site plant and equipment and off-site noise emissions, once construction activities have been completed and the site is operational.

Table 8.1 Acoustically significant plant and equipment for noise modelling

Item (location)	Sound power level per item (dBA)	Operating during this period		
		Day	Evening	Night
Awaba Colliery Surface Site				
Ventilation fan (x3)	107	✓	✓	✓
Pumps (x3)	95	✓	✓	✓
Methane flare	96	✓	✓	✓

The operational noise model considered a representative snapshot of surface operations with equipment placed at locations representing a realistic operational scenario. Adopted locations of operational plant and equipment at the Awaba Colliery Surface Site are provided in Appendix D.

Standard and noise-enhancing meteorological conditions have been considered in the noise model as per the requirements of the NPfI. Meteorological parameters assumed for the purpose of noise modelling are provided in Table 5.3.

8.2 Operational noise assessment

Predicted noise levels for operation of the project (namely operation of additional equipment at the Awaba Colliery Surface Site including the ventilation fans) are presented in Table 8.2 for all assessment locations. Standard and noise-enhancing weather conditions have been considered as per Section 5.2 and the highest predicted noise level is presented for each period.

Table 8.2 Predicted operational noise levels

Assessment locations	Period	Predicted $L_{Aeq,15 \text{ minute}}$ noise level (dB)		PNTL $L_{Aeq,15 \text{ minute}}$ (dB)
		Standard	Noise-enhancing	
R1	Day	<40	<40	40
	Evening	<35	<35	37
	Night	<35	<35	35
R2	Day	<40	<40	40
	Evening	<35	36	38
	Night	<35	36	38
R3	Day	<40	<40	40
	Evening	<35	37	38
	Night	<35	37	38
R4	Day	<40	<40	40
	Evening	<35	37	37
	Night	<35	37	35

Operational noise emissions are predicted to satisfy the PNTLs at all assessment locations during standard weather conditions. During noise-enhancing weather conditions, a negligible exceedance of the PNTLs (up to 2 dB) is predicted during the night-time period at assessment location R4.

The NPfI defines a 'negligible' exceedance as a predicted noise level which is 2 dB above the designated PNTL. Negligible exceedances are generally not discernible by the average listener and therefore do not warrant receiver-based treatments or controls (refer Table 3.3). Given that this exceedance is considered to be 'negligible', there is no requirement to consider VLAMP or additional noise mitigation measures. Notwithstanding, Centennial Newstan will undertake noise measurements at the Awaba Colliery Surface Site when it becomes operational for the purpose of validating the predicted operational noise levels presented in this assessment.

8.3 Sleep disturbance

Typical maximum noise level events at the Awaba Colliery Surface Site would include continual ventilation fan noise or methane flaring. These events represent the likely highest maximum noise level events from the Awaba Colliery Surface Site. It is noted that these sources may operate at any time, including the night-time period. Operation of these sources produces a relatively steady-state noise and, as such, maximum noise events are unlikely to occur, and otherwise would not be dissimilar to predicted average operational L_{Aeq} noise levels. On this basis, and the fact that predicted operational noise levels are significantly below the noise criteria, sleep disturbance impacts are also unlikely to occur. Hence, as per the NPfI requirements, a detailed maximum noise level event assessment is not required.

8.4 Noise mitigation, management and monitoring

Noise emissions from the project will continue to be managed in accordance with the existing *Noise Management Plan - Northern Region* (NMP). The NMP will be updated to incorporate the Awaba Colliery and proposed operations should the Project be approved. The updated NMP will detail the monitoring program to be implemented to ensure compliance with the relevant noise criteria.

In addition, Centennial Newstan will undertake a noise monitoring program to validate the assumptions made in this assessment including the sound power level of on-site plant and equipment and off-site noise emissions.

9 Road traffic noise assessment

9.1 Overview

Proposed road traffic volumes and routes associated with construction and operation of the project are described in the *Traffic Impact Assessment* prepared by EMM (2019) for the Newstan Mine Extension Project.

The Federal Highway Traffic Noise Model (FHWA) (US Department of Transportation) method was used to predict road traffic noise levels along routes associated with the project. Relative to other algorithms, the FHWA method provides more representative predictions for relatively low traffic volumes (ie less than 200 movements per hour). This prediction method considers traffic flow volume, average speed, percentage of heavy vehicles and road gradient to establish noise source strength, and includes attenuation due to distance, ground absorption and screening from buildings or barriers.

9.2 Construction road traffic

Construction-related traffic will primarily be to and from the Awaba Colliery Surface Site along Wilton Road via either Wangi Road, Cessnock Road or Awaba Road (refer Figure 2.2). The total construction period is expected to be 11 months.

The predicted daily construction traffic generation for the project is provided in Table 9.1.

Table 9.1 Project-related daily construction traffic – worst case construction period

Activity	Light vehicles (LV)	Heavy vehicles (HV)	LV/HV movements
Awaba Colliery Surface Site construction activities	50	5	100/10
Total	50	5	100/10

The proposed construction traffic routes and distribution of light vehicles are described as follows:

- 20% via Wilton Road and Wangi Road (north);
- 30% via Wilton Road and Wangi Road (south);
- 30% via Wilton Road and Awaba Road; and
- 20% via Wilton Road and Cessnock Road.

Heavy vehicles will access the Awaba Colliery Surface Site via Wilton Road and Wangi Road (ie the southern approach) to avoid the Awaba township. There are no directly affected residential assessment locations along this heavy vehicle route.

The nearest potentially affected residential façade locations on Wilton Road are situated approximately 15 m from the road kerb/edge. Existing daily traffic on Wilton Road is estimated at between 2,415 and 2,590 light vehicle movements (EMM 2019).

During construction, the workforce is expected to arrive at the Awaba Colliery Surface Site between 6:00 am and 7:00 am (ie during the NPfI defined night-time period) and depart between 3:00 pm and 4:00 pm. As such, it is assumed that the construction traffic movements will be split evenly between the daytime and night-time periods.

Based on the above traffic volumes, the predicted road traffic noise levels at the nearest potentially affected residence on Wilton Road are provided in Table 9.2.

Table 9.2 Road traffic noise results

Road	Receiver type (distance from road)	Existing noise levels, dB		Future ¹ noise levels, dB		Criteria, dB		Increase between existing and future, dB	
		Day ²	Night ²	Day	Night	Day	Night	Day	Night
		L _{Aeq,15 hour}	L _{Aeq,9 hour}	L _{Aeq,15 hour}	L _{Aeq,9 hour}	L _{Aeq,15 hour}	L _{Aeq,9 hour}		
Wilton Road	Residence (15 m)	62.5	56.7	62.5	56.8	60	55	+0.0	+0.1

Notes: 1. Levels inclusive of the predicted project-related construction traffic.
2. Day and night traffic noise levels have been predicted based on the assumption that 90% of total daily traffic movements occur during the day period and 10% during the night-time period.

Road traffic noise level predictions demonstrate a 0.1 dB increase between ‘existing’ and ‘existing + proposed’ L_{Aeq,period} noise levels for night-time construction traffic (ie early morning arrivals between 6:00 am and 7:00 am).

There was no predicted increase in daytime traffic noise levels. Predictions also demonstrate that existing traffic noise levels on Wilton Road are already above RNP criteria for both daytime and night-time periods.

The RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB. Road traffic noise levels from the project’s construction activities therefore satisfy RNP criteria.

9.3 Operation

Operational road traffic volumes associated with the Awaba Colliery Surface Site are not proposed to increase as a result of the project and therefore have not been considered as part of this assessment.

The NVIA prepared by SLR (2014) as part of the Northern Coal Logistics Project (SSD-5145), assessed road traffic volumes and routes associated with construction and operation of the Newstan Colliery Surface Site. Overall, employee numbers and subsequent traffic volumes are to remain below levels already approved under SSD-5145 for the Northern Coal Logistics Project. As such, road traffic noise for the Newstan Colliery Surface Site has not been assessed as part of this assessment.

10 Conclusion

EMM has prepared this NVIA to accompany the Newstan Mine Extension Project EIS. A quantitative assessment of noise emissions associated with operation, construction and off-site traffic has been undertaken.

The NVIA prepared by SLR (2014) as part of the Northern Coal Logistics Project assessed noise emissions from relevant infrastructure at the Newstan Colliery Surface Site. As no new acoustically significant infrastructure is proposed for the Newstan Colliery Surface Site as part of the project, only the Awaba Colliery Surface Site has been assessed with respect to potential noise impacts.

Operational noise emissions from the project are predicted comply with the PNTLs and the noise limits in PA 10_0038 at all assessment locations during standard weather conditions. During noise-enhancing weather conditions, a negligible exceedance of the PNTLs is predicted during the night-time period at assessment location R4. Given that this exceedance is considered to be 'negligible', there is no requirement to consider VLAMP or additional noise mitigation measures.

Maximum noise levels from the project are predicted to be below the sleep disturbance screening criteria. Hence, as per the NPfl requirements, a detailed maximum noise level event assessment was not required, as sleep disturbance is unlikely.

Notwithstanding the preceding, since Awaba Colliery is currently in care and maintenance, it was not possible to validate the adopted sound power levels or the relevance of modifying factors to account for annoying noise characteristics. Centennial Newstan will undertake noise measurements to validate sound power levels of on-site plant and equipment and off-site noise emissions once the Awaba Colliery Surface Site is operational.

Noise emissions from the project will continue to be managed in accordance with the existing NMP. The NMP will be updated to incorporate the Awaba Colliery and proposed operations should the Project be approved.

Construction noise levels were assessed for ICNG standard hours (daytime period) for standard and noise-enhancing meteorological conditions. Predictions satisfied the relevant NMLs at all assessment locations and hence proposed construction activities at the Awaba Colliery Surface Site are unlikely to cause noise impacts at any sensitive receivers.

Off-site road traffic noise levels are predicted to satisfy the relevant noise limits at the most-affected residential locations for both construction and operational project-related traffic.

References

Australian Standard AS 1055-2018 Acoustics - Description and Measurement of Environmental Noise.

Australian Standard AS 2436-2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites.

EMM 2019, *Newstan Mine Extension Project – Traffic Impact Assessment*, report prepared by EMM for Centennial Newstan.

Heggies Australia 2006, *Mandalong Mine Access Methane Flare Noise Impact Assessment*, report prepared by Heggies Australia for Centennial Mandalong.

NSW Department of Environment and Climate Change (DECC) 2009, *Interim Construction Noise Guideline*.

NSW Department of Environment and Conservation (DEC) 2006, *Assessing Vibration: A Technical Guideline*.

NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy*.

NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry*.

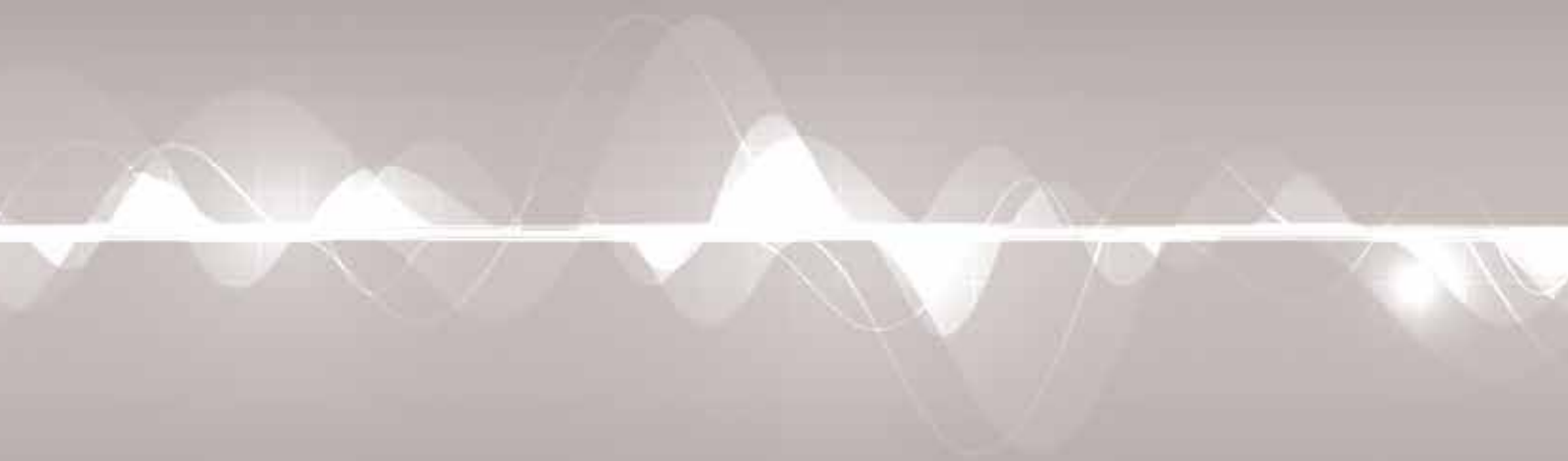
NSW Environmental Protection Authority (EPA) 2009, *Interim Construction Noise Guideline*.

