



Appendix E

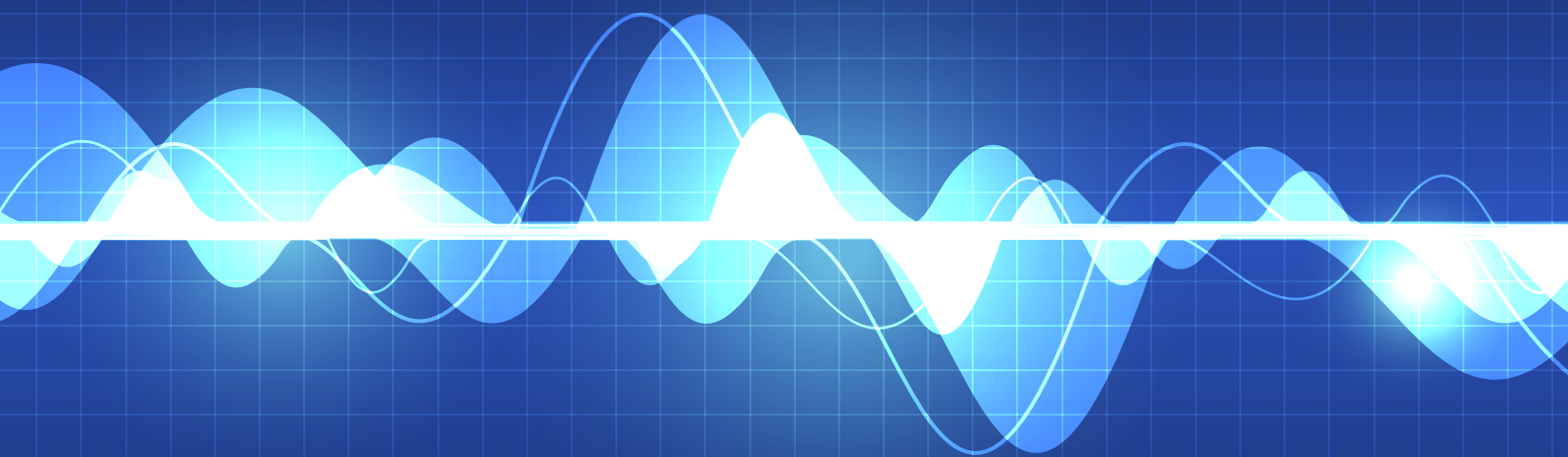
Charbon Colliery - Noise and vibration impact assessment



Charbon Colliery - Modification 2

Noise and vibration impact assessment

Prepared for Charbon Coal Pty Limited
August 2020





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Ground Floor, 20 Chandos Street
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T 03 9993 1905

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Perth WA 6000
T 02 9339 3184

CANBERRA

PO Box 9148
Deakin ACT 2600

Charbon Colliery - Modification 2

Noise and vibration impact assessment

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Prepared by



Katie Teyhan

Associate

25 August 2020

Approved by



Najah Ishac

Director

25 August 2020

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Executive Summary

Charbon Colliery (Charbon) is an underground and open cut coal mine owned and operated by Charbon Coal Pty Limited (Charbon Coal), a joint venture between Centennial Coal Company Limited (Centennial) and SK Networks Resources Australia Pty Ltd. Charbon has been in operation since the 1920s.

In 2015, mining operations ceased following the depletion of Charbon's approved coal reserves. Since the cessation of mining, Charbon Coal has been progressively rehabilitating the site. Charbon Coal undertakes rehabilitation and mine closure activities at the site pursuant to SSD 08_0211.

It is proposed to use coarse coal reject (CCR) material from Centennial's Clarence Colliery (Clarence) to enhance rehabilitation at Charbon. As nominated in Charbon's *Mining Operations Plan* (MOP), Charbon Coal proposes to import CCR from Clarence by train to backfill historical mining areas requiring rehabilitation. The transfer of CCR from Clarence to Charbon assist Charbon Coal to better develop a final landform that is representative of existing landforms within and adjacent to site.

Charbon Coal is seeking to modify SSD 08_0211 to allow for the transfer of CCR from Clarence to Charbon and the use of this material on-site during rehabilitation activities. If approved, the proposed modification will authorise:

- the importation of CCR from Clarence to Charbon by rail;
- use of CCR for ongoing rehabilitation at Charbon; and
- an extension of the time permitted to undertake water transfers between Charbon and Airly Mine.

This noise and vibration impact assessment (NVIA) has been prepared to accompany the modification report and assesses the noise and vibration impacts of the proposed modification on existing noise-sensitive receptors in the surrounding area. Project noise trigger levels (PNTLs) were established for Charbon based on the results of ambient noise monitoring to enable assessment of operational noise emissions in accordance with the *Noise Policy for Industry* (NPfI) (EPA 2017).

Construction activities are required as part of the proposed modification, including construction of a hardstand pad link road, and electricity infrastructure and widening of some existing haul roads. All construction activities will be undertaken during standard daytime construction hours as defined by the *Interim Construction Noise Guideline* (DECC 2009). No additional employees will be required during construction and the expected total duration of the proposed construction activities will be approximately eight weeks.

Most of the plant, materials and equipment required to complete the proposed construction activities (primarily dozers and trucks) are available on-site and have been captured in the operational noise assessment. Hence, the likely impacts from the proposed construction activities are not expected to be greater than those predicted for operational activities.

The proposed modification is not predicted to change existing operational noise emissions associated with approved rehabilitation activities. A high level of conservatism was incorporated into the noise model. Nonetheless, operational noise levels are predicted to satisfy the PNTLs at all assessment locations for operations associated with the proposed modification.

Noise emissions from Charbon will continue to be managed in accordance with the existing *Noise Management Plan* (NMP).

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1 Introduction

1.1 Overview

Charbon Colliery (Charbon) is an underground and open cut coal mine owned and operated by Charbon Coal Pty Limited (Charbon Coal), a joint venture between Centennial Coal Company Limited (Centennial) and SK Networks Resources Australia Pty Ltd. Charbon is approximately 87 kilometres (km) north-west of Lithgow and 3 km south of Kandos in the Western Coalfields of New South Wales (NSW) within the Mid-Western Regional local government area (LGA) (Figure 1.1). The project site boundary, shown on Figure 1.1, covers an area of 2,692 hectares (ha) (the site) and comprises historical underground workings and open cut areas.

Charbon was approved as a Major Project under the now repealed Section 75J Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 7 September 2010 (PA 08_0211). PA 08_0211 has since been declared a State significant development (SSD) under Clause 6 of Schedule 2 of NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017 (SSD 08_0211).

Charbon has been in operation since the 1920s and has been owned and operated by Charbon Coal since 1994. In 2015, mining operations ceased following the depletion of Charbon's approved coal reserves. Since the cessation of mining, Charbon Coal has been progressively rehabilitating the site.

Charbon Coal undertakes rehabilitation and mine closure activities at the site pursuant to SSD 08_0211. While mining is permitted to continue until 31 August 2025, only rehabilitation and mine closure activities are currently being undertaken and these activities are approved to continue beyond 31 August 2025. In addition to rehabilitation activities, water is currently transferred from Charbon's existing surface water dams via rail to Centennial Airly Pty Limited's (Centennial Airly's) Airly Mine (Figure 1.1) in accordance with the relevant conditions of SSD 08_0211 and Airly's development consent (SSD-5581). Under SSD-5581, this activity is approved until 31 January 2037.

It is proposed to use coarse coal reject (CCR) material from Centennial's Clarence Colliery (Clarence) to enhance rehabilitation at Charbon. Clarence is an underground coal mining operation utilising bord and pillar mining and partial extraction techniques. It is situated in the Western Coalfields of NSW, approximately 10 km east of Lithgow in the Lithgow LGA (Figure 1.1). Clarence operates under DA 504-00 which was granted in 2005 by the NSW Department of Infrastructure, Planning and Natural Resources (now NSW Department of Planning, Industry and Environment (DPIE)). Clarence is managed by Centennial.

As nominated in Charbon's *Mining Operations Plan* (MOP), Charbon Coal proposes to import CCR from Clarence by train to backfill historical mining areas requiring rehabilitation. The transfer of CCR from Clarence to Charbon will assist Charbon Coal to better develop a final landform that is representative of existing landforms within and adjacent to site.

Charbon Coal is seeking to modify SSD 08_0211, pursuant to Section 4.55(2) of the EP&A Act, to allow for the transfer of CCR from Clarence to Charbon and the use of this material on-site during rehabilitation activities. If approved, the proposed modification will authorise:

- the importation of CCR from Clarence to Charbon by rail;
- use of CCR for ongoing rehabilitation at Charbon; and
- an extension of the time permitted to undertake water transfers between Charbon and Airly Mine.

At the same time Charbon Coal is seeking to modify SSD 08_0211, Centennial will submit a modification application for DA 504-00 to allow for the exportation of CCR from Clarence to Charbon by rail.

1.2 Site description

The project site boundary (Figure 1.2) is the existing development consent boundary applicable to SSD 08_0211 and includes all areas of disturbance requiring rehabilitation. The majority of the site is owned by Centennial Forestry Corporation of NSW owns Kandos State Forest and Clandulla State Forest, both of which intersect with the project site boundary (Figure 1.2). Various small private landholdings occur in the southern and western portions of the site and several small areas of Crown land (mostly Crown road reserves) also occur.

Land uses surrounding the site include rural residences, agriculture, transport infrastructure and commercial forestry. There is bushland, Charbon Lime Works and the village of Charbon to the north, bushland (Kandos State Forest) and escarpment (Great Dividing Range) to the east and bushland and agricultural land to the south and west (Figure 1.2).

There are a number of non-mine owned residences in the area surrounding the project site boundary (Figure 1.2). The closest non-mine owned residence is Residence H, approximately 80 m from the project site boundary. The closest non-mine owned residence to the rail loop and proposed rail unloading activities is Residence P, approximately 1,500 m south-west of the rail loop.

1.3 Assessment guidelines and requirements

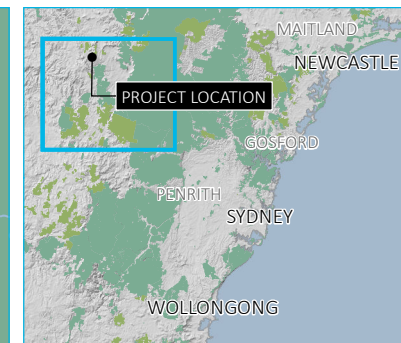
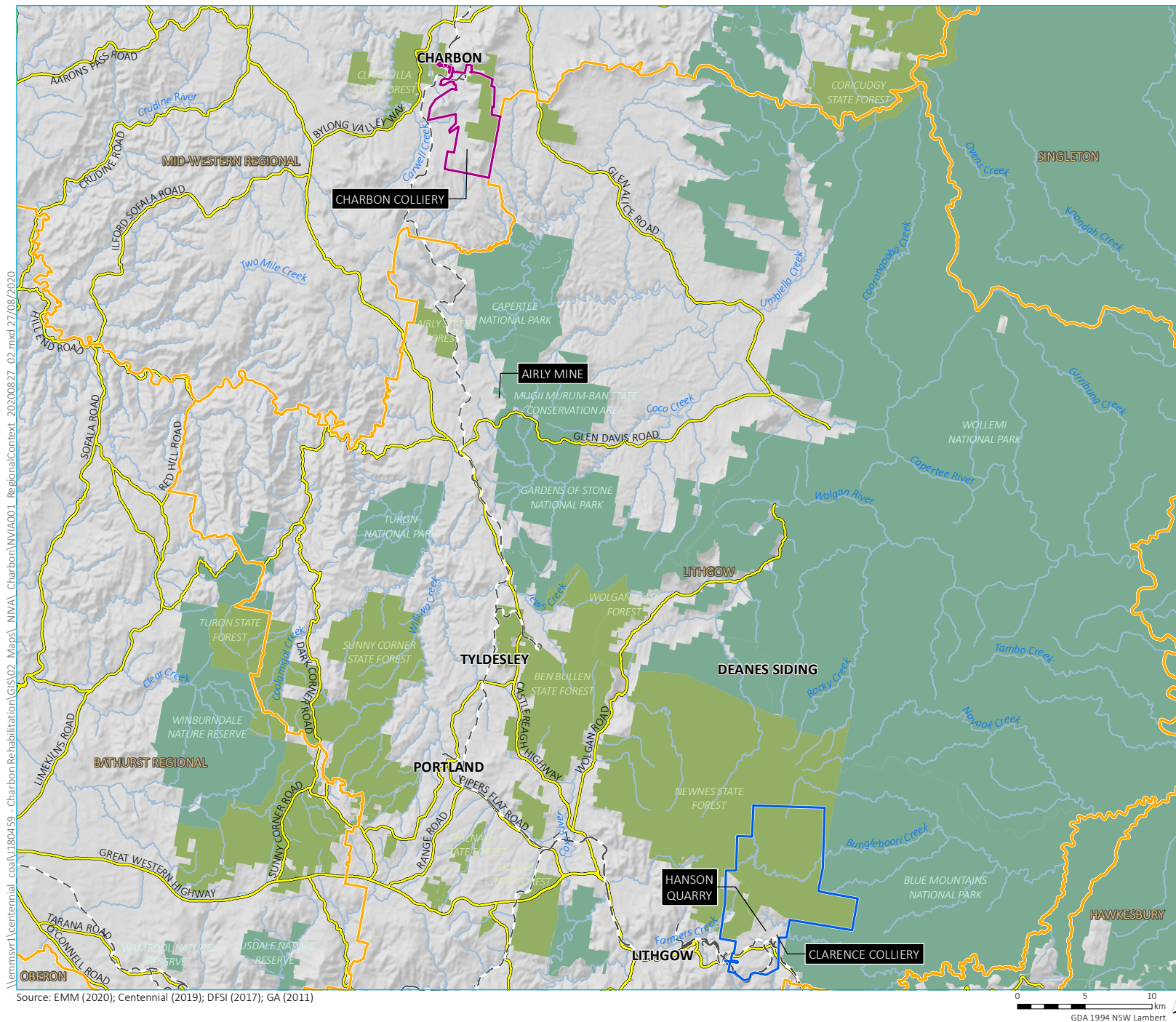
This noise and vibration impact assessment (NVIA) has been prepared to accompany the modification report and assesses the noise and vibration impacts of the proposed modification on existing noise-sensitive receptors in the surrounding area.

This NVIA has been completed with reference to the following guidelines and policies:

- NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry* (NPfI);
- NSW Department of Environment and Climate Change (DECC) 2009, *Interim Construction Noise Guideline* (ICNG); and
- NSW Department of Environment and Conservation (DEC) 2006, *Assessing Vibration: a technical guideline*.

A number of technical terms have been utilised throughout this report for the discussion of noise and vibration. These are explained in the Glossary.