NSW Government 2015, *Voluntary Land Acquisition and Mitigation Policy*.

SLR Consulting 2014, *Northern Coal Logistics Project - Noise and Vibration Impact Assessment*, report prepared by SLR Consulting for Centennial Newstan.

Appendix A

Glossary of acoustic termss



A number of technical terms are required for the discussion of noise. These are explained in Table A.1.

Table A.1 **Glossary of acoustic terms**

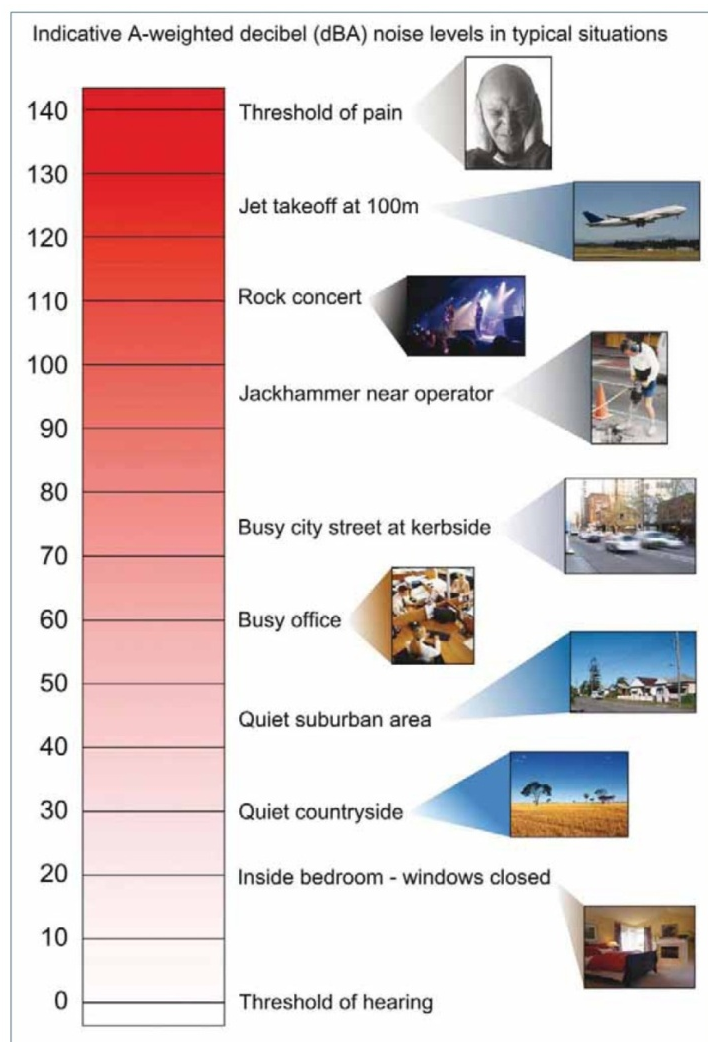
Term	Description
dB	Noise is measured in a unit called decibel (dB).
A-weighting	There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
L _{A1}	The A-weighted noise level exceeded for 1% of a measurement period.
L _{A10}	The A-weighted noise level which is exceeded 10% of the time. It is approximately equivalent to the average of maximum noise levels.
L _{A90}	Commonly referred to as the background noise, this is the A-weighted level exceeded 90% of the time.
L _{Aeq}	The A-weighted energy average noise from a source and is the equivalent continuous sound pressure level over a given period. The L _{Aeq,15 minute} descriptor refers to an L _{Aeq} noise level measured over a 15-minute period.
L _{Amax}	The maximum root mean squared A-weighted sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period.
Sound power level	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.

For discussion of noise impacts, it is also useful to have an appreciation of decibel, the unit of noise measurement. Table A.2 gives an indication as to what an average person perceives about changes in noise levels.

Table A.2 **Perceived change in noise**

Change in sound pressure level (dB)	Perceived change in noise
1 to 2	typically indiscernible
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times (or quarter) as loud

Examples of common noise levels are provided in Figure A.1.



Source: RNP (DECCW 2011).

Figure A.1 **Common noise levels**

Appendix B

Unattended noise monitoring results and charts

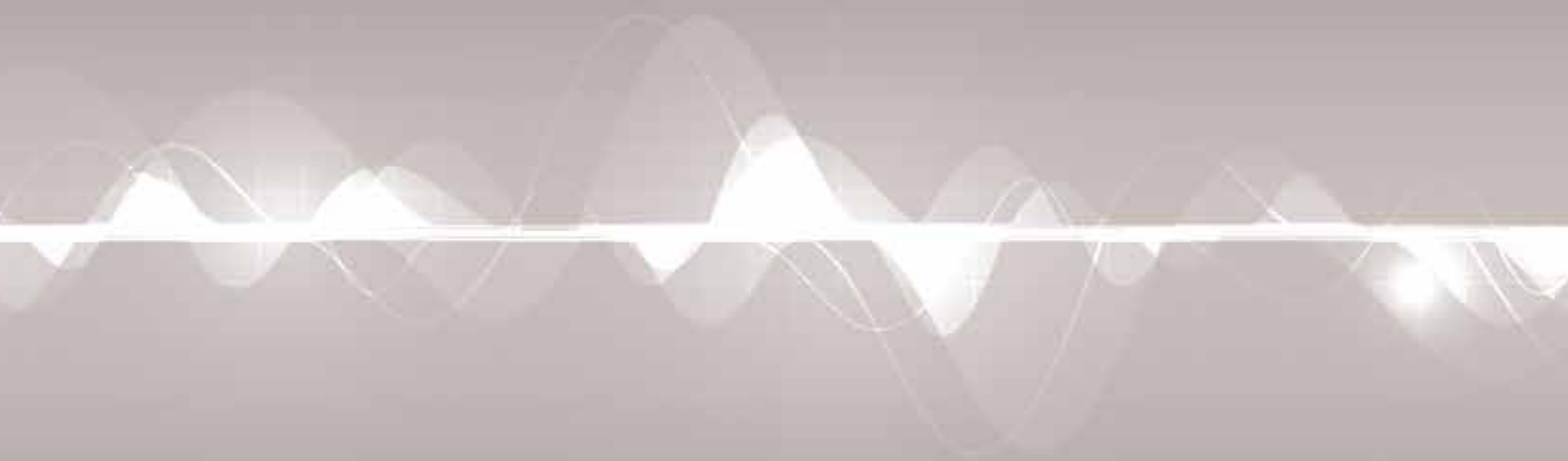
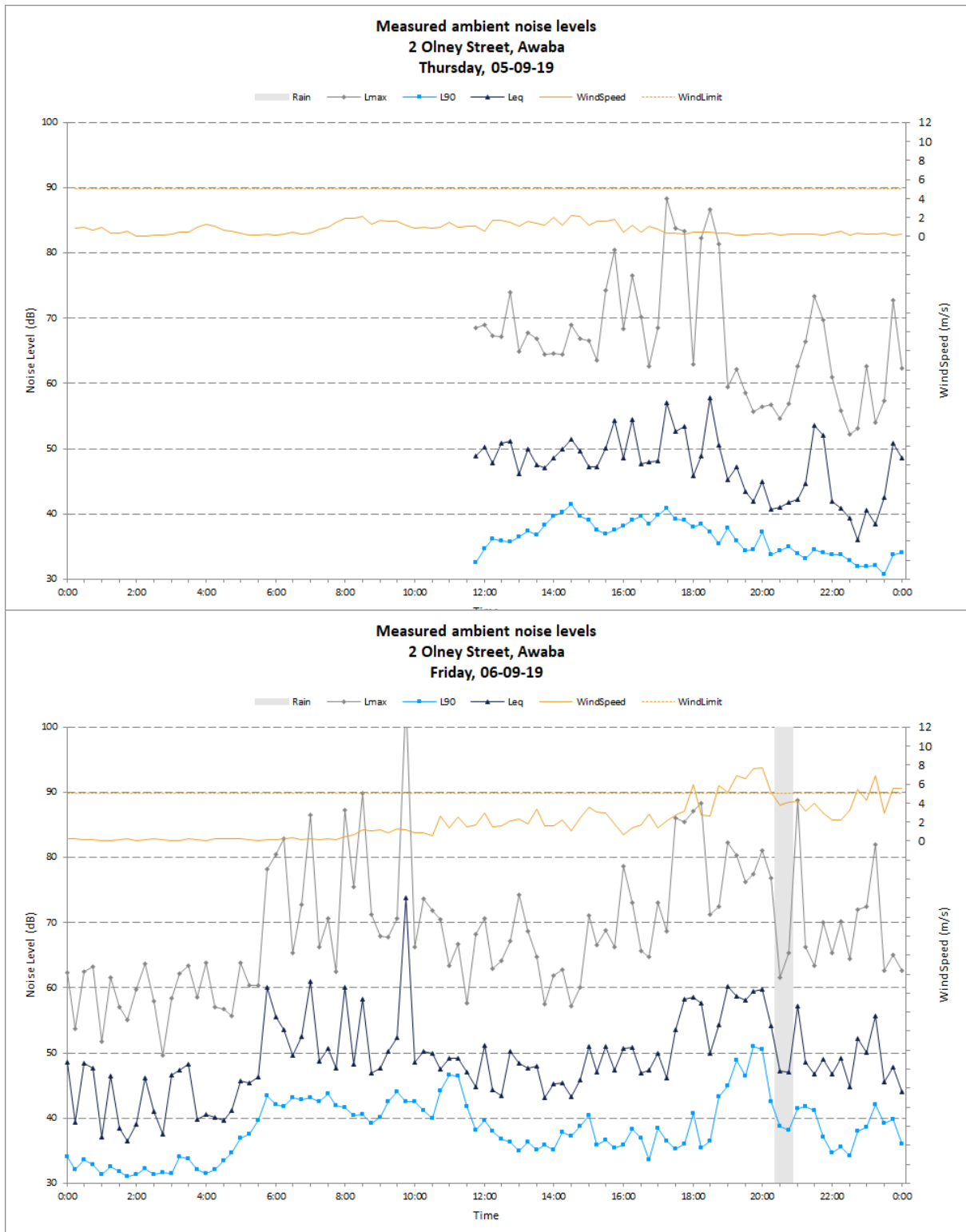
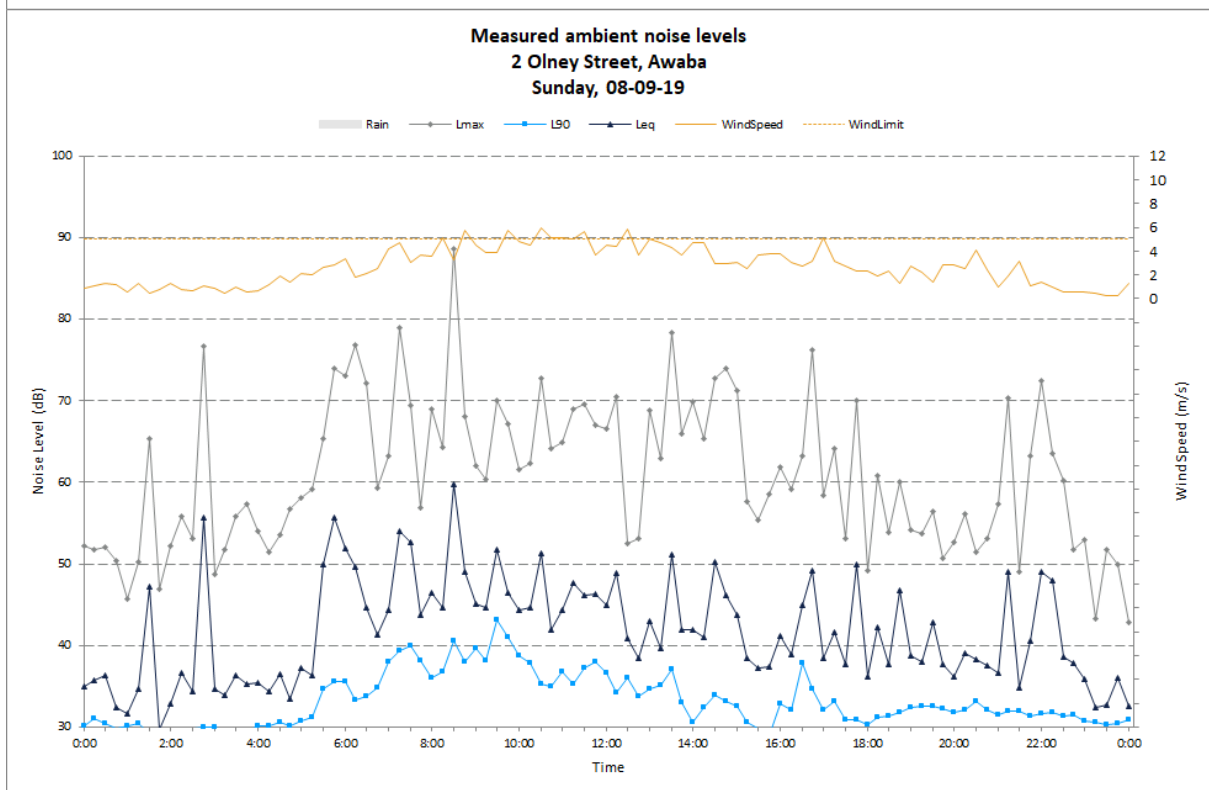
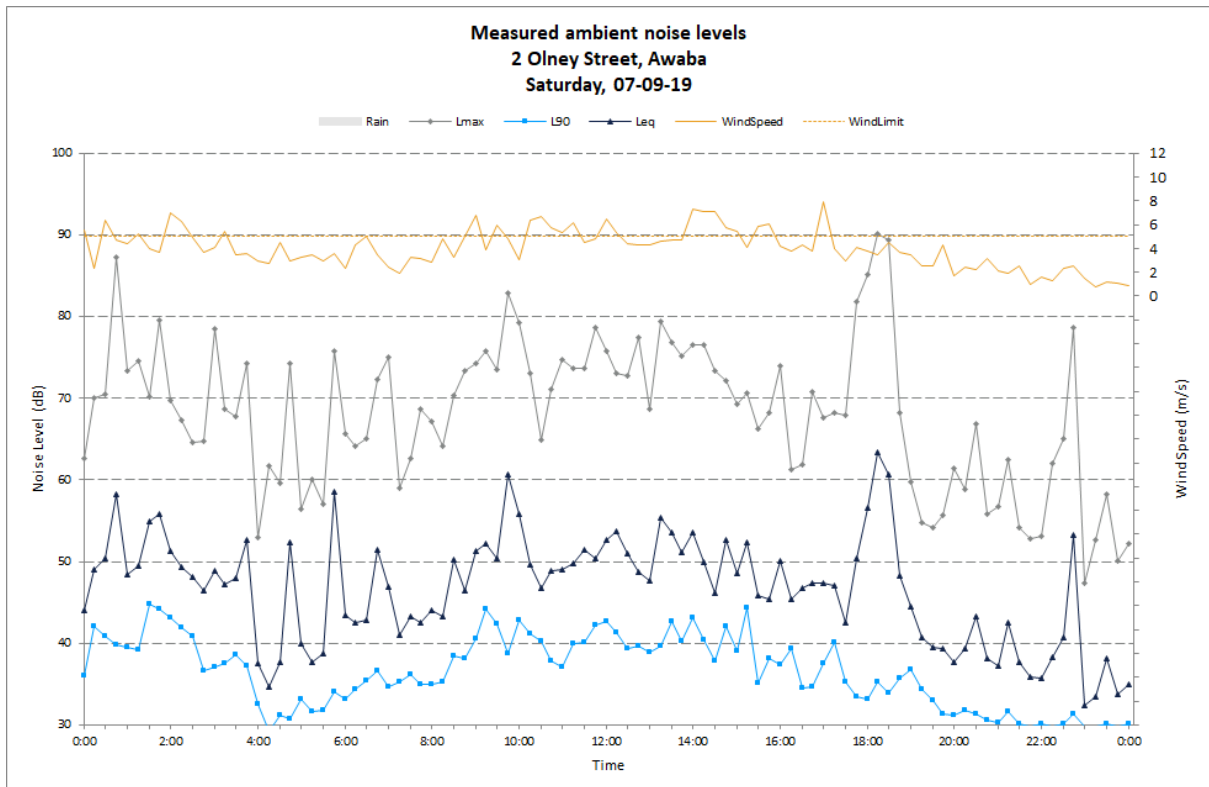


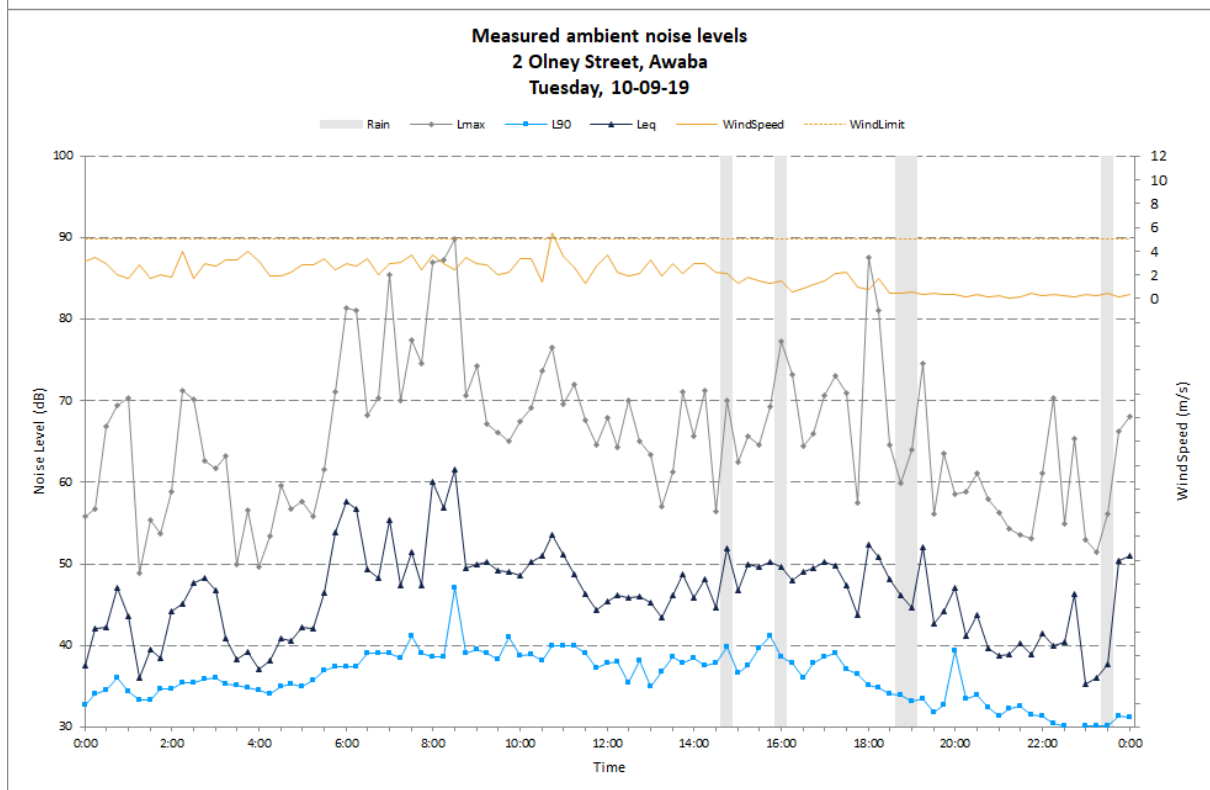
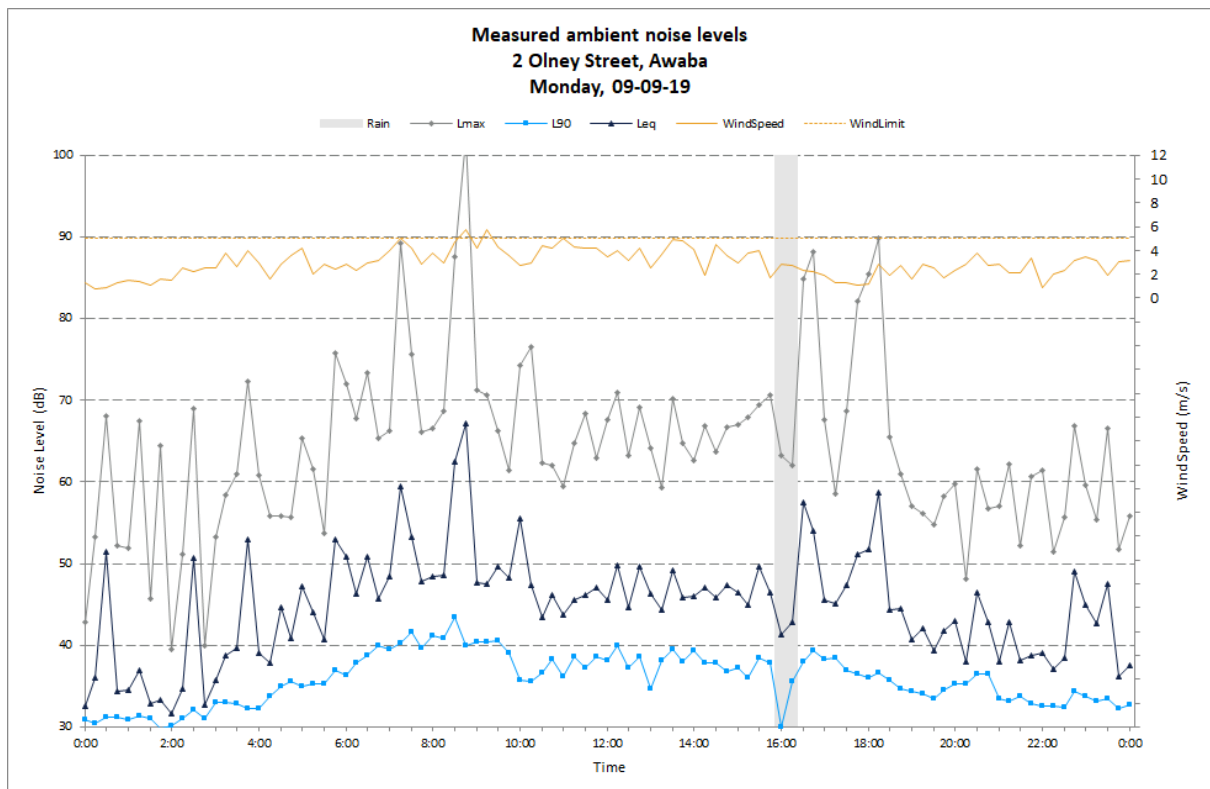
Table B.1 **Summary of daily noise logging results – L1**