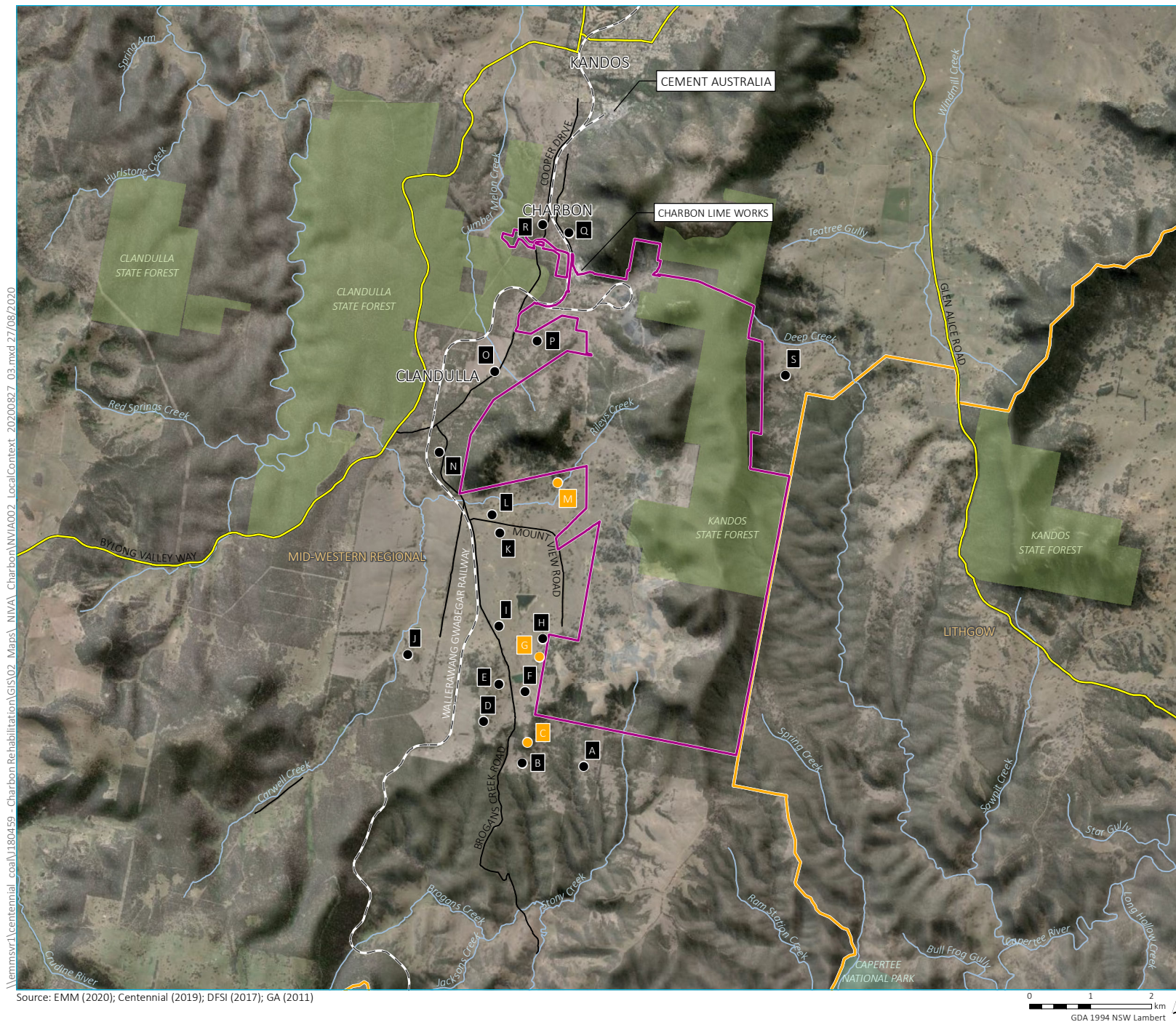
A separate NVIA will assess the noise and vibration impacts associated with the proposed modifications to existing operations at Clarence.



- KEY**
- Charbon Colliery project site boundary
 - Clarence Colliery holding boundary
 - Rail line
 - Main road
 - Watercourse
 - NPWS reserve
 - State forest
 - LGA boundary

Regional context

Charbon Colliery Modification 2
Noise and vibration impact assessment
Figure 1.1



- KEY**
- Charbon Colliery project site boundary
 - Sensitive receiver
 - Centennial-owned property
 - Rail line
 - Watercourse
 - NPWS reserve
 - State forest
 - LGA boundary

Local context

Charbon Colliery Modification 2
Noise and vibration impact assessment
Figure 1.2

2 Proposed modification

2.1 Overview

Charbon Coal is seeking to modify SSD 08_0211, pursuant to Section 4.55(2) of the EP&A Act, to allow for the transfer of CCR from Clarence to Charbon and the use of this material on-site during rehabilitation activities. The transfer of CCR from Clarence to Charbon will assist Charbon Coal to better develop a final landform that is representative of existing landforms within and adjacent to the site. The proposed modification includes:

- Construction of a 3,000 square metre (m²) hardstand pad adjacent to Charbon's existing rail loop (Figure 2.1). During unloading activities, a forklift and other machinery will be operated on this hardstand. Containers used to transport CCR to Charbon may also be stored on this hardstand. Some minor vegetation clearance is required to construct the proposed hardstand.
- Construction of a link road to facilitate vehicle movements between the proposed hardstand and Charbon's existing haul roads (Figure 2.1). The link road will be constructed within the existing disturbance footprint for Charbon's reject emplacement area (REA) complex.
- Widening of Charbon's existing haul roads in some areas to ensure a minimum width of 8.8 m is maintained. Widening activities will remain within Charbon's existing approved disturbance footprint.
- Importation of CCR from Clarence to Charbon by rail (one loaded train per day).
- Unloading of CCR containers at Charbon's existing rail loop using a forklift truck. Containers will either be moved directly onto waiting trucks for transfer to the active rehabilitation areas or placed on the proposed hardstand for temporary storage. A fleet of three or four trucks will be used to transport the containers from the proposed hardstand to the active rehabilitation areas.
- Use of CCR for ongoing rehabilitation at Charbon (including establishment of management measures to mitigate the risk of acid metalliferous drainage (AMD) and potential impacts on the surrounding environment).
- Construction of powerline poles and an additional 11 kV transmission line to Charbon's existing pump shed.
- An extension to the approved water transfer activities from Charbon to Airly Mine from 31 August 2025 to 31 January 2037 to align with Airly Mine's Development Consent (SSD-5581).

2.1.1 Construction activities

As described above, as part of the proposed modification, the following construction activities will be undertaken:

- construction of a 3,000 m² hardstand pad adjacent to Charbon's existing rail loop;
- construction of a link road to facilitate vehicle movements between the proposed hardstand and Charbon's existing haul roads;
- widening of Charbon's existing haul roads in some areas to ensure a minimum width of 8.8 m is maintained; and
- construction of powerline poles and an additional 11 kV transmission line from close to Charbon's access road to the existing pump shed.

The majority of plant, materials and equipment required to complete these activities is available on-site. Additional materials may be delivered to site via the local road network.

The proposed areas for the additional construction activities have been extensively disturbed as part of previous mining activities on-site (including construction of surface water dams, water loading infrastructure and Charbon's rail loader).

The 11 kV transmission line will replace an existing powerline that provides electricity to the pump station and will be rerouted away from the proposed hardstand pad.

All construction activities will be undertaken during standard daytime construction hours in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECC 2009). Construction works will be restricted to:

- Monday to Friday: 7 am–6 pm;
- Saturday: 8 am–1 pm; and
- no work on Sundays and public holidays.

No additional employees will be required during construction.

2.1.2 Proposed rail movements

Charbon's existing rail loop is connected to the Wallerawang-Gwabegar Rail Line, which is not operated to a fixed timetable. During mining, an average of eight coal trains (ie sixteen train movements) per week were dispatched from Charbon on the Wallerawang-Gwabegar Rail Line. Charbon is currently approved to operate eight train movements in the day period (7 am–10 pm) and two train movements in the night period (10 pm–7 am) daily.

Since the completion of mining, rail transport has been used infrequently for importation of materials to Charbon's pit top for rehabilitation activities. In addition, one water-laden train per day (ie two rail movements) is permitted to travel from Charbon to Airly Mine.

As part of the proposed modification, one CCR-laden train will be used per day (ie two rail movements) to transport CCR from Clarence to Charbon. It is anticipated that trains will consist of two locomotives and approximately 30 wagons. Each train will carry two containers per wagon, providing a total of 60 containers per train. Containers are able to hold 25 tonnes (t) of CCR. Therefore, each train will have the ability to transport up to approximately 1,500 t of CCR.

Over a period of five years, it is anticipated that up to 1.5 million tonnes (Mt) of CCR will be transported from Clarence to Charbon with an average annual transfer of between 300,000 t and 350,000 t.

2.1.3 Material handling

On arrival at Charbon, containers with CCR will be transferred from the train to trucks and transported to the areas being rehabilitated for use during the construction of the final landform.

To transfer the containers from the train to trucks, a forklift and other machinery will be operated on the hardstand pad. Containers used to transport CCR to Charbon may also be stored on this hardstand.

A grader and water truck will be used to maintain the haul roads used to transport CCR from the proposed hardstand to the rehabilitation areas.

2.1.4 Water transfers to Airly Mine

It is proposed to continue to operate pumping infrastructure to load trains with water at Charbon. Charbon Coal will continue to transport up to 170 megalitres per year (ML/year) to Airly Mine by rail, in accordance with a recent modification to SSD 08_0211.

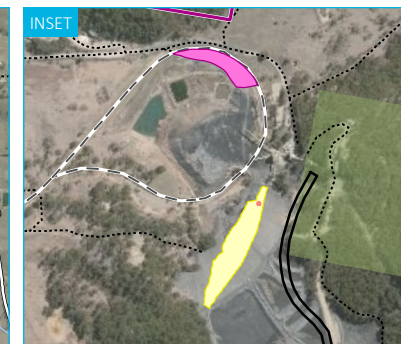
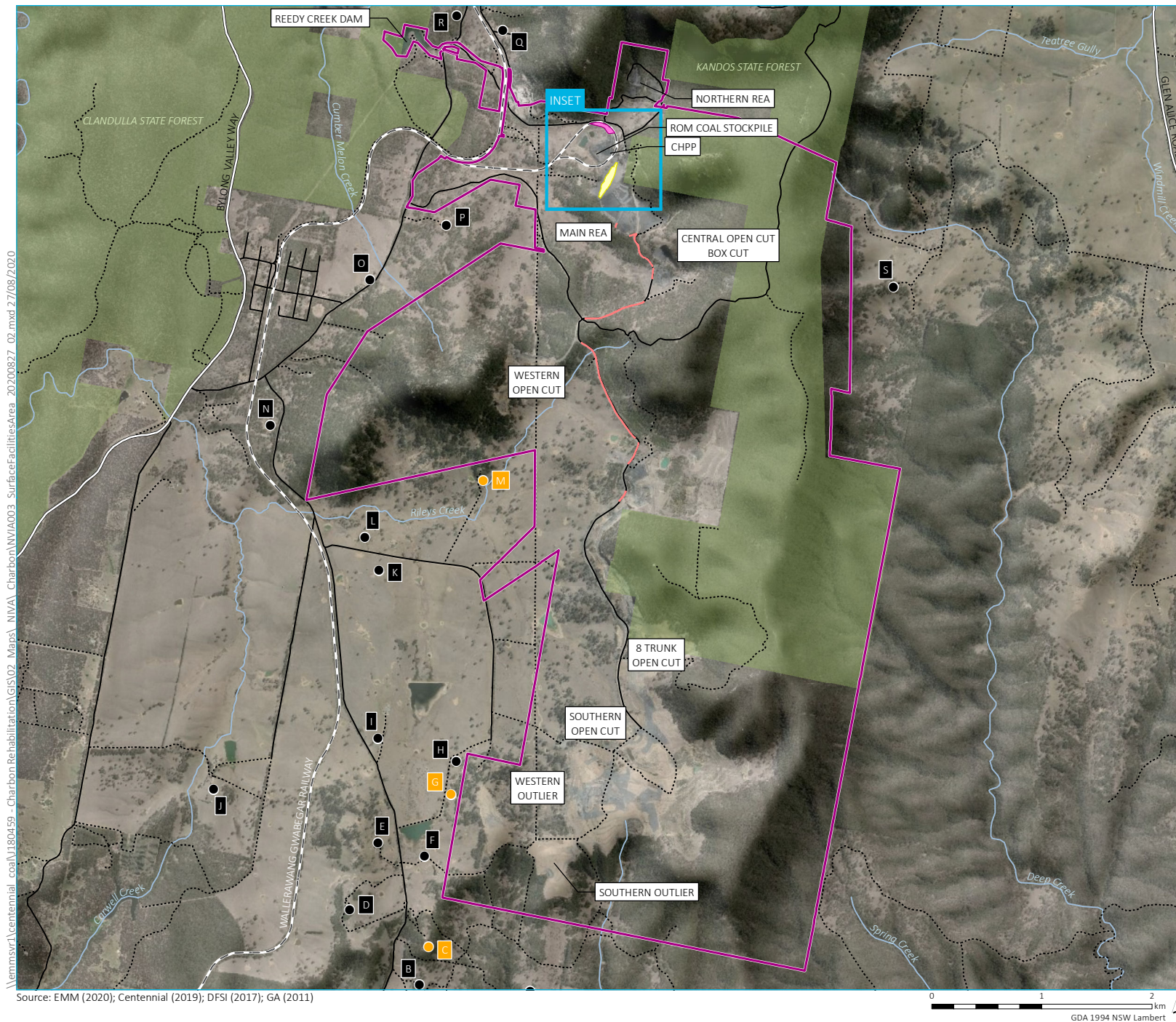
2.2 Assessment locations

The nearest noise and vibration sensitive receptors are private residences (herein referred to as assessment locations) and are described in Table 2.1 shown in Figure 2.1. The numbering of these assessment locations is consistent with that utilised in previous noise assessments as well as SSD 08_0211.

Table 2.1 Assessment locations

Assessment location	Easting	Northing	Type
A	217169	6348765	Residence
B	216161	6348765	Residence
D	215486	6349411	Residence
E	215708	6350033	Residence
F	216139	6349936	Residence
H	216377	6350816	Residence
I	215654	6350985	Residence
J	214186	6350434	Residence
K	215577	6352510	Residence
L	215432	6352806	Residence
N	214512	6353775	Residence
O	215345	6355148	Residence
P	216010	6355684	Residence
Q	216422	6357487	Residence
R	215993	6357595	Residence
S	220106	6355359	Residence

Note: Centennial-owned residences within proximity of Charbon have not been considered as part of this assessment.



- KEY**
- Charbon Colliery project site boundary
 - Sensitive receiver
 - Centennial-owned property
 - Rail line
 - Main road
 - Local road
 - Vehicular track
 - Watercourse
 - State forest
- Proposed modification elements**
- Hardstand
 - Link road
 - Haul road widening

Mine layout

Charbon Colliery Modification 2
Noise and vibration impact assessment
Figure 2.1



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 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 project noise trigger levels (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 as applicable to the amended project:

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 long-term noise goals for the site. This may involve interaction between the regulator and proponent as well as consultation with the community. Regulators and operators need to consider the technical practicalities and cost of noise reduction measures, and how long it will take to implement these measures, along with the environmental consequences of exceeding the PNTLs.
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 is 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 feasible and reasonable noise mitigation measures.

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

A long-term, unattended ambient noise survey was undertaken during December 2018 to establish background noise levels at neighbouring noise sensitive receptors.

3.2.2 Assessing amenity

The amenity assessment is based on noise targets specific to land use and associated activities. The targets relate only to industrial-type noise and do not include road, rail and/or community noise. Where the measured existing industrial noise approaches the 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 typically the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB. An exception to this is where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases, such as for Charbon, the relevant amenity noise level is assigned as the project amenity noise level for the development.

Residences have been categorised in the NPfI rural amenity (the most conservative) category as per the definition provided in the NPfI:

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. Settlement patterns would be typically sparse.

An extract from the NPfI that relates to the amenity noise levels relevant to the proposed modification is given in Table 3.1.

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

¹ Daytime: 7 am to 6 pm; Evening: 6 pm to 10 pm; Night-time: 10 pm to 7 am. On Sundays and Public Holidays, Daytime: 8 am - 6 pm; Evening: 6 pm - 10 pm; Night-time: 10 pm - 8 am.

²The 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 levels.

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 (9 hour) assessment period. This 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 Sleep disturbance

The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where night-time noise levels at a residential location exceed certain screening levels. An assessment of maximum noise levels is not necessary as part of the proposed modification as activities will be limited to daytime hours only.

3.2.5 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 ($L_{Zeq,15minute}$)**

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

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 3.2 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 day period.

3.3 Voluntary Land Acquisition and Mitigation Policy

Consent authorities are required to consider the *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (VLAMP) (DPE 2018) when assessing and determining development applications and modification applications for SSD mining developments. Page 17 of VLAMP (DPE 2018) states the following with regard to the application of voluntary mitigation and voluntary land acquisition:

A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:

- operational noise impacts of a development on privately-owned land; and
- rail noise impacts of a development on privately-owned land near a non-network rail line (private rail line), that is on, or exclusively servicing an industrial site (see Appendix 3 of the *Rail Infrastructure Noise Guideline* (RING) (EPA 2013));

But not:

- construction noise impacts, as these impacts are shorter term and can be controlled;
- noise impacts on the public road or rail network; or
- modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts¹³.

¹³Noise issues for existing premises may be addressed through site-specific pollution reduction programs under the NSW *Protection of the Environment Operations Act 1997*.

Of most interest is the last point above relating to the relative noise impact of the proposed operation compared to the existing development. This report demonstrates that the noise emissions from the proposed modification are predicted to be the same compared to approved operational noise emissions at all assessment locations.

The characterisation of the noise impacts (as outlined in the VLAMP) are generally based on human perception to changes in noise levels as explained in the glossary of acoustic terms in this report. 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.