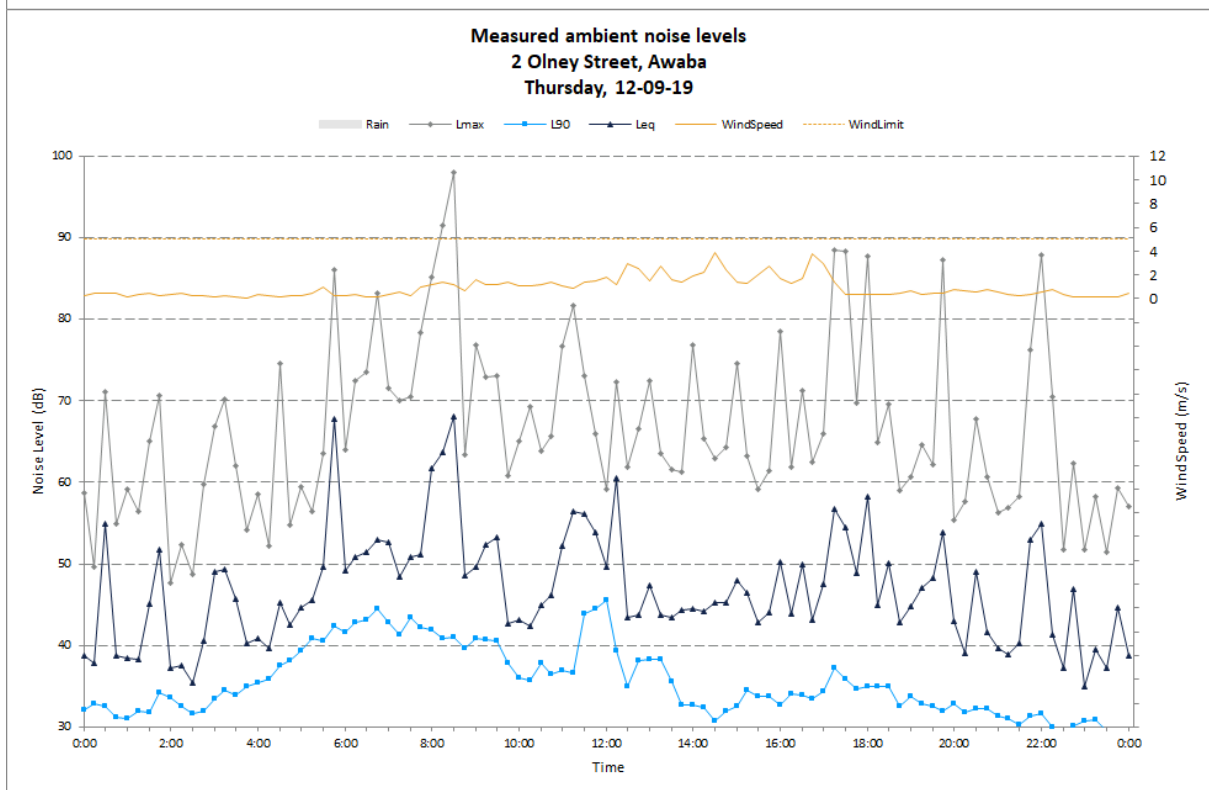
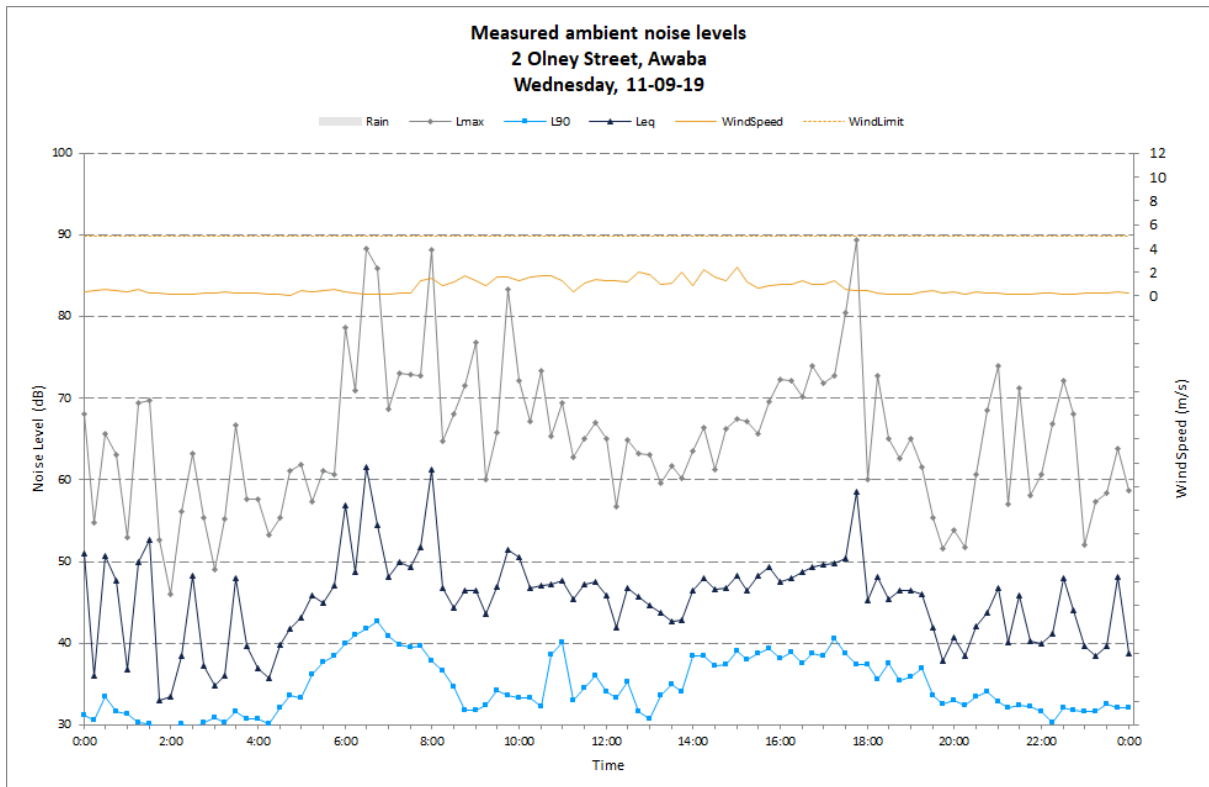
Date	RBL (Day)	RBL (Evening)	RBL (Night)	L _{Aeq,15 hour} , dB (Day)	L _{Aeq,4 hour} , dB (Evening)	L _{Aeq,9 hour} , dB (Night)
Wednesday, 05-09-18	0	34	31	0	50	50
Thursday, 06-09-18	35	36	32	58	57	51
Friday, 07-09-18	35	30	30	51	54	46
Saturday, 08-09-18	31	31	31	48	43	46
Sunday, 09-09-18	36	33	33	54	48	48
Monday, 10-09-18	37	31	30	52	46	50
Tuesday, 11-09-18	32	32	32	50	44	53
Wednesday, 12-09-18	33	31	28	56	49	47
Thursday, 13-09-18	34	33	27	54	48	48
Friday, 14-09-18	33	30	26	50	50	43
Saturday, 15-09-18	31	32	23	47	46	51
Sunday, 16-09-18	34	30	0	49	56	0
Monday, 17-09-18	0	0	0	0	0	0
Tuesday, 18-09-18	0	32	0	0	49	0
Wednesday, 19-09-18	0	0	0	0	0	0
Overall	34	32	30	53	51	49

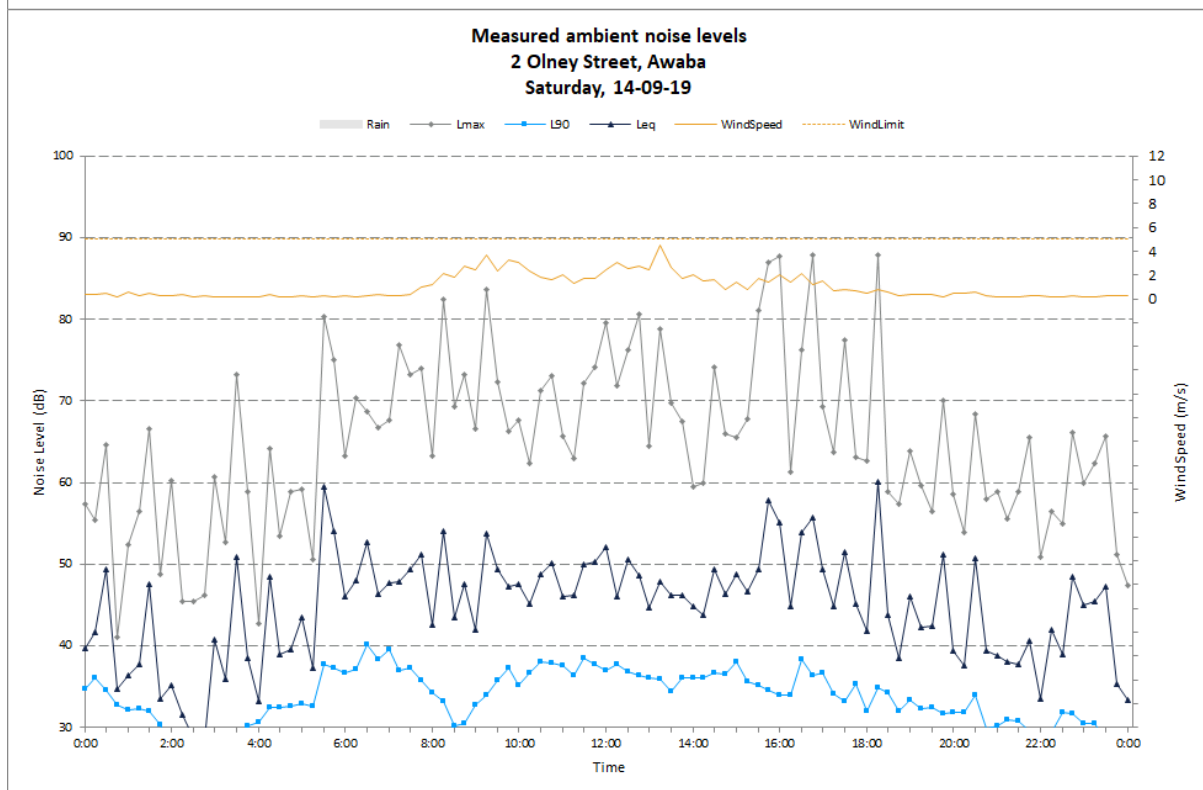
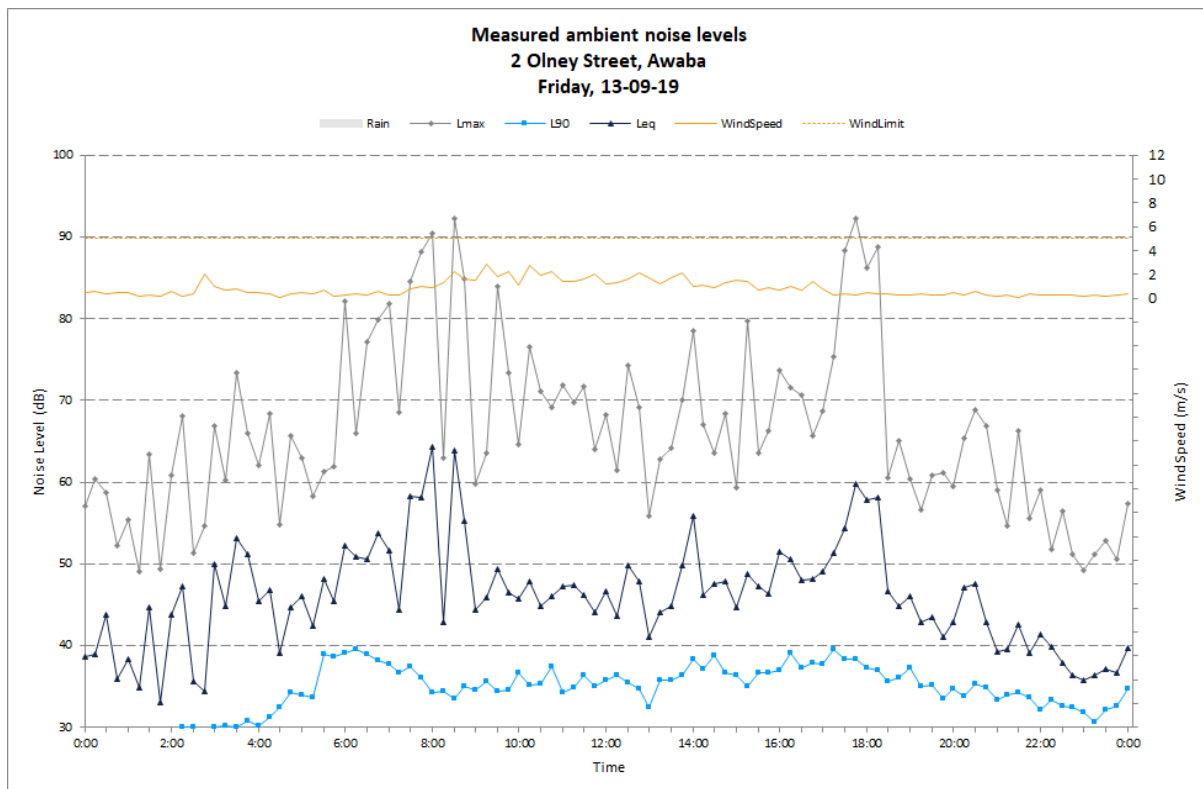
Notes: “0” indicates periods with too few valid samples due to weather or logger operation