3.4 Construction noise

As described in Section 2.1.1, as part of the proposed modification, the following construction activities will be undertaken:

- construction of a 3,000 m² hardstand pad adjacent to Charbon's existing rail loop;
- construction of a link road to facilitate vehicle movements between the proposed hardstand and Charbon's existing haul roads;
- widening of Charbon's existing haul roads in some areas to ensure a minimum width of 8.8 m is maintained; and
- construction of powerline poles and an additional 11 kV transmission line for Charbon's existing pump shed.

All construction activities will be undertaken during standard daytime construction hours as defined by the ICNG (DECC 2009).

The proposed construction areas have been extensively disturbed as part of previous mining activities on-site. The expected total duration of the proposed construction activities will be approximately eight weeks.

Most of the plant, materials and equipment required to complete the proposed construction activities (primarily dozers and trucks) are available on-site and have been captured in the operational noise impact assessment (Chapter 7). Hence, the likely impacts from the proposed construction activities are not expected to be greater than those predicted for operational activities.

Given the preceding, construction noise impacts have not been assessed in detail within this report.

3.5 Operational and construction vibration

Vibration from rail and rehabilitation activities is not expected to change as a result of the proposed modification compared to that currently approved.

Given the limited amount of construction activity proposed and the separation distance between the construction activity and the nearest residences (ie greater than 1,200 m), vibration impacts from construction activities are not expected. Thus, a detailed assessment of vibration impacts has not been included in this report.

3.6 Rail noise

Charbon's existing rail loop is connected to the Wallerawang-Gwabegar Rail Line, which is not operated to a fixed timetable. During mining, an average of eight coal trains (ie sixteen train movements) per week were dispatched from Charbon on the Wallerawang-Gwabegar Rail Line. Charbon is currently approved to operate eight train movements in the day period (7 am–10 pm) and two train movements in the night period (10 pm–7 am) daily.

Since the completion of mining, rail transport has been used infrequently for importation of materials to Charbon's pit top for rehabilitation activities. In addition, one water-laden train per day (ie two rail movements) is permitted to travel from Charbon to Airly Mine (Figure 1.1).

As part of the proposed modification, one CCR-laden train will be used per day (ie two rail movements) to transport CCR from Clarence to Charbon. This is well within the previously assessed and approved eight train movements during the day period (7 am–10 pm). Hence, a detailed assessment of off-site rail noise impacts has not been included as part of this assessment.

4 Existing mine noise

4.1 Existing noise limits

Noise limits for Charbon are provided in Schedule 3 Condition 1 of SSD 08_0211 and Condition L4 of Charbon's Environment Protection Licence (EPL) 528. Noise limits are consistent between these two documents and are summarised in Table 4.1.

Table 4.1 Charbon noise limits

Location	Day	Evening	Night	
	L _{Aeq,15min} (dB)	L _{Aeq,15min} (dB)	L _{Aeq,15min} (dB)	L _{A1,1min} (dB)
Residence P	35	39	39	45
All residences within 150 m of, and including, Residence Q	38	38	38	45
Residence M	36	37	35	45
All other privately-owned land	35	35	35	45

4.2 Existing noise emissions

Noise monitoring is undertaken to measure the ambient noise levels at the nearest potentially worst-affected receptor locations surrounding Charbon in accordance with Condition 1 of Schedule 3 in SSD 08_0211 and Condition L4 of EPL 528. Charbon's *Noise Management Plan* (NMP) (Centennial 2018) was reviewed during 2018 and approved by DPIE on 29 June 2018. The revised noise monitoring program requires monitoring to be undertaken annually at locations H, L, P and Q. Prior to the latest revision of the NMP, monitoring was undertaken on a quarterly basis.

A summary of the noise monitoring results, as provided in Charbon's Annual Reviews (2015–2020), show that noise contributions from Charbon complied with relevant noise limits in the period between (and inclusive of) 2015 and 2020.

4.3 Noise and vibration complaints history

No complaints have been received in relation to noise or vibration emissions from Charbon since April 2015.

5 Existing acoustic environment

To establish ambient and background noise levels unattended noise monitoring was completed by EMM at two locations surrounding Charbon (Figure 5.1) in accordance with the NPfI.

The noise loggers were in place from 13 December 2018 and were programmed to record statistical noise level indices continuously in 15-minute intervals. Calibration of each noise logger was checked prior to and following unattended noise monitoring. The equipment carried appropriate and current NATA calibration certificates. Weather data for the unattended noise monitoring period was obtained from the on-site automatic weather station. Wind speed and rainfall data were used to exclude noise data during periods of any rainfall and/or wind speeds in excess of 5 m/s (approximately 9 knots) in accordance with the methodology provided in the NPfI.

The locations of relevant long-term noise loggers and short-term operator-attended noise monitoring are shown on Figure 5.1.

A summary of the background and ambient noise monitoring results is provided in Table 5.1. Detailed graphs of the data obtained by EMM are provided in Appendix A. It is noted that the data obtained at location NML2 appears to have been affected by unidentified extraneous noise as indicated by the elevated levels during the day from Saturday 15 December to Friday 21 December. Hence, although the data is presented here for completeness, this data has not been utilised for the purpose of establishing PNTLs.

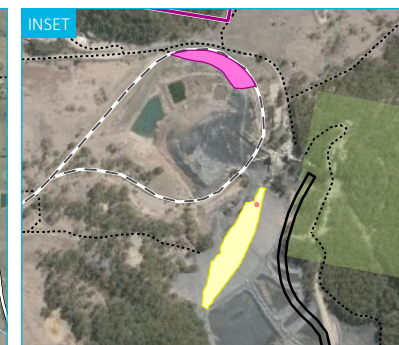
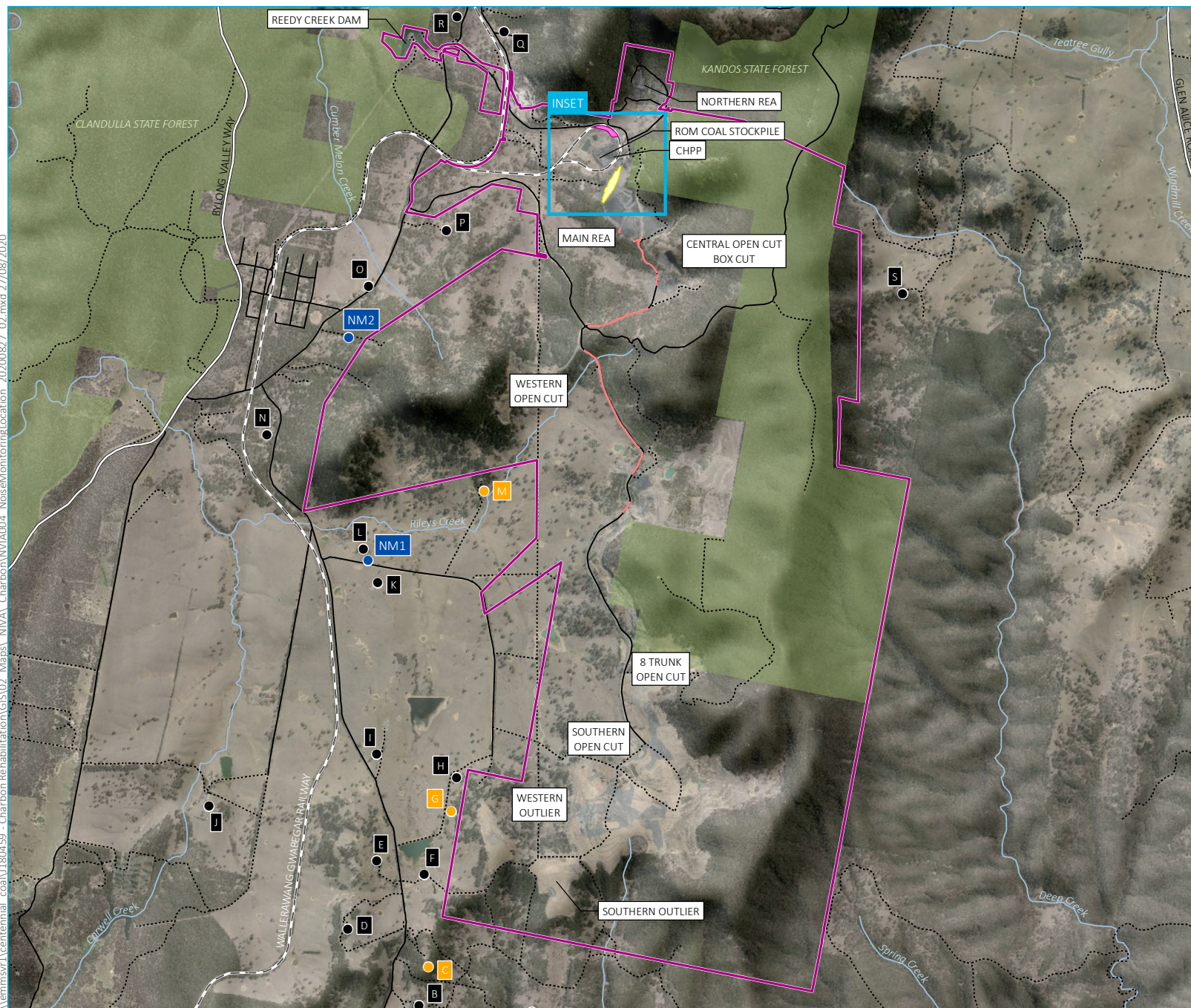
Table 5.1 Summary of existing measured background and ambient noise levels (December 2018)

Monitoring location	Period ¹	RBL ² (dB)	L _{Aeq, period} noise level ³ (dB)
NML1 – 39 Mountain View Road, Clandulla	Day	39	53
	Evening	27	49
	Night	20	45
NML2 – 537 Cooper Drive, Clandulla	Day	45	61
	Evening	42	57
	Night	<20	45

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

Based on observations whilst on-site, the main contributors to overall ambient noise levels are natural sounds (eg insects and birdsong), distant traffic noise and residential activity. Noise from Charbon was not audible and is considered unlikely to have affected final RBL values.

\\lemmsvr1\centennial_coal\1180459 - Charbon Rehabilitation\GIS\02 Maps\ NVA\ Charbon\NVA\A004 NoiseMonitoringLocation 20200827 02.mxd 27/08/2020



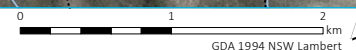
- KEY**
- Charbon Colliery project site boundary
 - Noise monitoring location
 - Sensitive receiver
 - Centennial-owned property
 - Rail line
 - == Main road
 - Local road
 - Vehicular track
 - Watercourse
 - State forest
 - Hardstand
 - Link road
 - Haul road widening
- Proposed modification elements

Noise monitoring locations

Charbon Colliery Modification 2
Noise and vibration impact assessment
Figure 5.1



Source: EMM (2020); Centennial (2019); DFSI (2017); GA (2011)



6 Operational noise targets

6.1 Project noise trigger levels

6.1.1 Intrusiveness

The intrusiveness targets require that $L_{Aeq,15min}$ noise levels from a site during the relevant operational periods (ie day, evening and night) do not exceed the relevant RBL by more than 5 dB. The RBLs utilised for determination of the intrusiveness target are based on either the background noise monitoring results at NML1 presented in Chapter 5 or the minimum RBLs as provided in the NPfI.

The project intrusive noise levels are presented in Table 6.1.

Table 6.1 Intrusive noise levels

Assessment locations ¹	Adopted RBL (dB) ²			Project intrusive noise level, $L_{Aeq,15min}$ (dB)		
	Day ³	Evening ³	Night ³	Day	Evening	Night
A (minimum RBL)	35	30	30	40	35	35
B (NML1)	39	30	30	44	35	35
D (NML1)	39	30	30	44	35	35
E (NML1)	39	30	30	44	35	35
F (NML1)	39	30	30	44	35	35
H (NML1)	39	30	30	44	35	35
I (NML1)	39	30	30	44	35	35
J (NML1)	39	30	30	44	35	35
K (NML1)	39	30	30	44	35	35
L (NML1)	39	30	30	44	35	35
N (NML1)	39	30	30	44	35	35
O (NML1)	39	30	30	44	35	35
P (NML1)	39	30	30	44	35	35
Q (NML1)	39	30	30	44	35	35
R (NML1)	39	30	30	44	35	35
S (minimum RBL)	35	30	30	40	35	35

1. Representative noise monitoring locations presented in brackets.

2. The RBL is an NPfI term and is used to represent the background noise level.

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

6.1.2 Amenity

The assessment of amenity is based on noise targets specific to the land use. Assessment locations have been categorised in the NPfI (EPA 2017) 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, having little or no road traffic noise and generally characterised by low background noise levels).

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 typically the recommended amenity noise level

(outlined in Table 2.2 of the NPfI) minus 5 dB. An exception to this is where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development. It is acknowledged that there are several isolated industrial operations in the vicinity (eg Charbon Lime Works north-west of the rail loop - Figure 1.2). However, it is acknowledged that these would have negligible impact on the majority of the assessment locations considered as part of this assessment.

As described earlier, a 3 dB adjustment is adopted for 15-minute worst case period noise levels from Charbon for the entire day (11 hour), evening (4 hour) and night (9 hour) assessment periods. 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.

The corresponding recommended amenity noise levels for all assessment locations are given in Table 6.2.

Table 6.2 **Project amenity noise levels**

Assessment location	Indicative area	Project amenity noise level ($L_{Aeq,15min}$) (dB)		
		Day	Evening	Night
All	Rural	53	48	43

1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; night: all remaining periods.

6.1.3 Project noise trigger levels

The PNTLs are the more stringent of either the project intrusive or amenity noise levels and are shown in Table 6.3. In all cases the intrusiveness targets are the PNTLs.

Table 6.3 **Project noise trigger levels, $L_{Aeq,15min}$**

Assessment location	Intrusive noise level, $L_{Aeq,15min}$, dB			Amenity noise level, $L_{Aeq,period}$, dB			PNTL, $L_{Aeq,15min}$, dB		
	Day ¹	Evening ¹	Night ¹	Day ¹	Evening ¹	Night ¹	Day ¹	Evening ¹	Night ¹
A	40	35	35	53	48	43	40	35	35
B	44	35	35	53	48	43	44	35	35
D	44	35	35	53	48	43	44	35	35
E	44	35	35	53	48	43	44	35	35
F	44	35	35	53	48	43	44	35	35
H	44	35	35	53	48	43	44	35	35
I	44	35	35	53	48	43	44	35	35
J	44	35	35	53	48	43	44	35	35
K	44	35	35	53	48	43	44	35	35
L	44	35	35	53	48	43	44	35	35
N	44	35	35	53	48	43	44	35	35
O	44	35	35	53	48	43	44	35	35
P	44	35	35	53	48	43	44	35	35
Q	44	35	35	53	48	43	44	35	35
R	44	35	35	53	48	43	44	35	35
S	40	35	35	53	48	43	40	35	35

1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; night: all remaining periods.

7 Operational noise assessment

7.1 Overview

This section presents the methods and base parameters used to model noise emissions from Charbon.

Noise modelling was based on three-dimensional digitised ground contours of the surrounding land and surface infrastructure. The operational noise model represents a snapshot of typical operations, with equipment placed at various locations and heights, representing a realistic scenario representative of potential worst-case noise emissions. The topography utilised in the noise model is representative of the expected final landform (ie highest elevation) thus also providing a potential worst-case in terms of noise source locations.

Noise predictions were carried out using the iNoise software, created by the same developers responsible for B&K's Predictor 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 surface facilities area and surrounds and applicable meteorological conditions.

7.2 Meteorology

During certain weather conditions, operational noise emissions from Charbon at the assessment locations may increase or decrease compared with noise during calm conditions. This is due to refraction caused by the varying speed of sound with increasing height above the ground that occurs during winds or where air temperature changes with height.

A simple yet conservative approach has been selected for the consideration of potentially noise-enhancing weather conditions with reference to Fact Sheet D of the NPfI. Noise emissions from Charbon have been predicted for noise-enhancing conditions. This provides a conservative approach since the noise emissions predicted under noise-enhancing conditions are expected to represent the upper range of noise emissions from Charbon.

7.3 Plant and equipment

The operational noise model considered a snapshot of surface operations with equipment placed at representative locations of a potentially worst-case operational scenario. Adopted locations of plant and equipment are shown in Appendix B. Conservative assumptions have been made regarding the number of items operating simultaneously (Section 7.4).

Acoustically significant fixed and mobile equipment items considered in the noise model are provided for expected daytime operations in Table 7.1. Most of the sound power data were obtained from noise measurements of existing activities at Charbon. Where this was not available, sound power data has been obtained from an EMM database of similar plant and equipment.

Charbon Coal has committed to limiting train movements (for both CCR and water transport) on the rail loop to daytime only (ie 7 am to 6 pm).

Table 7.1 Acoustically significant plant and equipment for noise modelling

Item (location)	Sound power level per item (dBA)	Operating during this period		
		Day	Evening	Night
Dozer – Komatsu 155AX (Southern Open Cut) ¹	110	✓	✗	✗
Front end loader (Southern Open Cut) ¹	110	✓	✗	✗
Dozer - Komatsu 155AX (8 Trunk Open Cut) ¹	110	✓	✗	✗
Dozer – Komatsu D375A (8 Trunk Open Cut) ²	122	✓	✗	✗
Dozer - Komatsu 155AX (Central Open Cut Box Cut) ¹	110	✓	✗	✗
Dozer – Komatsu D375A (Central Open Cut Box Cut) ²	122	✓	✗	✗
Dozer - Komatsu 155AX (Western Open Cut) ¹	110	✓	✗	✗
Dozer – Komatsu D375A (Western Open Cut) ²	122	✓	✗	✗
Dozer - Komatsu 155AX (Main REA) ¹	110	✓	✗	✗
Dozer – Komatsu D375A (Main REA) ²	122	✓	✗	✗
Forklift (rail unloading) ²	105	✓	✗	✗
Front end loader (Northern REA) ¹	110	✓	✗	✗
Train wagons (rail loop) ¹	78/m	✓	✗	✗
Locomotives (3 of) (rail loop) ²	105	✓	✗	✗
REA haul trucks ¹ (Northern REA to Main REA) Two trucks in total	108	✓	✗	✗
Water cart (all haul roads) ¹	107	✓	✗	✗
Haul trucks ¹ (Southern Open Cut to other open cut areas and Main REA) Ten trucks on each route	108	✓	✗	✗
CCR trucks ² (rail loop to open cut areas) Four trucks on each route	108	✓	✗	✗

1. Sourced from on-site measurements from a previous study at Charbon.

2. Sourced from EMM database.

7.4 Noise model validation

Given the spatial variation in assessment locations and operational activities over recent years as well as the variation in the level of activity at Charbon, it has been difficult to obtain relevant data to enable validation of the noise model.

Due to the preceding, a high level of conservatism has been incorporated into the noise model. The current fleet available at Charbon consists of two dozers and ten trucks. For the purpose of noise modelling, this fleet has been assumed to operate in each open cut and REA, simultaneously. Similarly, it has been assumed that the full fleet of trucks used to transport CCR (ie four trucks) will operate between the rail loop and each open cut area, simultaneously. This is not possible based on existing operational constraints but was used to simplify the modelling process. Further, due to the spatial variation of rehabilitation activity it is unlikely that specific assessment locations will be impacted by more than one area of activity even if they are operating simultaneously.

In light of the preceding, noise emission predictions are considered to be conservative.

7.5 Operational noise assessment

Predicted noise levels for operation of Charbon incorporating the conservative assumptions (Section 7.4) are presented in Table 7.2 for the proposed hours of operation (ie daytime only).

Noise-enhancing weather conditions have been considered and the highest predicted noise level is presented. Given the similarity between proposed operations and existing rehabilitation activity on-site, the predicted operational noise levels are considered to be generally the same as existing noise levels.

Indicative noise contours under noise-enhancing weather conditions are provided in Appendix C.

Table 7.2 Predicted daytime $L_{Aeq,15min}$ operational noise levels

Assessment location	Predicted Charbon noise level (dB)	PNTL $L_{Aeq,15min}$, dB
	Noise-enhancing	
A	33	40
B	34	44
D	36	44
E	37	44
F	37	44
H	41	44
I	39	44
J	35	44
K	41	44
L	40	44
N	34	44
O	37	44
P	41	44
Q	38	44
R	37	44
S	<30	40

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

Operational noise emissions are predicted to satisfy the PNTLs at all assessment locations for operations associated with the proposed modification. It is noted that noise emissions are expected to be unchanged compared to currently approved rehabilitation activities.

Noise emissions are predicted to be highest at assessment locations closest to the Main REA or active rehabilitation areas (Residences H, K and P - Figure 2.1). Dozers operating in the 8 Trunk Open Cut or Southern Open Cut areas are the main contributors to noise emissions at Residences H and K. The main contributors at Residence P are the dozer operating in the Main REA and locomotives on the rail loop.

7.6 Noise mitigation, management and monitoring

Charbon Coal will continue to implement the existing noise mitigation and management measures as provided in the NMP (Centennial 2018).

The NMP outlines the noise mitigation and management measures relevant to Charbon's existing operations and also describes the noise monitoring program which incorporates operator-attended noise surveys at nearest residences as well as on-site sound power level measurements.

Where required, the NMP will be updated following determination of the proposed modification.

8 Conclusion

EMM has prepared this NVIA to accompany a modification report for a proposed modification to SSD 08_0211. A quantitative assessment of noise emissions associated with Charbon's operations has been undertaken. The assessment included ambient noise monitoring, establishment of PNTLs and computer noise modelling.

Preliminary results of noise modelling indicated the potential for noise emissions above the PNTLs during the evening and night period at Residence P due to noise from trains on the rail loop. Consequently, Charbon Coal has committed to limiting train movement on the rail loop to daytime only (ie 7 am–6 pm).

Operational noise emissions from Charbon are predicted to satisfy the daytime PNTLs at all assessment locations.

Noise emissions from Charbon will continue to be managed in accordance with the existing NMP. The NMP will be updated following determination of the proposed modification (as required).

Glossary

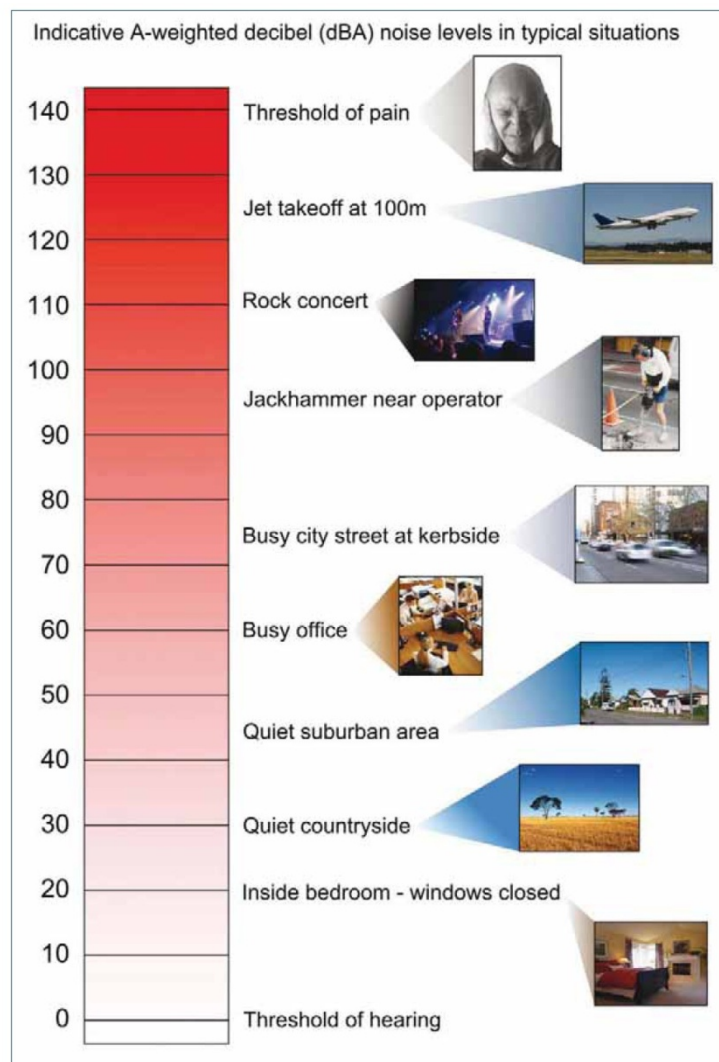
Table G.8.1 Glossary of acoustic terms and abbreviations

Abbreviation or term	Definition
ABL	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L_{A90} statistical noise levels.
Amenity noise level	The amenity noise levels relate to the overall level of industrial noise subject to land zoning or use
A-weighting	There are several different weightings utilised for describing noise, the most common being the 'A-weighting'. This attempts to closely approximate the frequency response of the human ear.
Day period	Monday–Saturday: 7.00 am to 6.00 pm, on Sundays and public holidays: 8.00 am to 6.00 pm.
dB	Noise is measured in units called decibels (dB).
DPIE	NSW Department of Planning, Industry and Environment
EMM	EMM Consulting Pty Limited
EP&A Act	NSW <i>Environmental and Planning Assessment Act 1979</i> (NSW)
EPA	NSW Environment Protection Authority (formerly the Department of Environment, Climate Change and Water).
Evening period	Monday–Saturday: 6.00 pm to 10.00 pm, on Sundays and public holidays
ICNG	Interim Construction Noise Guideline
Intrusive noise level	The intrusive noise level refers to noise that intrudes above the background level by more than 5 dB.
L_{A1}	The A-weighted noise level exceeded for 1% of the time.
L_{A10}	The A-weighted noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{A90}	The A-weighted noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{Aeq}	The A-weighted energy average noise level. This is the equivalent continuous sound pressure level over a given period. The $L_{Aeq(15\text{-minute})}$ descriptor refers to an L_{Aeq} noise level measured over a 15 minute period.
L_{Zeq}	The unweighted energy average noise level. This is the equivalent continuous sound pressure level over a given period without any frequency weighting applied.
L_{Amax}	The maximum A-weighted sound pressure level received during a measurement interval.
Night period	Monday–Saturday: 10.00 pm to 7.00 am, on Sundays and public holidays: 10.00 pm to 8.00 am.
NMP	Noise management plan
PNTL	The project noise trigger levels are targets for a particular industrial noise source or industry. The PNTLs are the lower of either the project intrusive noise level or project amenity noise level.
POEO Act	NSW <i>Protection of the Environment Operations Act 1997</i> (NSW)
RBL	The rating background level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the average background levels.
RNP	Road Noise Policy
Sound power level (L_w)	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.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

It is useful to have an appreciation of decibels (dB), the unit of noise measurement. Table G.8.2 gives an indication as to what an average person perceives about changes in noise levels. Examples of common noise levels are provided in Figure G.8.1.

Table G.8.2 Perceived change in noise

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



Source: Road Noise Policy (Department of Environment, Climate Change and Water 2011)

Figure G.8.1 Common noise levels

References

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

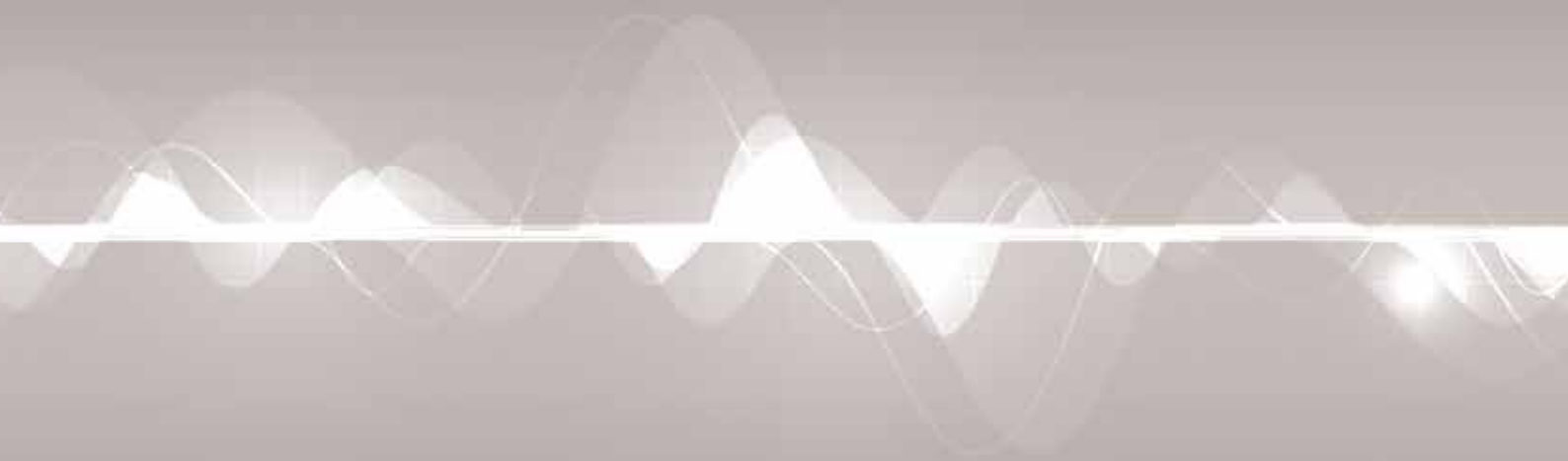
NSW Department of Environment and Climate Change (DECC) 2009, *Interim Construction Noise Guideline (ICNG)*.

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

NSW Government 2018, *Voluntary Land Acquisition and Mitigation Policy For State Significant Mining, Petroleum and Extractive Industry Developments*.

Appendix A

Measured existing ambient noise levels



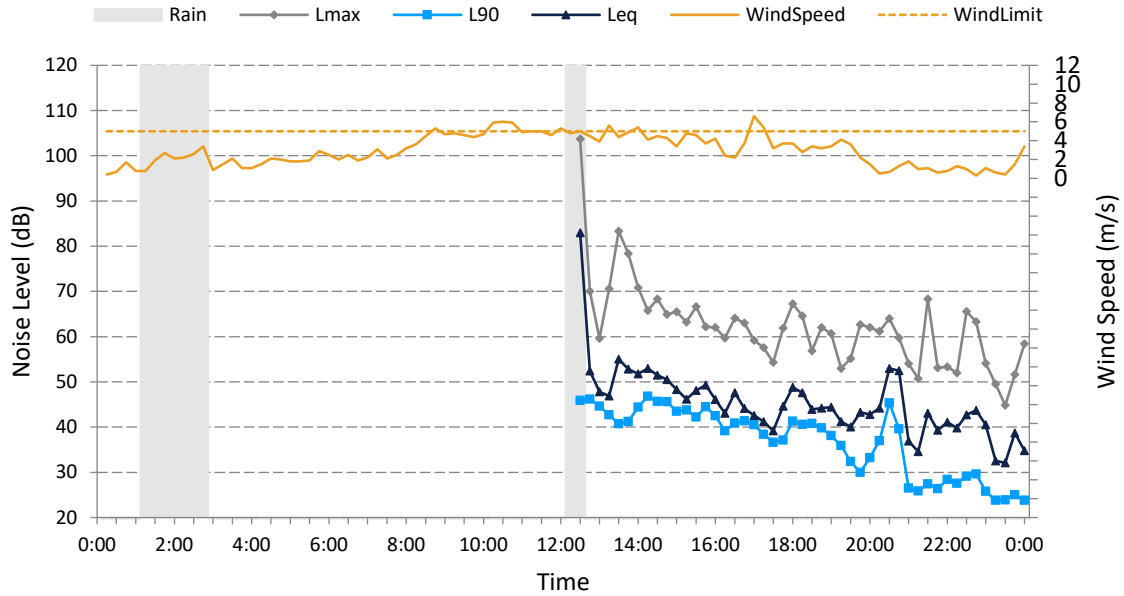
Date	ABL Day	ABL Evening	ABL Night	L _{Aeq,11 hour} Day	L _{Aeq,4 hour} Evening	L _{Aeq,9 hour} Night	L _{Aeq,15 hour} Day	L _{Aeq,24 hour} Day	L _{Aeq,8 hour} Night
Thursday, 13-12-18	0	26	20	0	46	39	0	0	37
Friday, 14-12-18	0	0	20	0	0	43	0	0	44
Saturday, 15-12-18	0	33	21	0	49	38	0	48	37
Sunday, 16-12-18	42	29	19	50	47	39	49	47	38
Monday, 17-12-18	41	26	20	48	44	38	47	45	37
Tuesday, 18-12-18	41	34	28	48	48	45	48	47	46
Wednesday, 19-12-18	34	25	19	49	53	39	51	49	36
Thursday, 20-12-18	0	27	33	0	48	47	0	0	47
Friday, 21-12-18	36	26	19	50	44	38	49	47	36
Saturday, 22-12-18	36	40	26	60	56	46	59	57	46
Sunday, 23-12-18	35	25	20	48	41	39	47	46	38
Monday, 24-12-18	36	27	19	46	47	39	46	45	37
Tuesday, 25-12-18	39	28	19	48	49	48	48	48	48
Wednesday, 26-12-18	39	28	19	49	49	54	49	51	39
Thursday, 27-12-18	39	28	19	55	48	42	54	52	41
Friday, 28-12-18	39	27	0	50	48	0	50	0	0
Summary Values	39	27	20	53	49	45	52	50	43