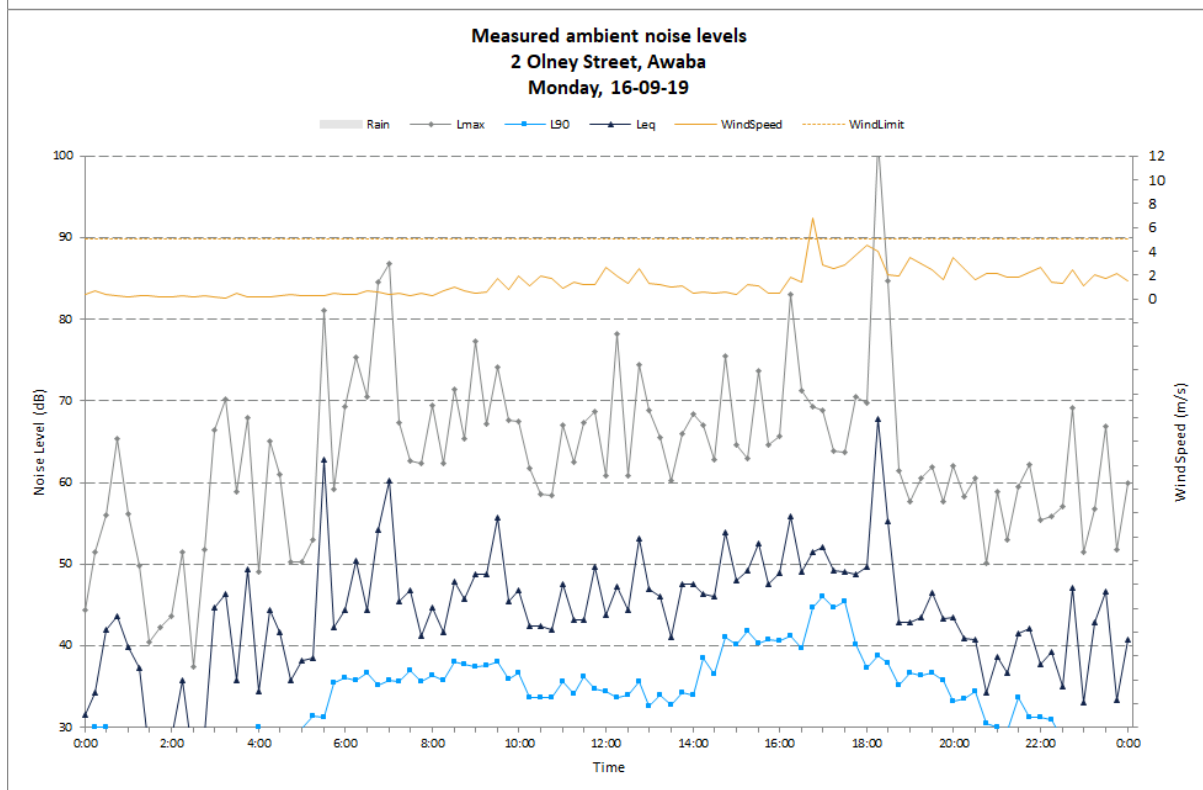
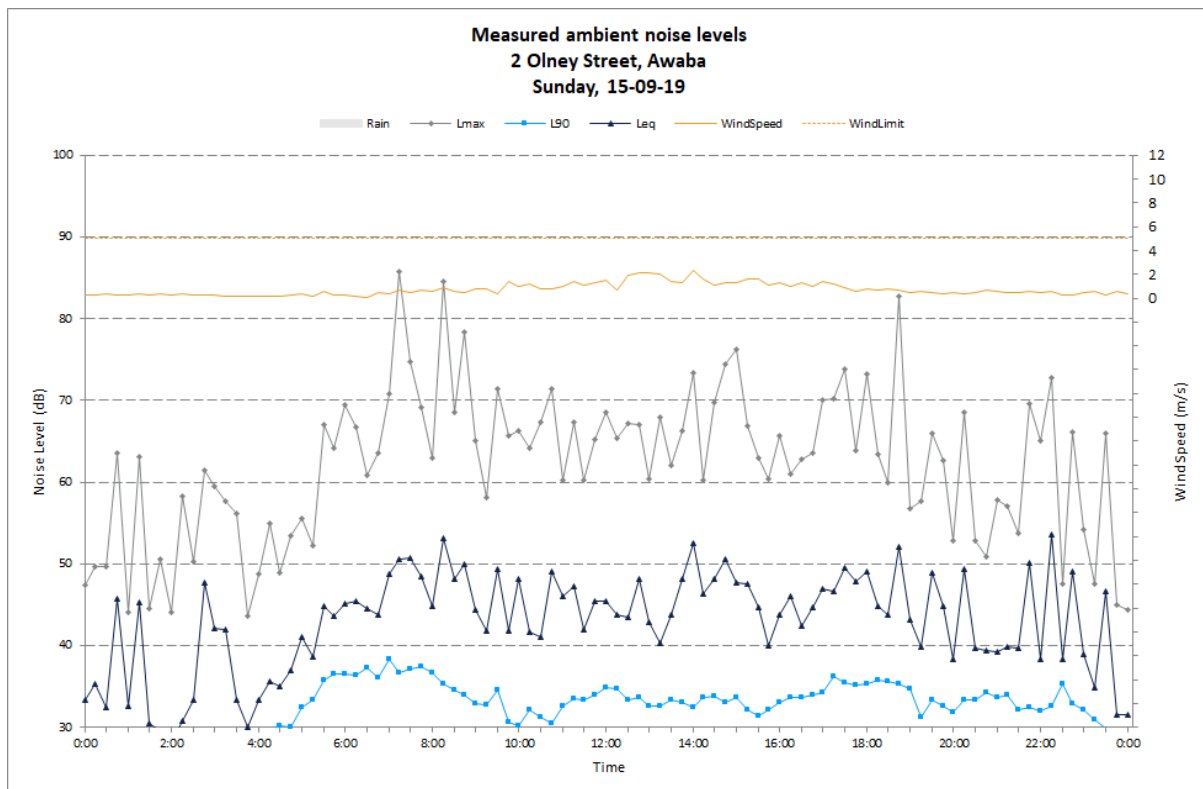


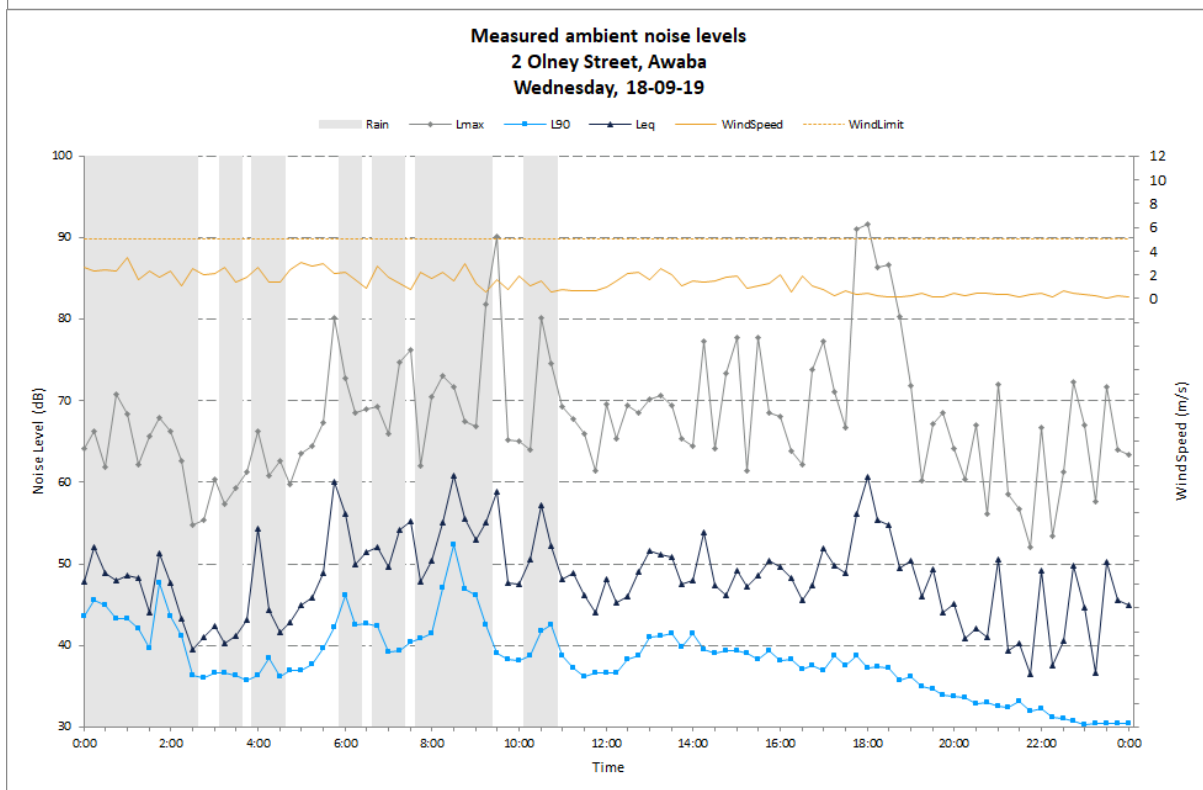
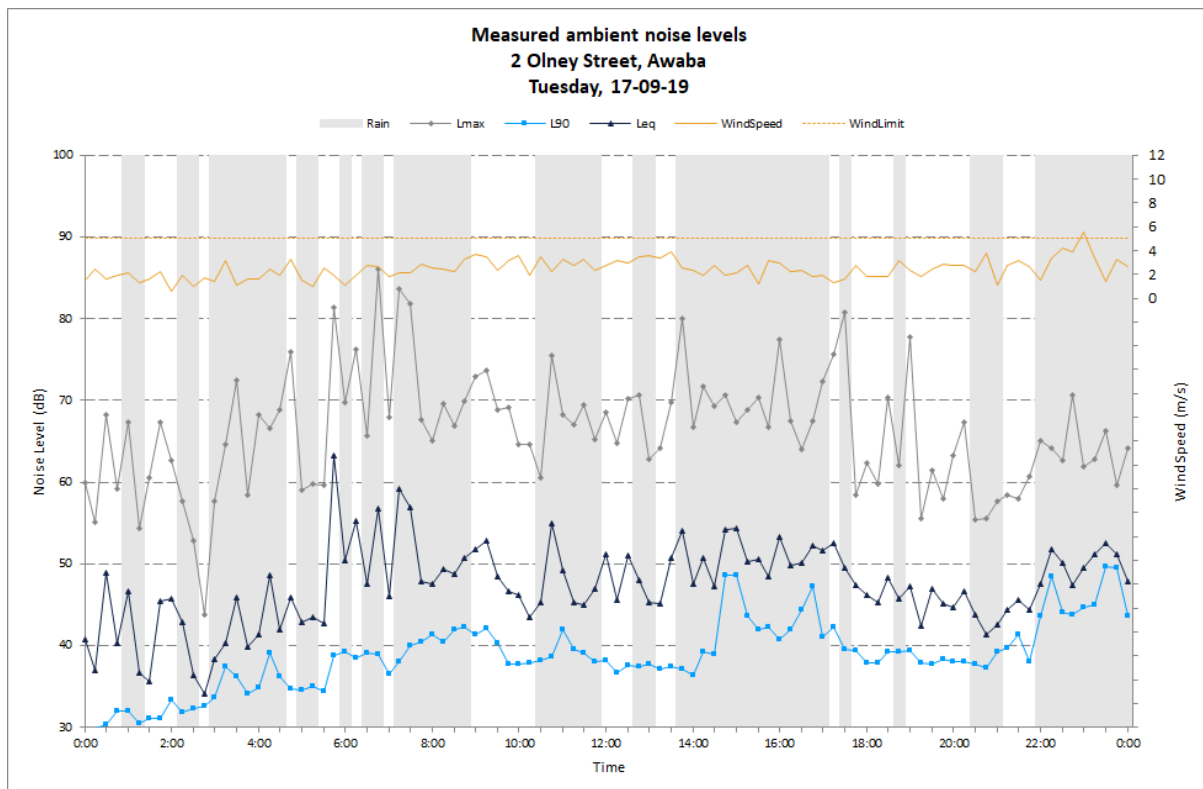












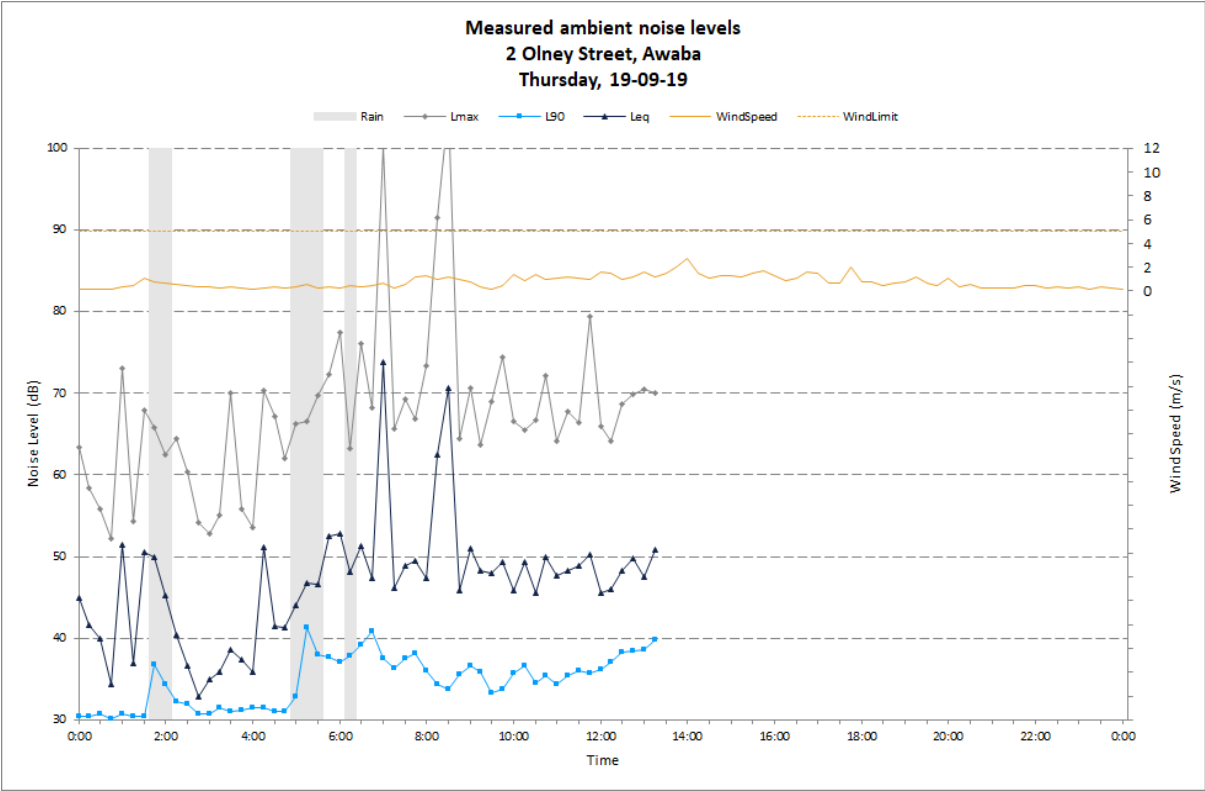
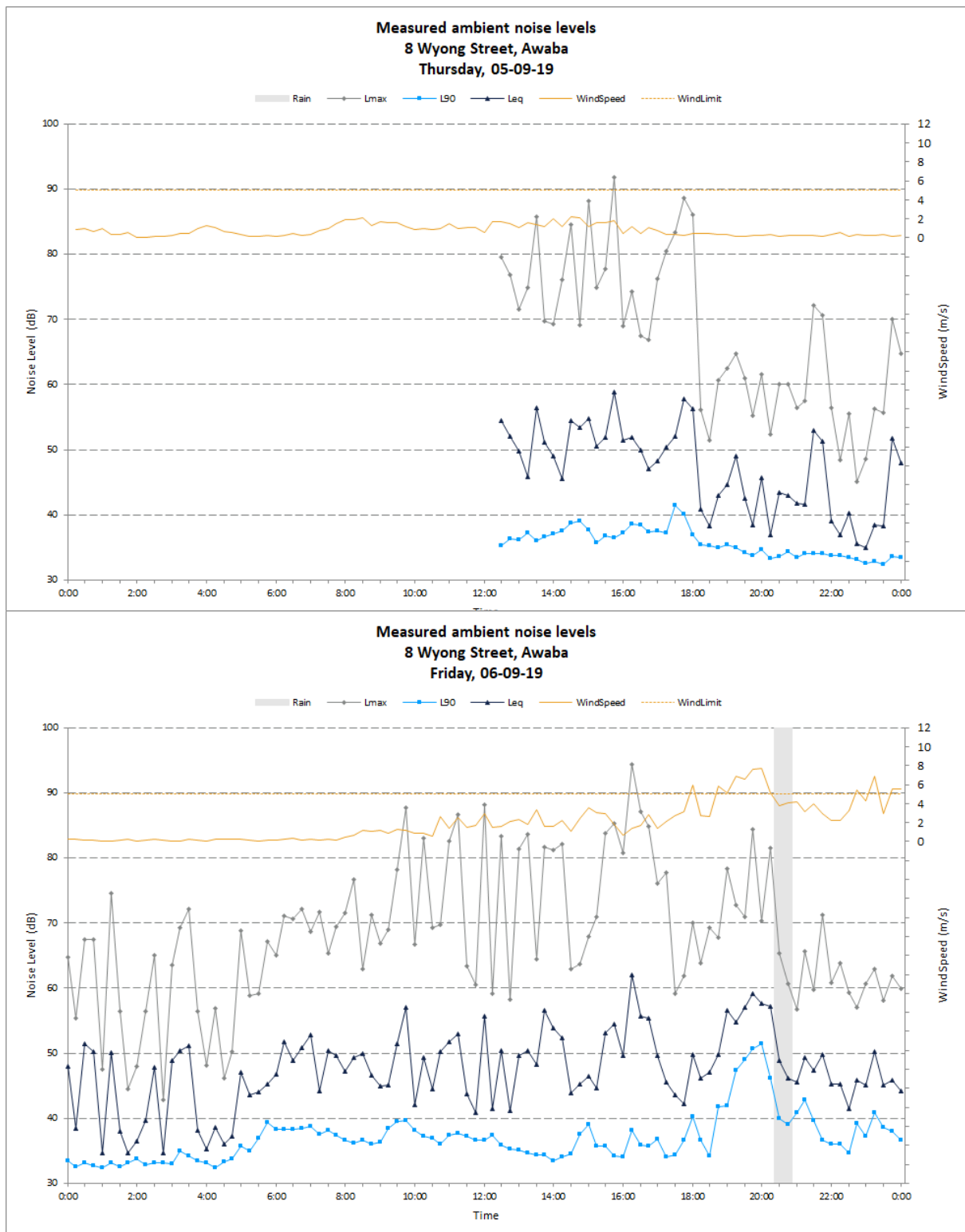
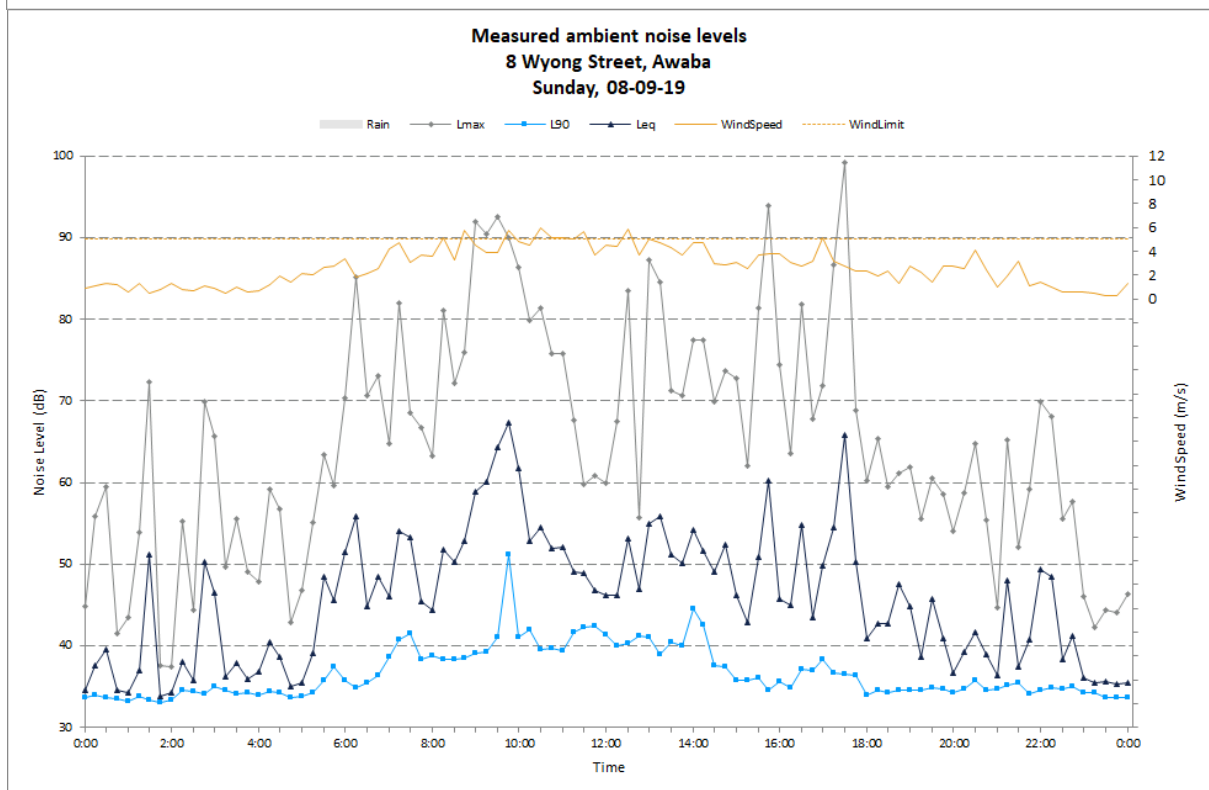
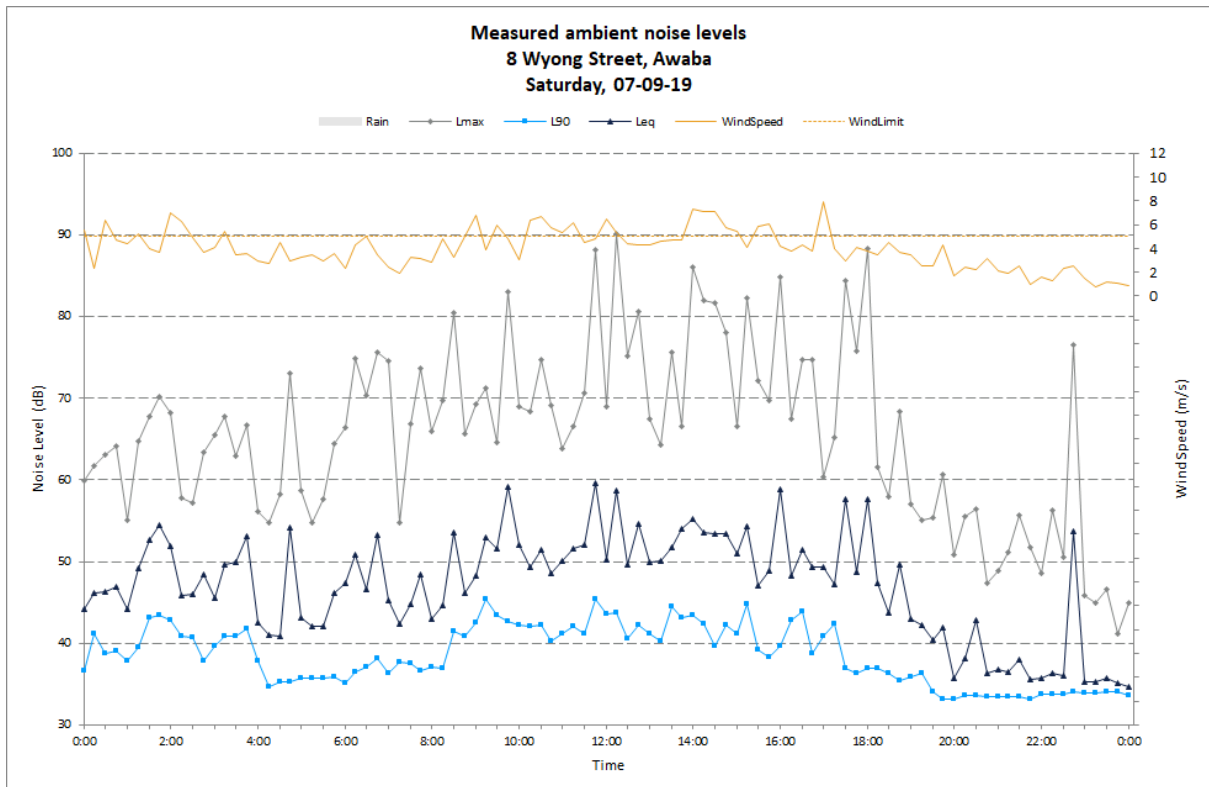