Notes:

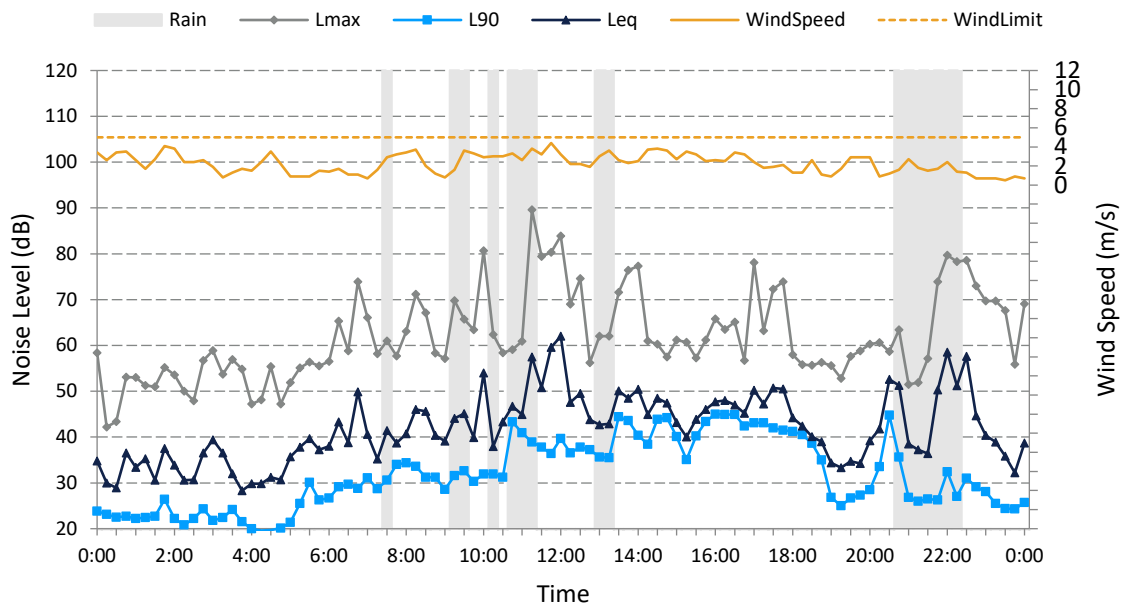
0 indicates periods with too few valid samples due to weather or logger operation

Leq24hr encompasses the period 7am to 7am

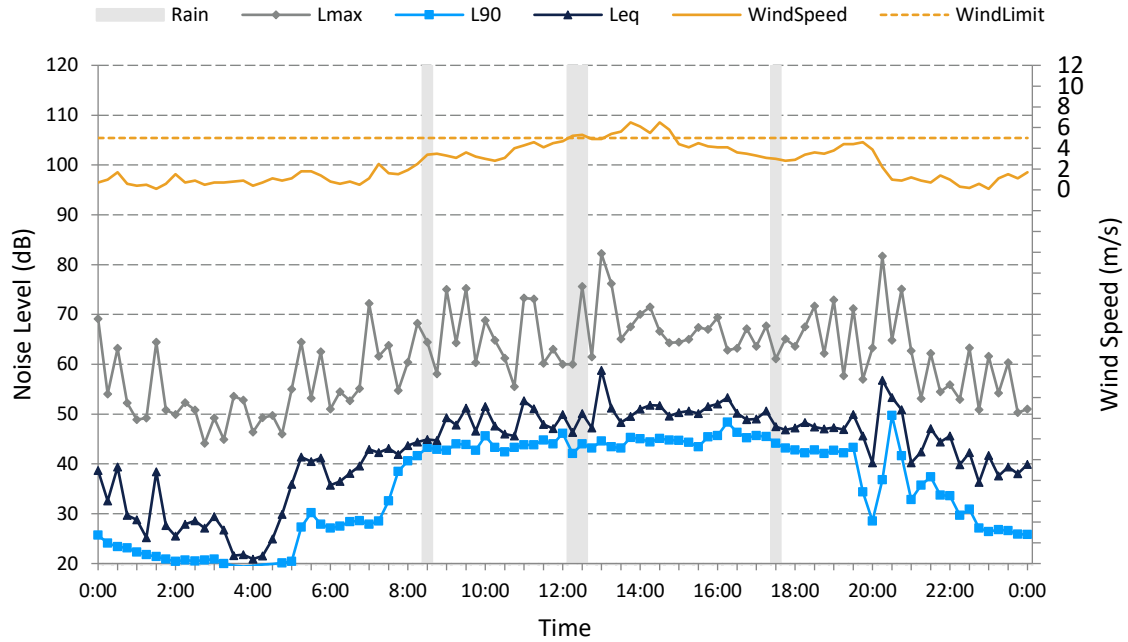
**Measured ambient noise levels
39 Mount View Road, Clandulla
Thursday, 13-12-18**



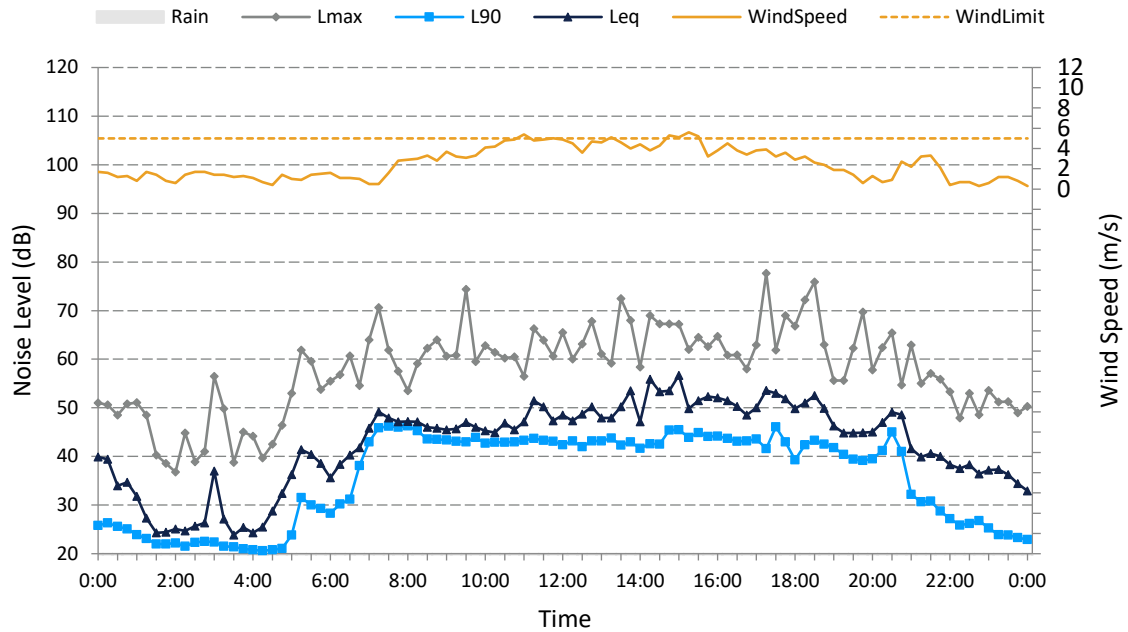
**Measured ambient noise levels
39 Mount View Road, Clandulla
Friday, 14-12-18**



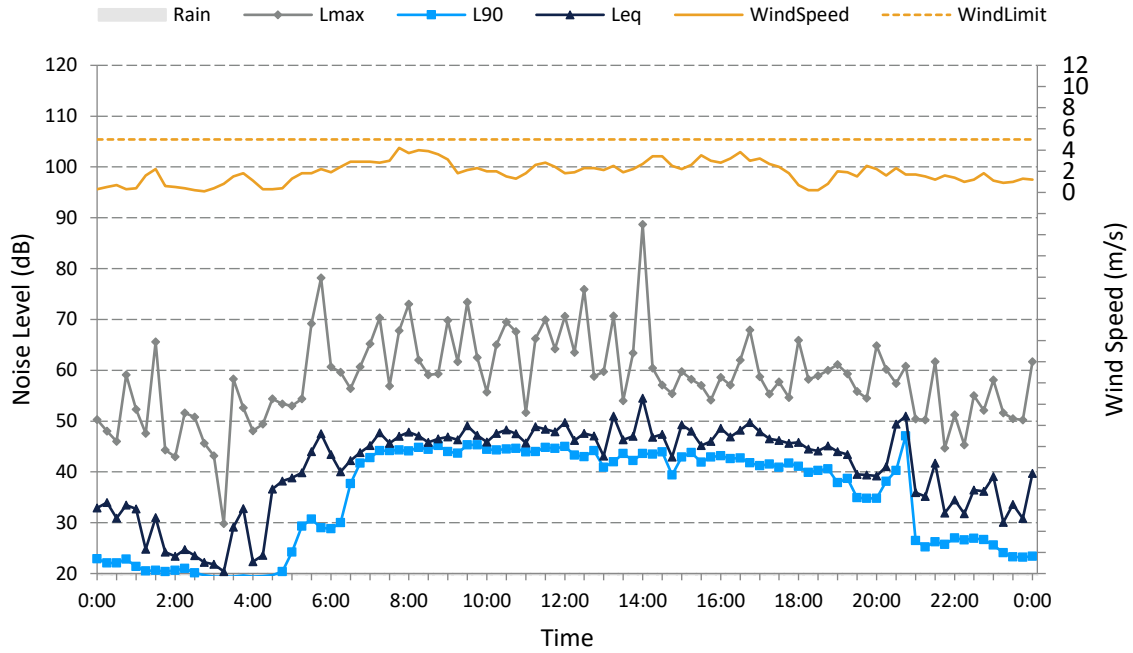
**Measured ambient noise levels
39 Mount View Road, Clandulla
Saturday, 15-12-18**



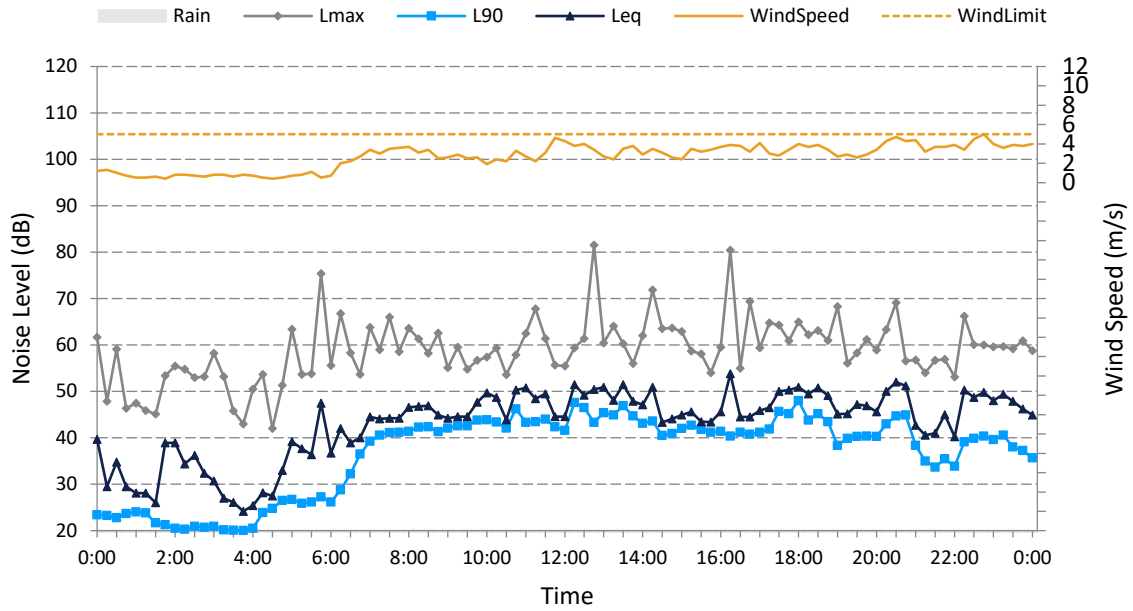
**Measured ambient noise levels
39 Mount View Road, Clandulla
Sunday, 16-12-18**



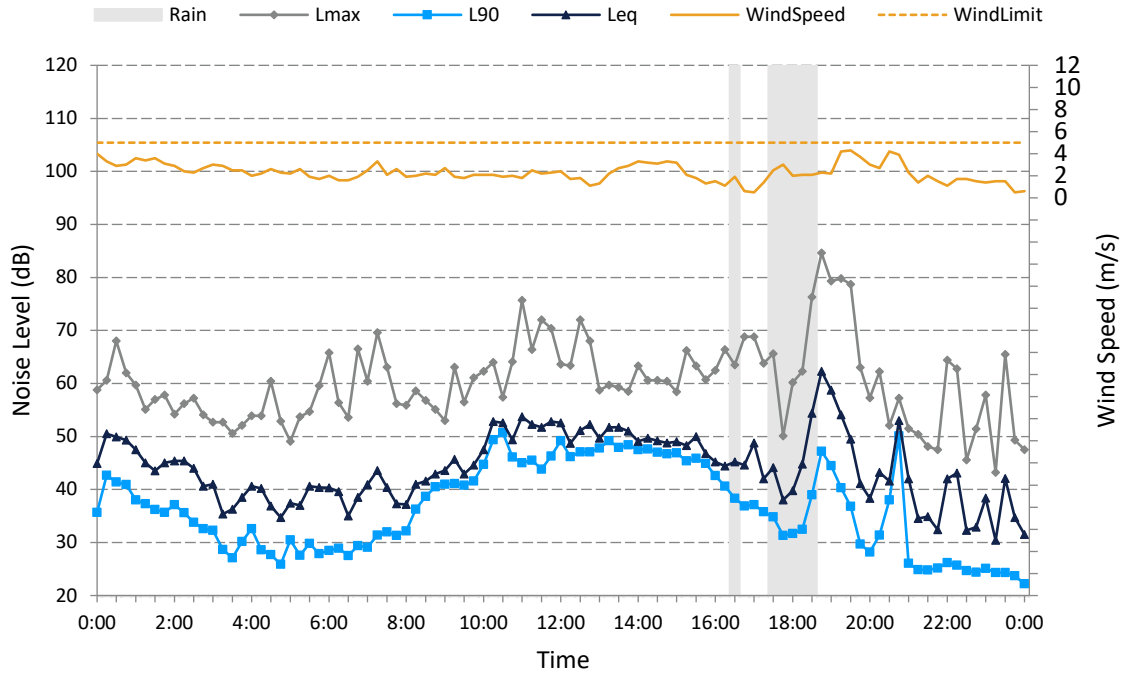
**Measured ambient noise levels
39 Mount View Road, Clandulla
Monday, 17-12-18**



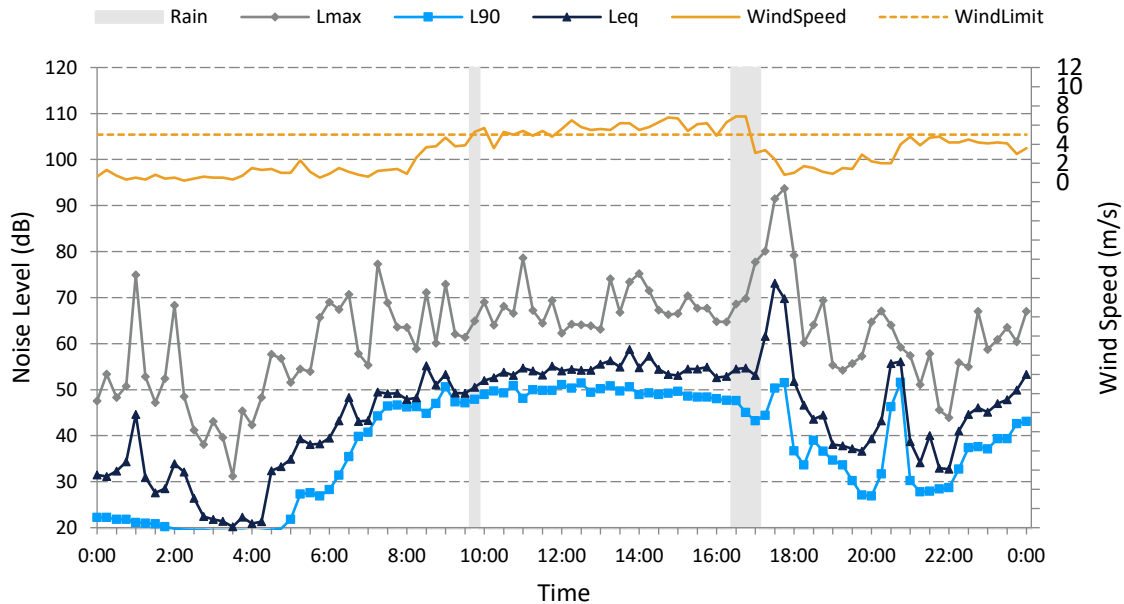
**Measured ambient noise levels
39 Mount View Road, Clandulla
Tuesday, 18-12-18**