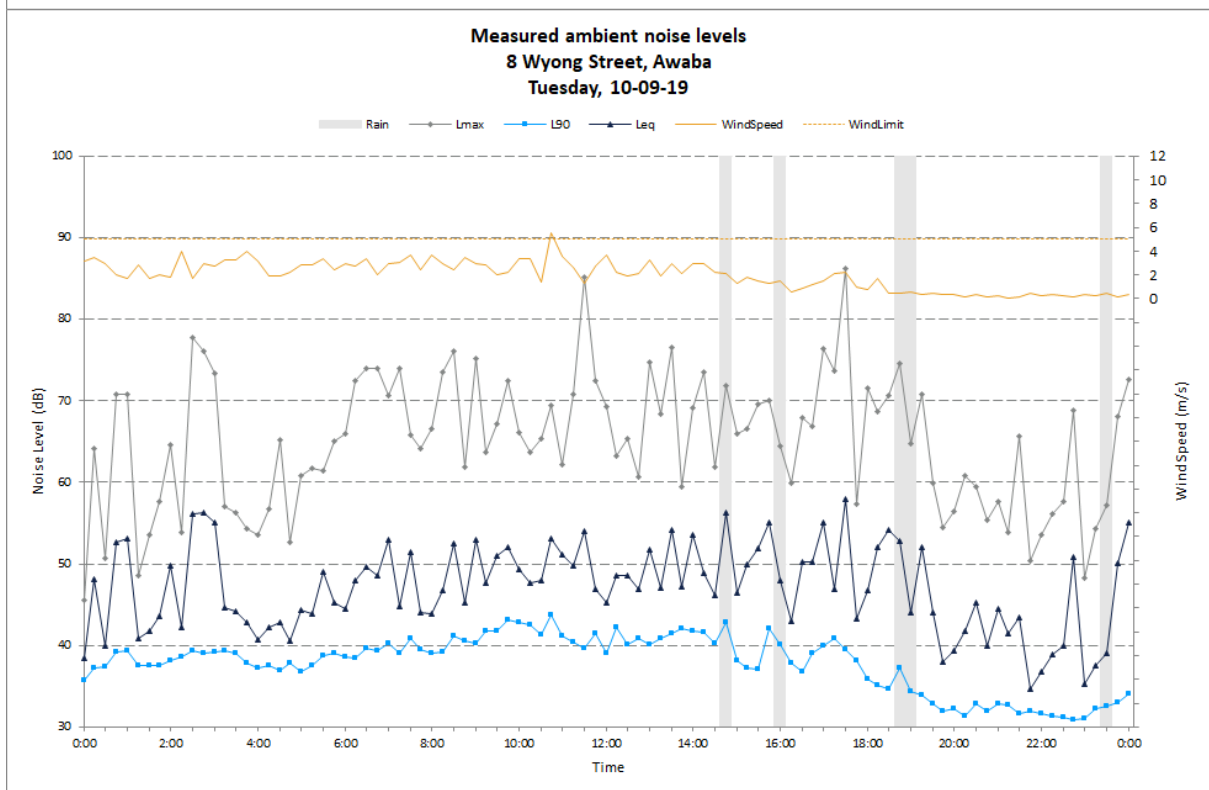
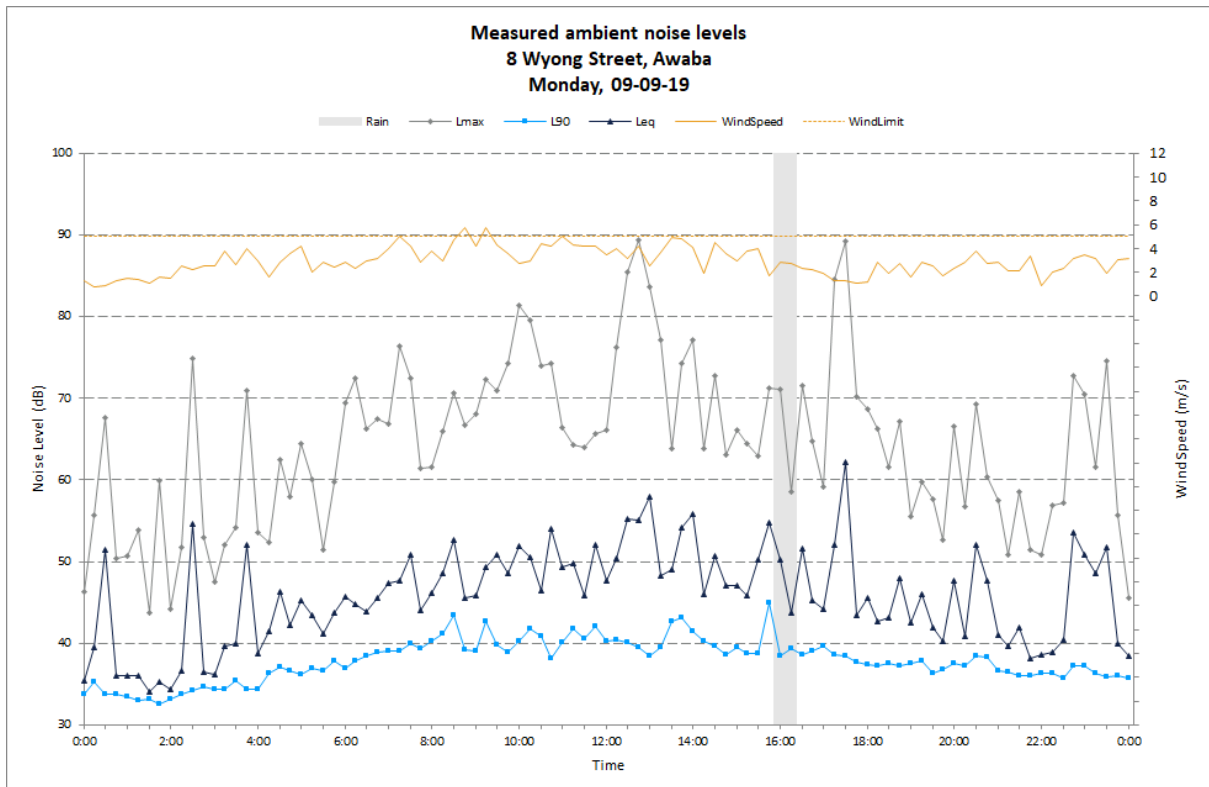
Table B.2 Summary of daily noise logging results – L2

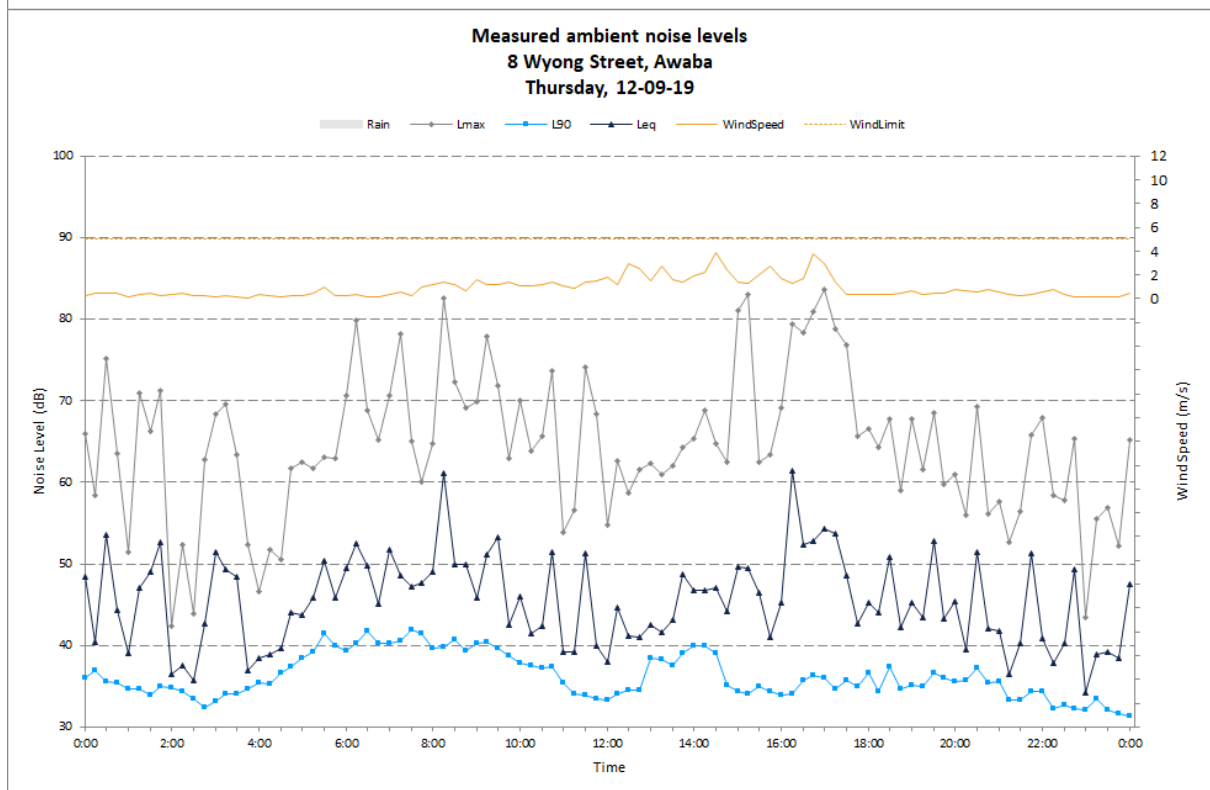
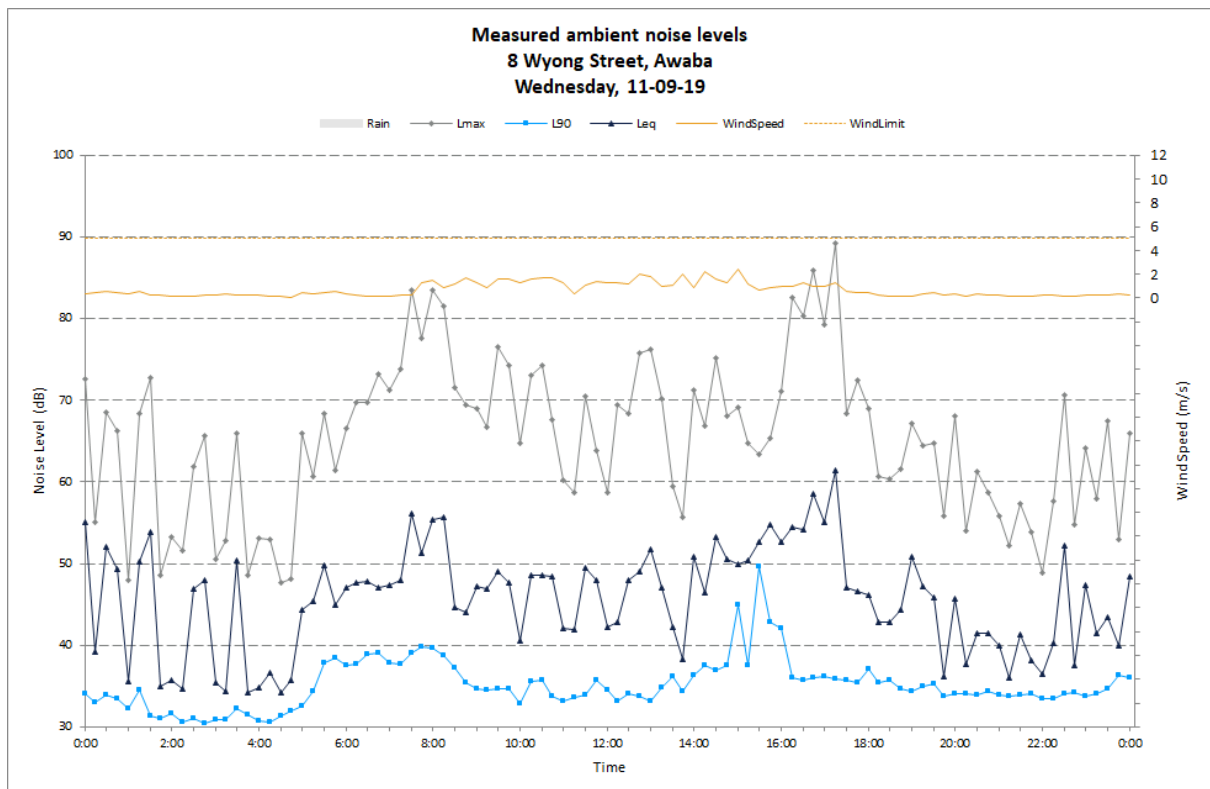
Date	RBL (Day)	RBL (Evening)	RBL (Night)	L _{Aeq,15 hour} , dB (Day)	L _{Aeq,4 hour} , dB (Evening)	L _{Aeq,9 hour} , dB (Night)
Wednesday, 05-09-18	0	34	33	0	46	47
Thursday, 06-09-18	34	36	35	52	54	49
Friday, 07-09-18	37	33	33	53	43	46
Saturday, 08-09-18	36	34	33	57	44	45
Sunday, 09-09-18	39	36	36	52	45	49
Monday, 10-09-18	38	32	31	51	47	47
Tuesday, 11-09-18	34	34	34	52	44	48
Wednesday, 12-09-18	34	33	31	51	47	48
Thursday, 13-09-18	36	32	33	53	43	47
Friday, 14-09-18	35	31	30	55	44	45
Saturday, 15-09-18	33	33	0	55	46	0
Sunday, 16-09-18	0	0	0	0	0	0
Monday, 17-09-18	0	0	0	0	0	0
Tuesday, 18-09-18	0	0	0	0	0	0
Wednesday, 19-09-18	0	0	0	0	0	0
Overall	35	33	33	54	47	47