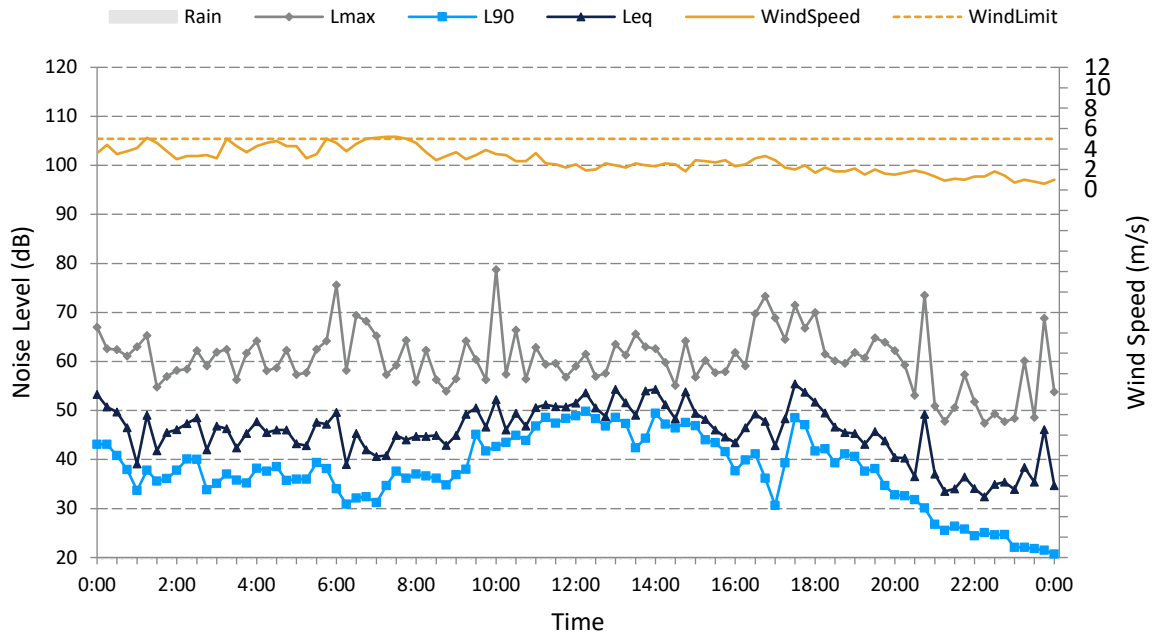
**Measured ambient noise levels
39 Mount View Road, Clandulla
Wednesday, 19-12-18**



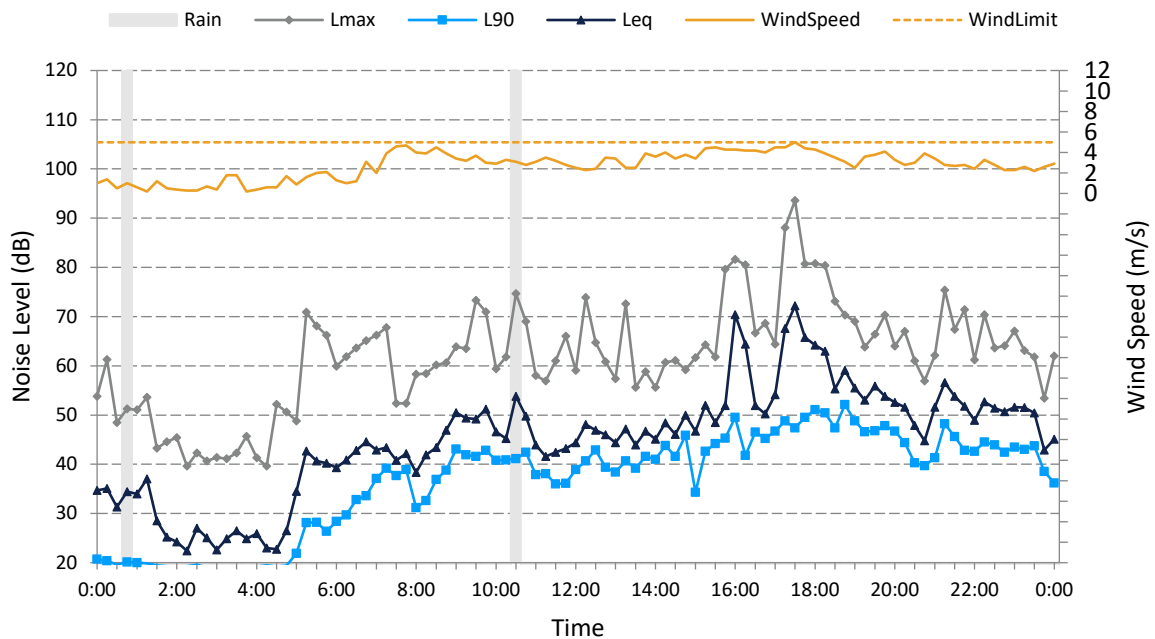
**Measured ambient noise levels
39 Mount View Road, Clandulla
Thursday, 20-12-18**



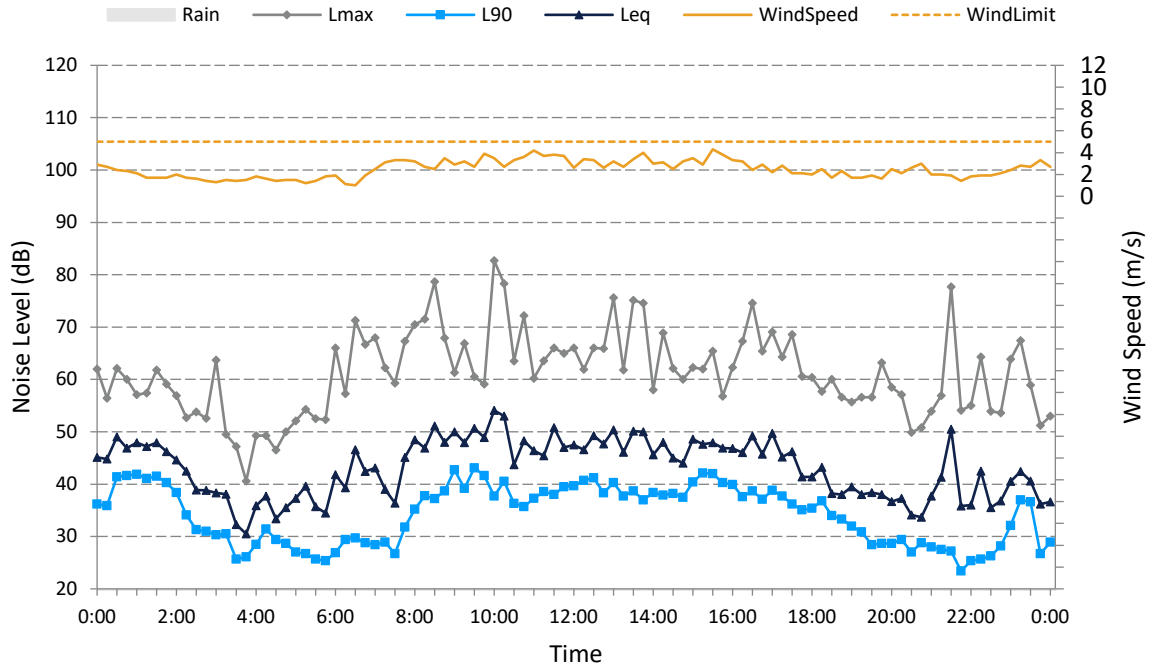
**Measured ambient noise levels
39 Mount View Road, Clandulla
Friday, 21-12-18**



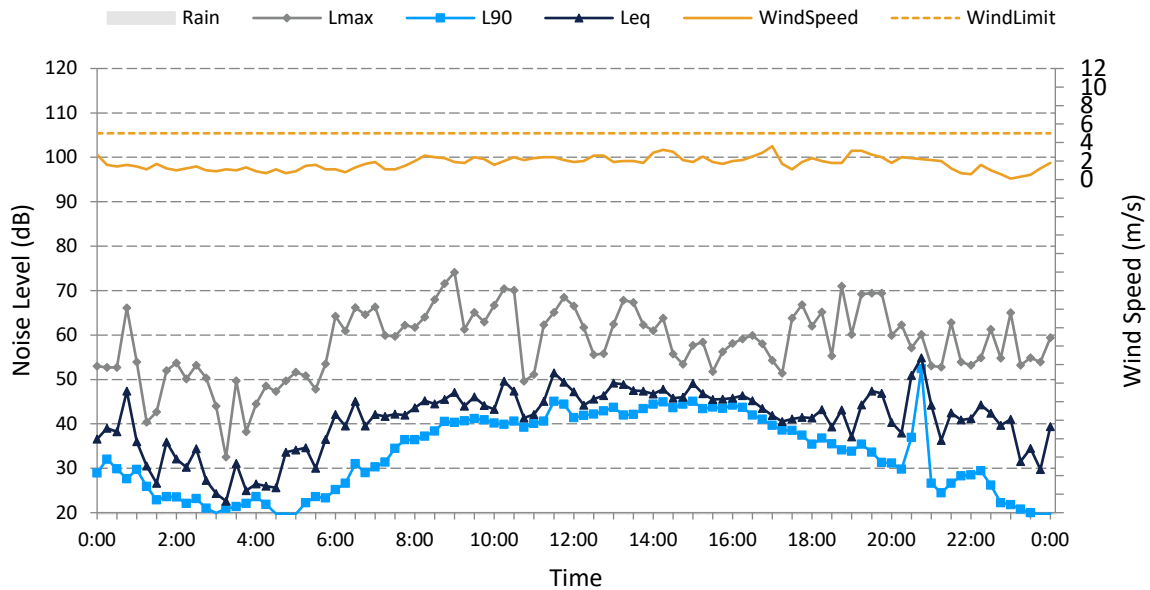
**Measured ambient noise levels
39 Mount View Road, Clandulla
Saturday, 22-12-18**



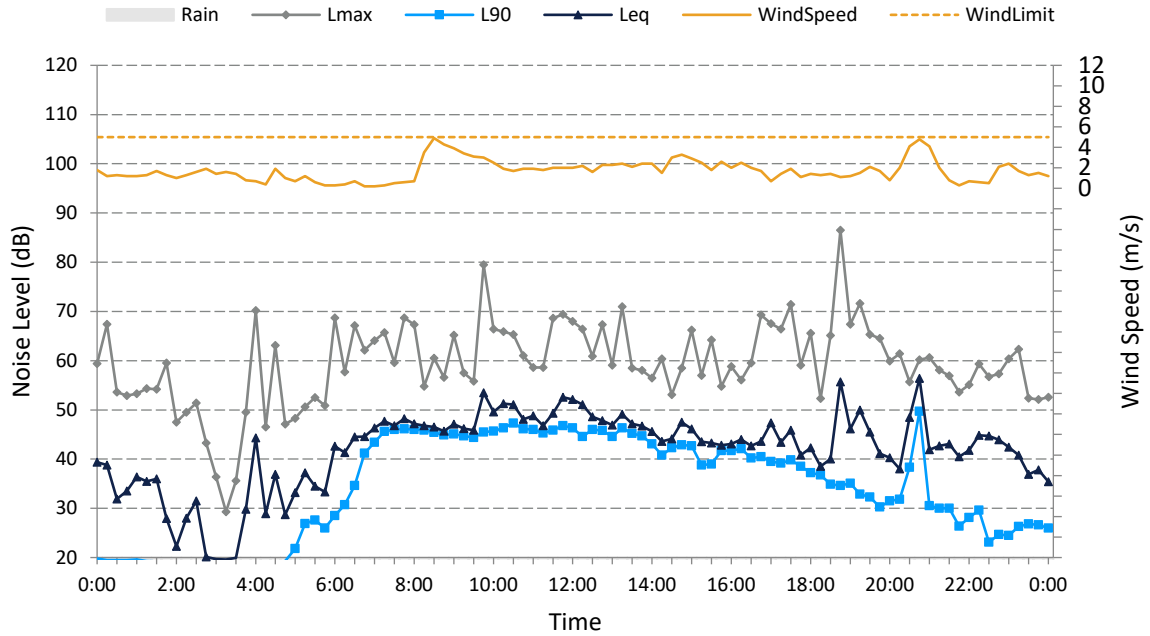
**Measured ambient noise levels
39 Mount View Road, Clandulla
Sunday, 23-12-18**



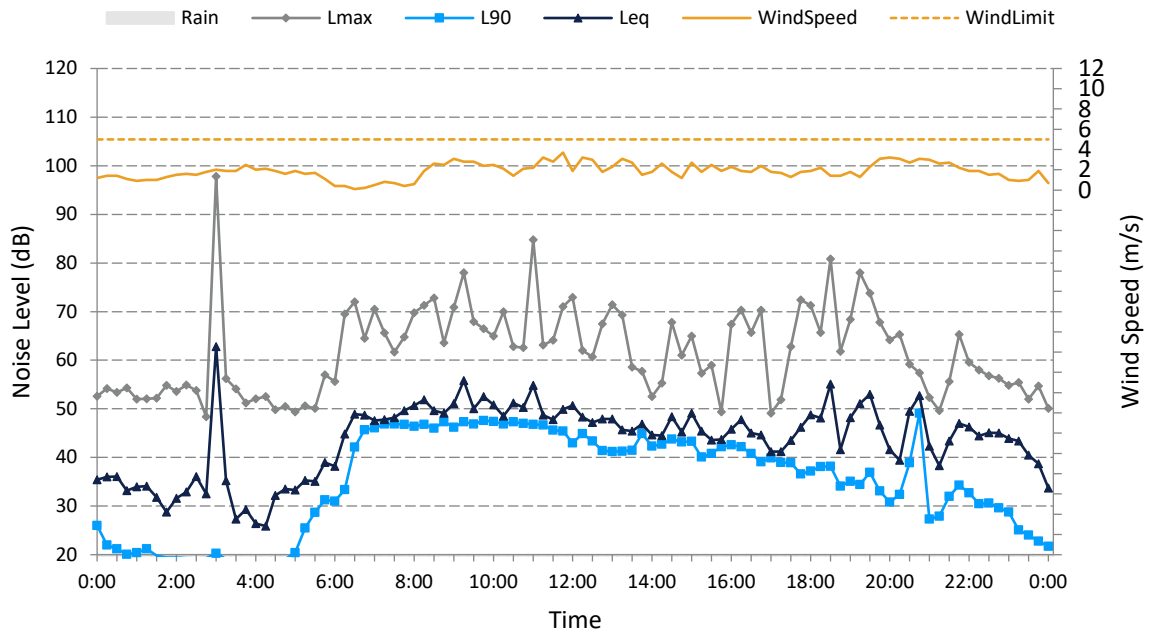
**Measured ambient noise levels
39 Mount View Road, Clandulla
Monday, 24-12-18**



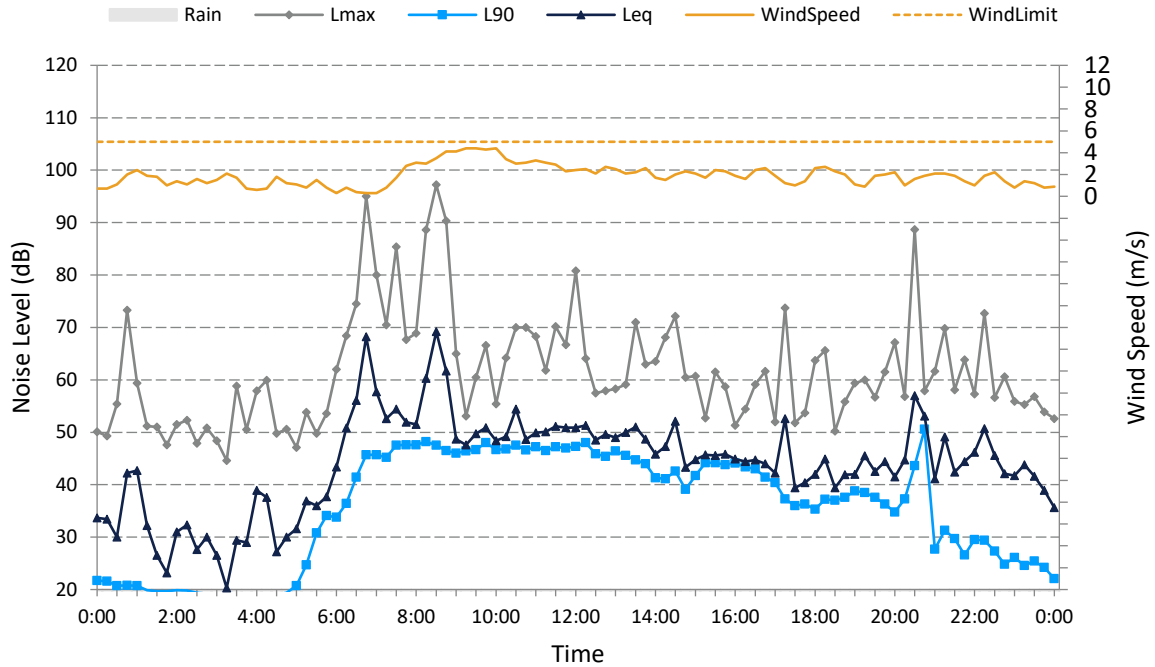
Measured ambient noise levels
39 Mount View Road, Clandulla
Tuesday, 25-12-18



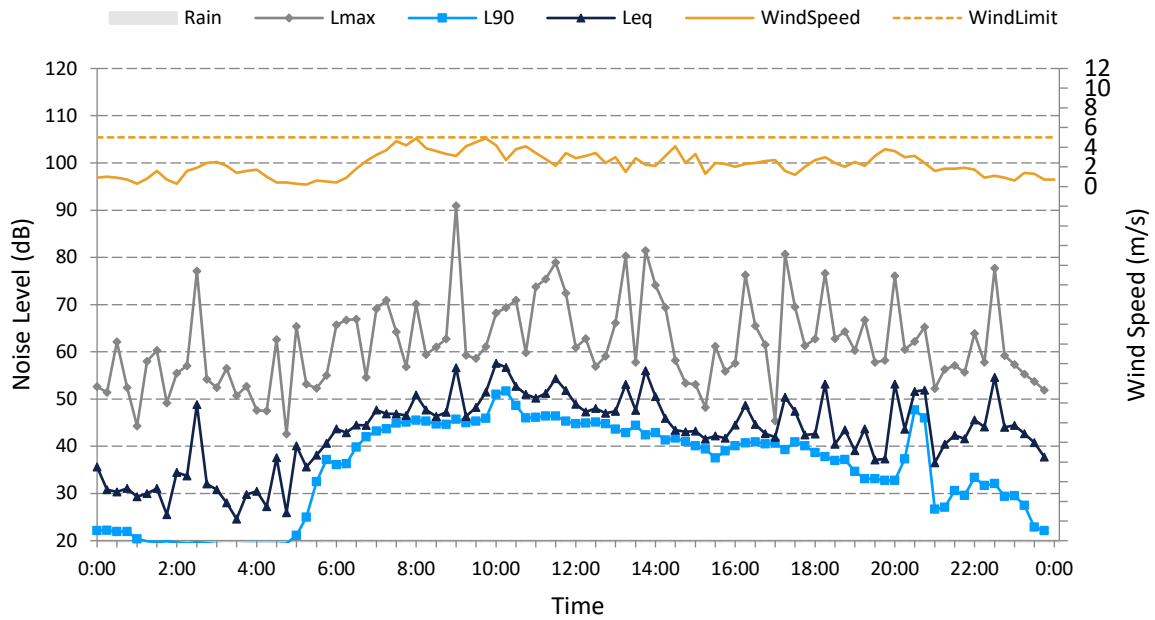
Measured ambient noise levels
39 Mount View Road, Clandulla
Wednesday, 26-12-18



**Measured ambient noise levels
39 Mount View Road, Clandulla
Thursday, 27-12-18**



**Measured ambient noise levels
39 Mount View Road, Clandulla
Friday, 28-12-18**

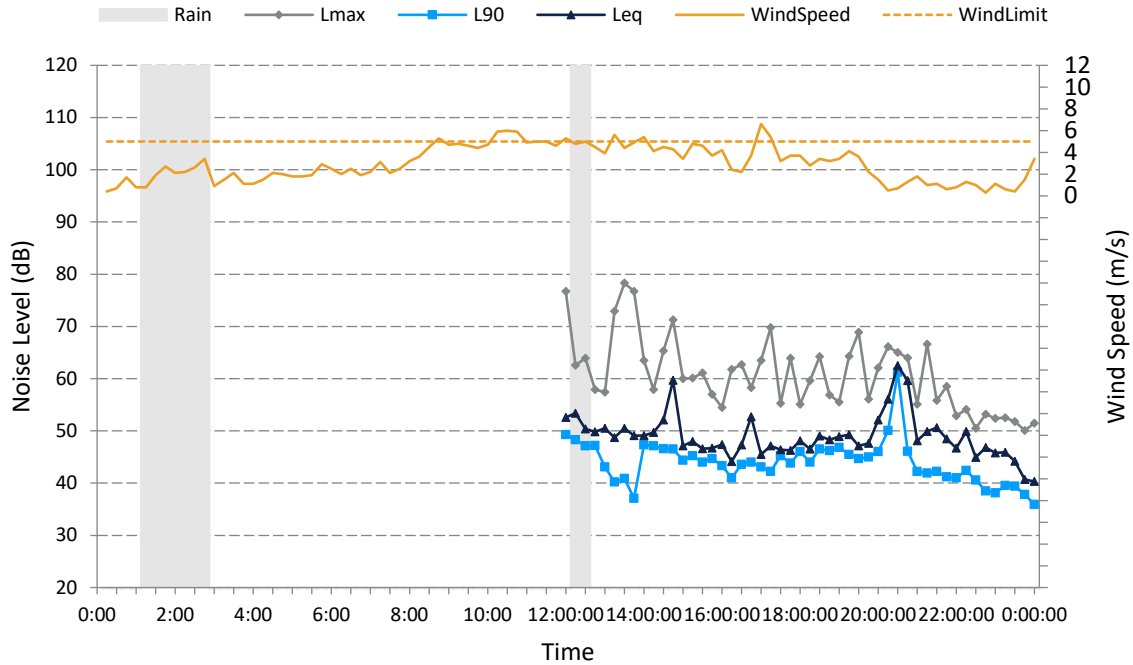


Date	ABL Day	ABL Evening	ABL Night	L _{Aeq,11 hour} Day	L _{Aeq,4 hour} Evening	L _{Aeq,9 hour} Night	L _{Aeq,15 hour} Day	L _{Aeq,24 hour} Day	L _{Aeq,8 hour} Night
Thursday, 13-12-18		41	19	0	54	43	0	0	42
Friday, 14-12-18			20	0	0	44	0	0	44
Saturday, 15-12-18		45	18	0	60	44	0	54	44
Sunday, 16-12-18	47	48	18	59	59	47	59	57	48
Monday, 17-12-18	50	50	25	60	59	48	60	58	48
Tuesday, 18-12-18	58	46	25	64	56	45	62	61	45
Wednesday, 19-12-18	43	33	17	57	55	45	57	55	45
Thursday, 20-12-18		42	30	0	57	47	0	0	48
Friday, 21-12-18	38	36	16	63	52	42	62	60	41
Saturday, 22-12-18	30	31	21	57	45	41	56	54	38
Sunday, 23-12-18				0	0	0	0	0	0
Summary Values	45	42	19	61	57	45	60	58	45
Notes:	34	33	17						

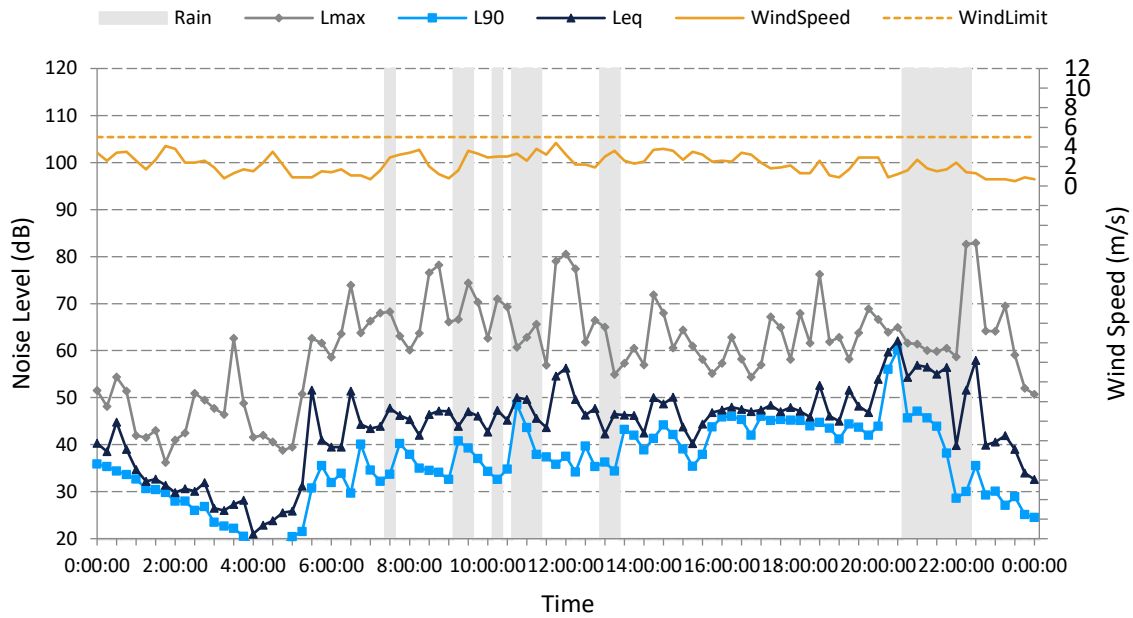
0 indicates periods with too few valid samples due to weather or logger operation

Leq24hr encompasses the period 7am to 7am

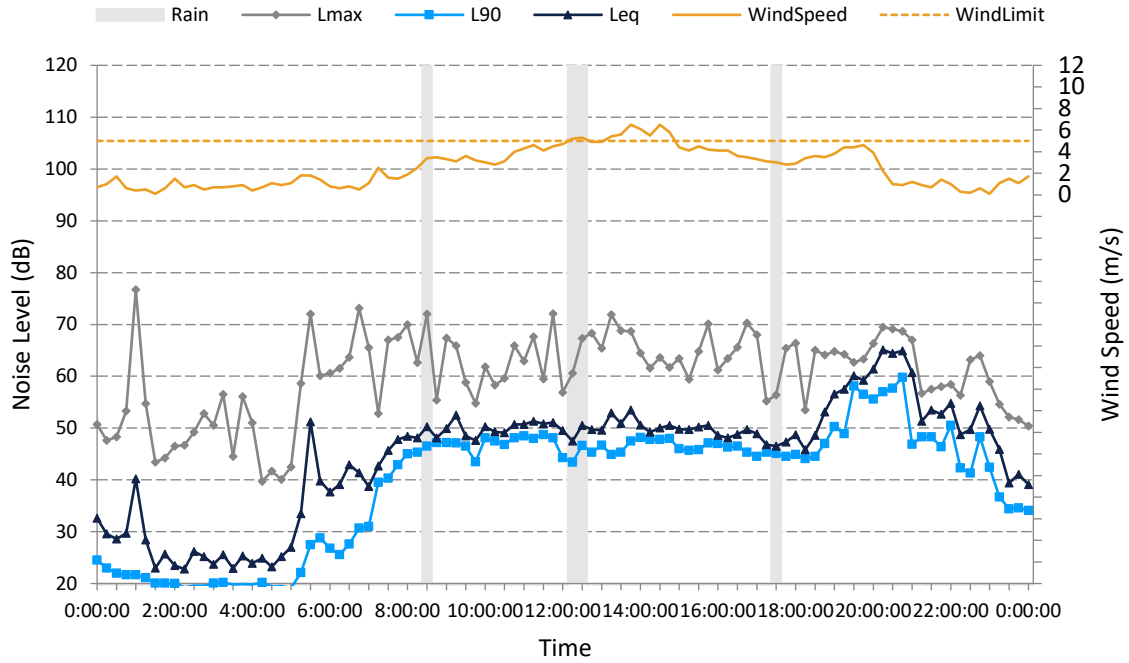
**Measured ambient noise levels
537 Cooper Drive, Clandulla
Thursday, 13-12-18**



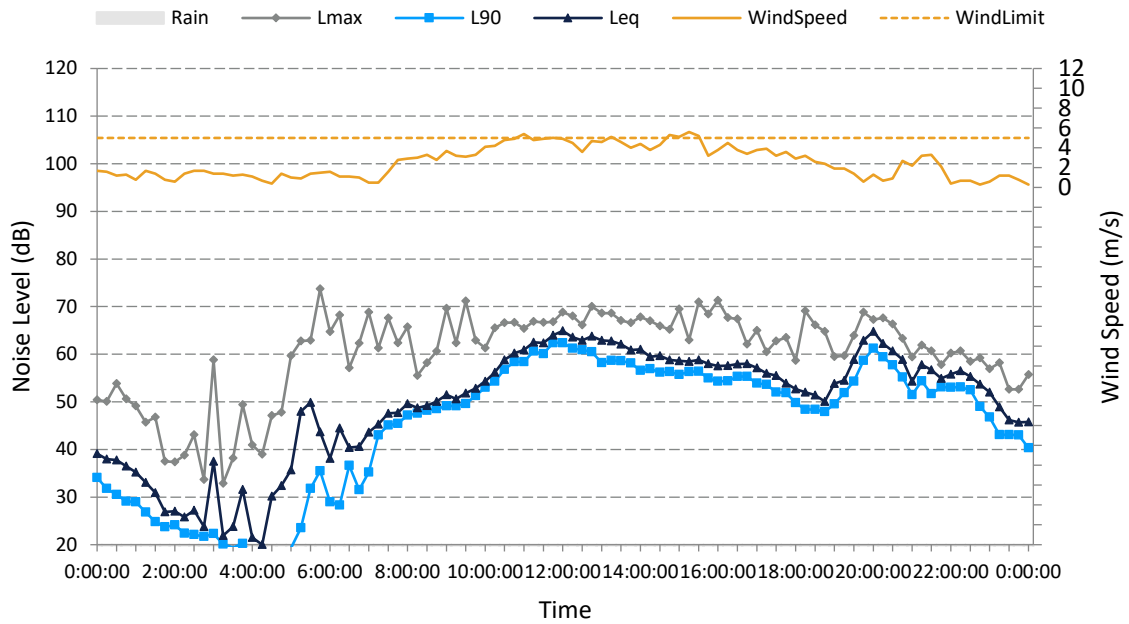
**Measured ambient noise levels
537 Cooper Drive, Clandulla
Friday, 14-12-18**