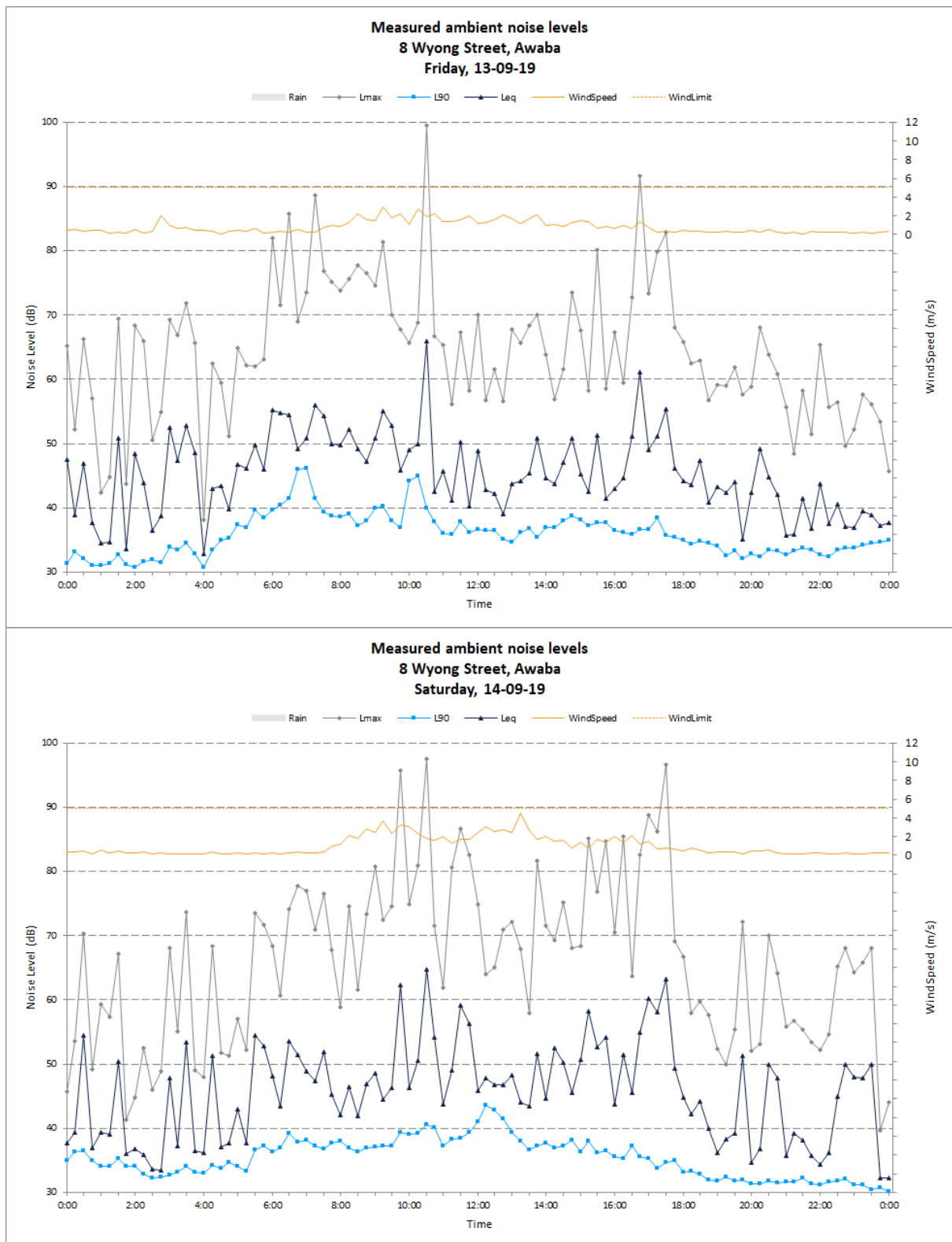
Notes: “0” indicates periods with too few valid samples due to weather or logger operation

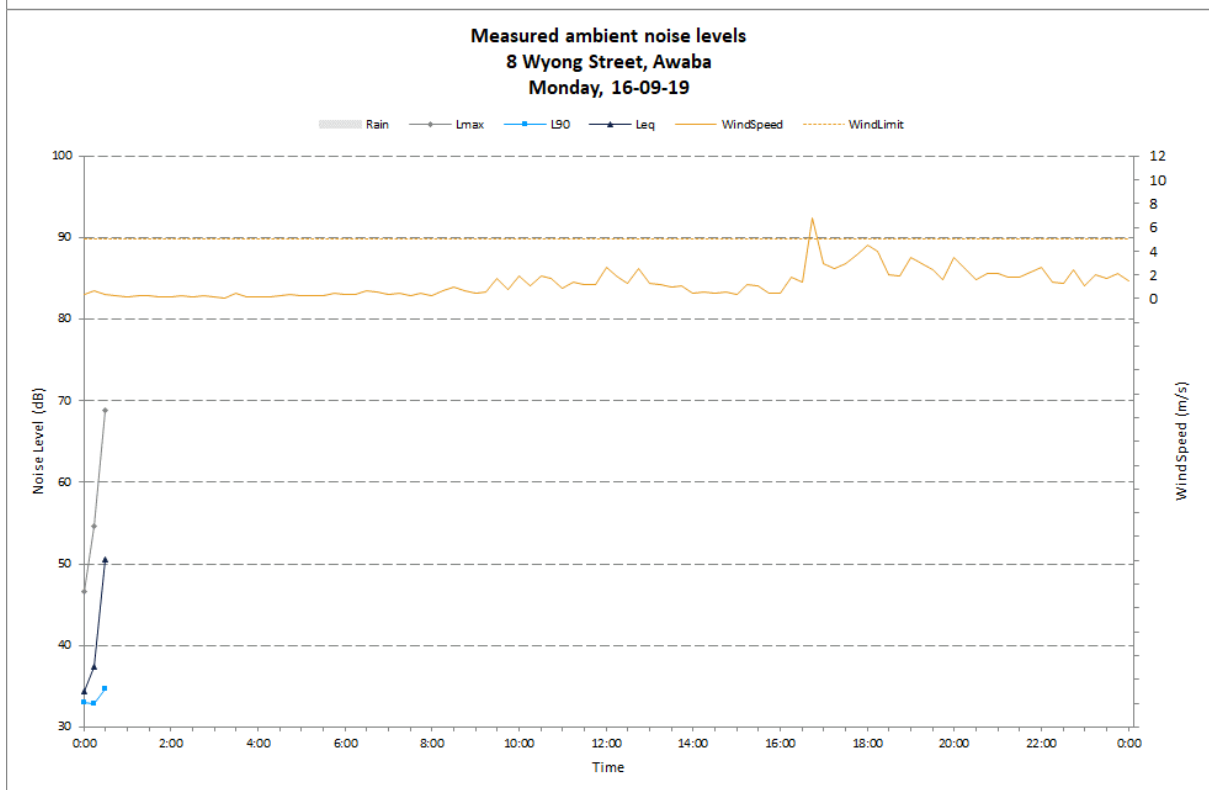
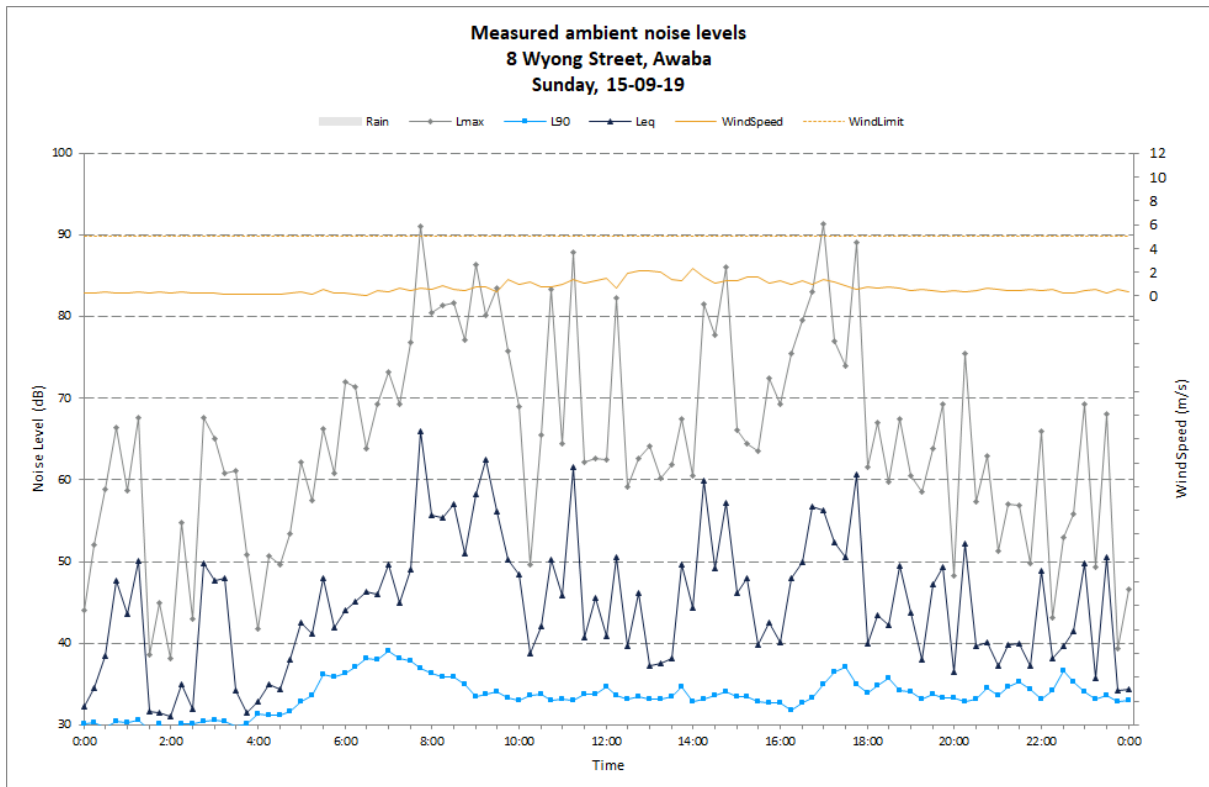






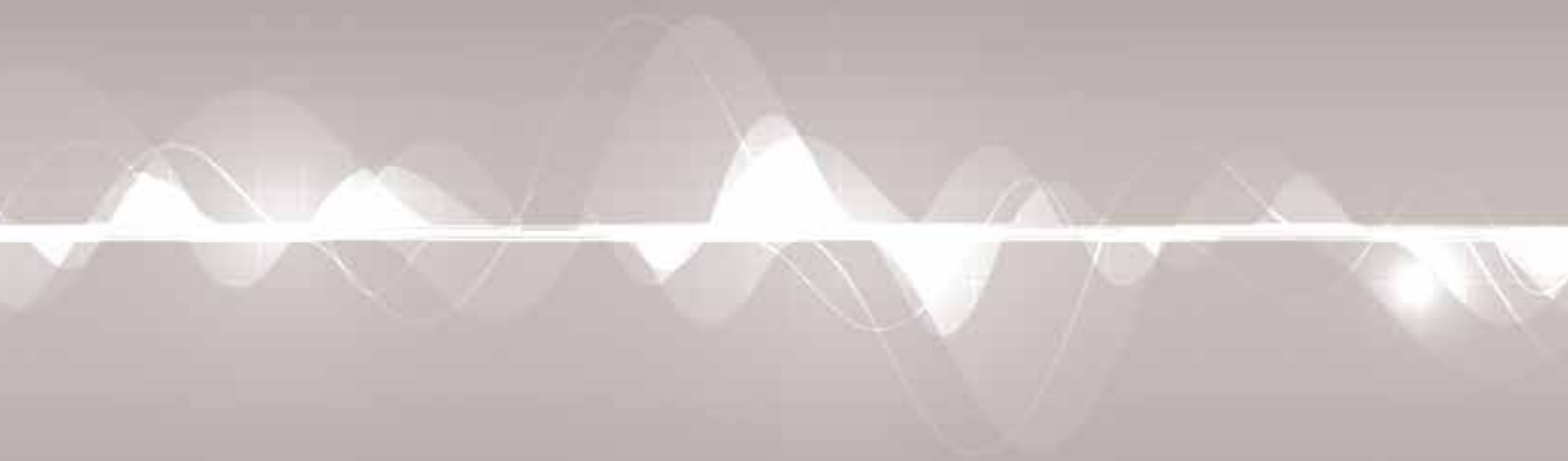






Appendix C

Construction noise modelling assumptions





Appendix D

Operational noise modelling assumptions