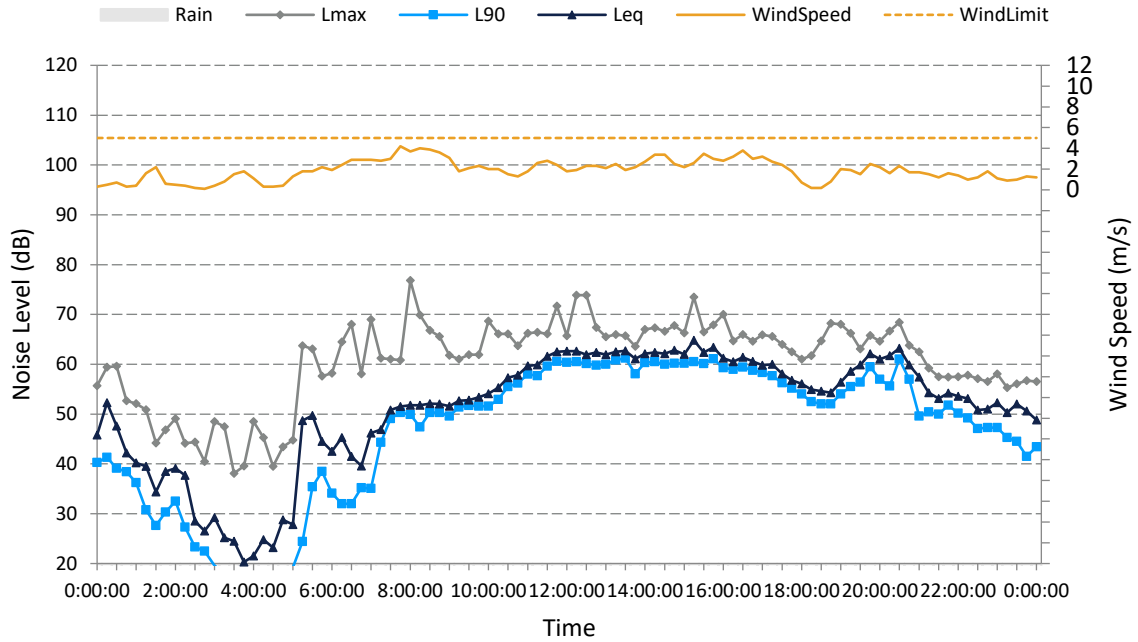
Measured ambient noise levels
537 Cooper Drive, Clandulla
Saturday, 15-12-18



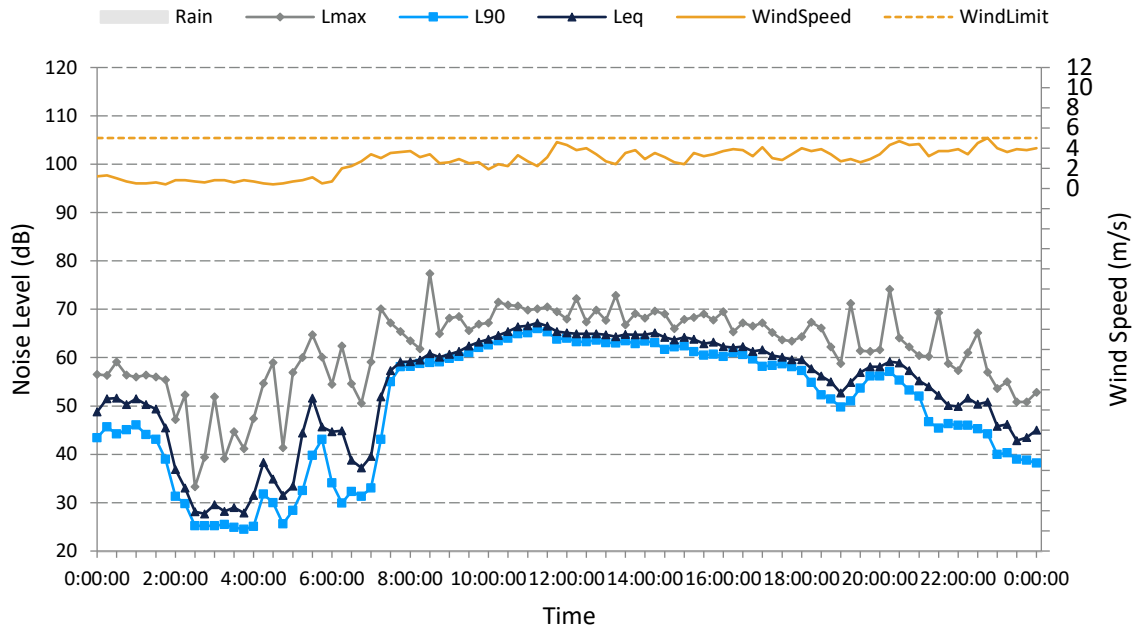
Measured ambient noise levels
537 Cooper Drive, Clandulla
Sunday, 16-12-18



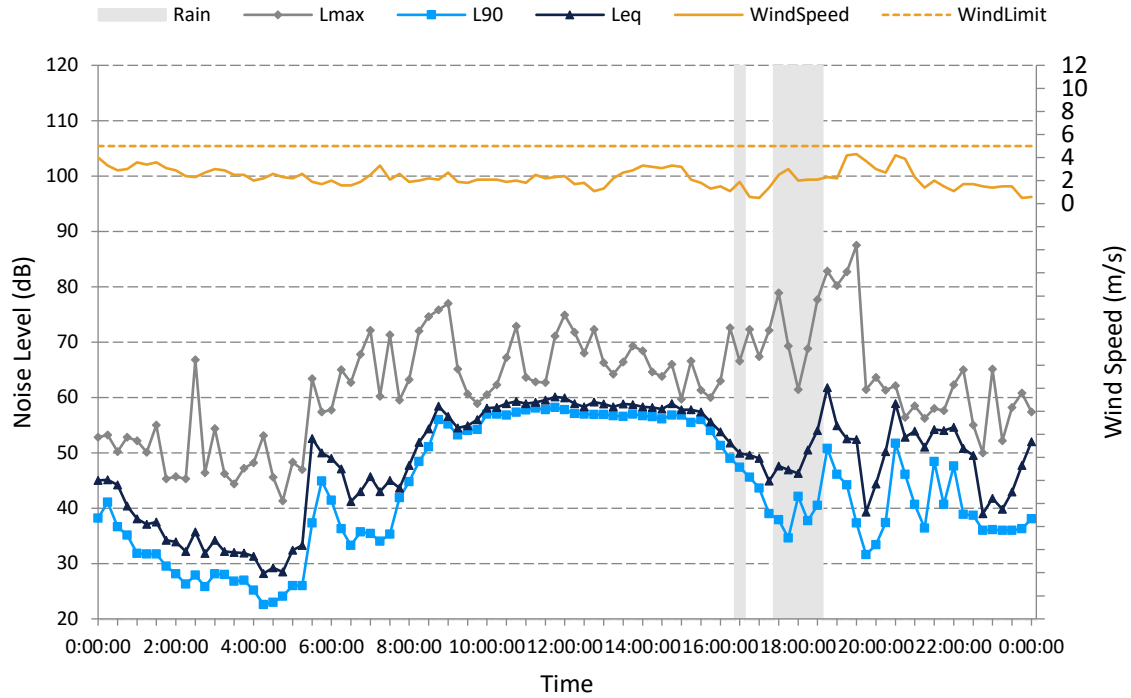
**Measured ambient noise levels
537 Cooper Drive, Clandulla
Monday, 17-12-18**



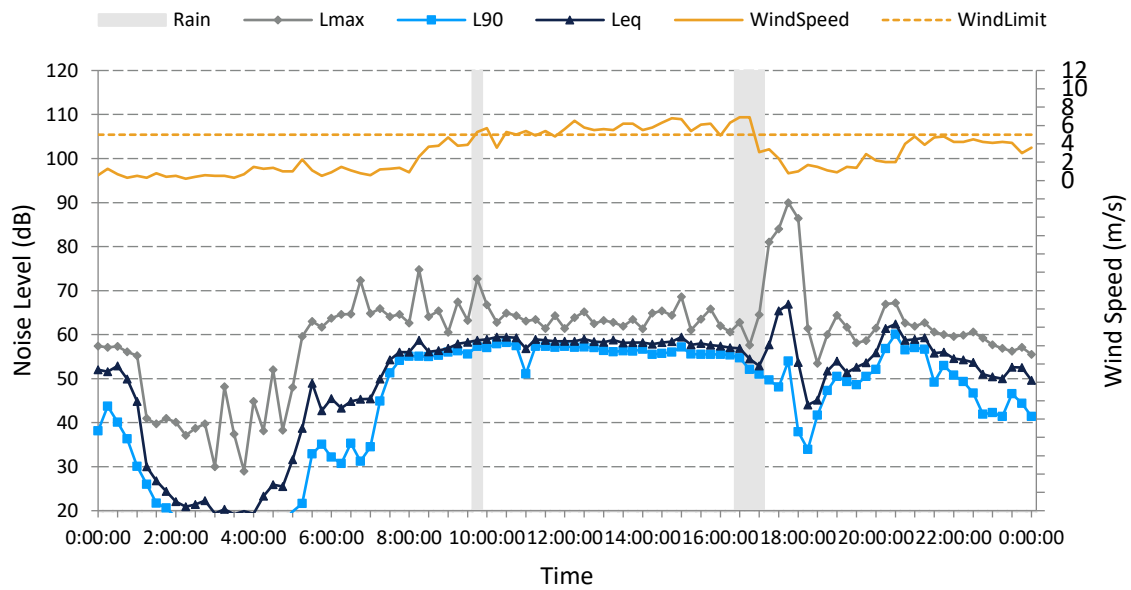
**Measured ambient noise levels
537 Cooper Drive, Clandulla
Tuesday, 18-12-18**



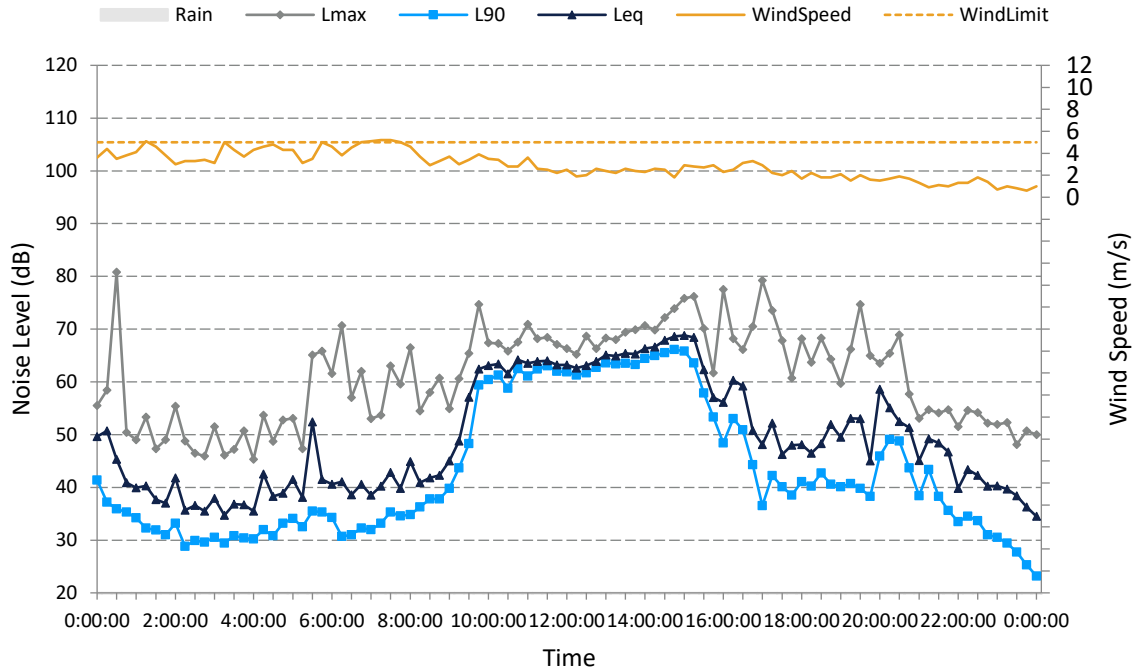
**Measured ambient noise levels
537 Cooper Drive, Clandulla
Wednesday, 19-12-18**



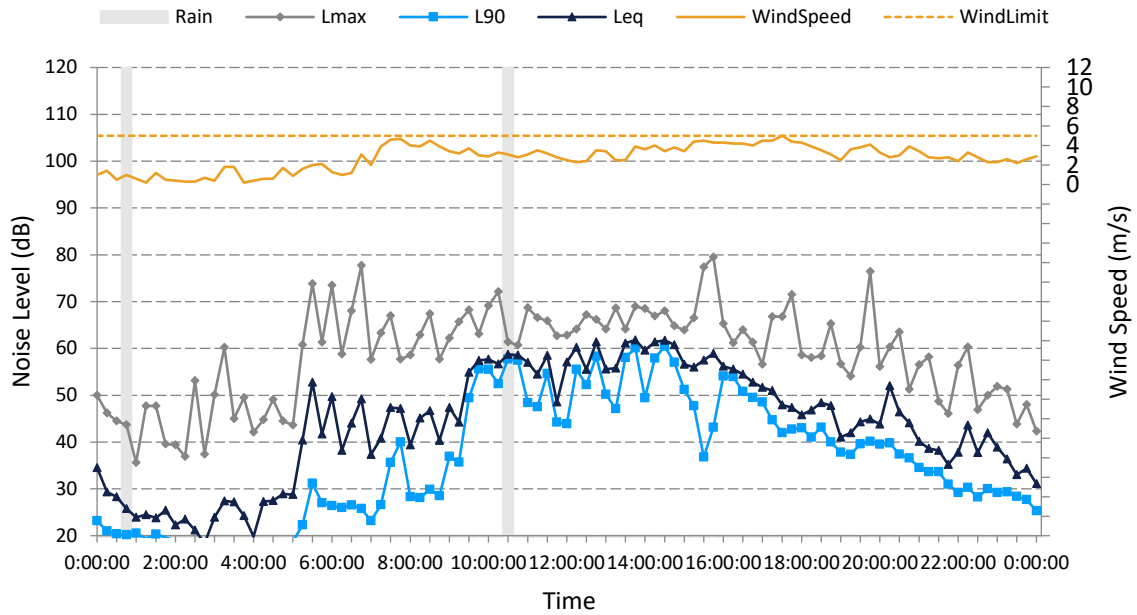
**Measured ambient noise levels
537 Cooper Drive, Clandulla
Thursday, 20-12-18**



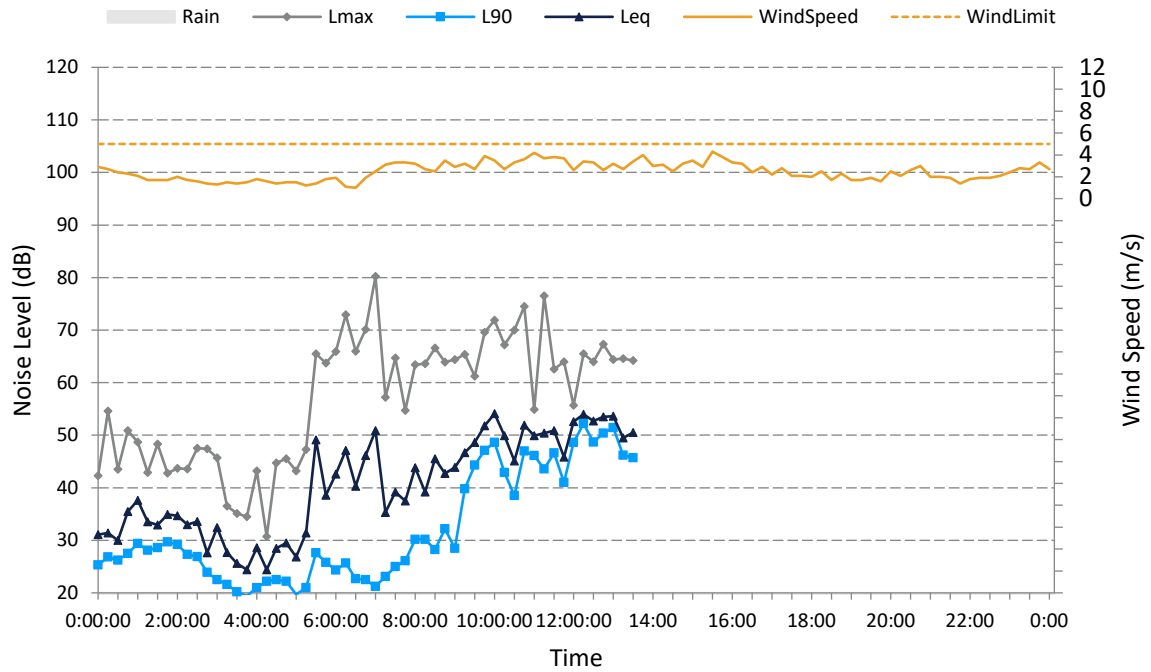
**Measured ambient noise levels
537 Cooper Drive, Clandulla
Friday, 21-12-18**



**Measured ambient noise levels
537 Cooper Drive, Clandulla
Saturday, 22-12-18**

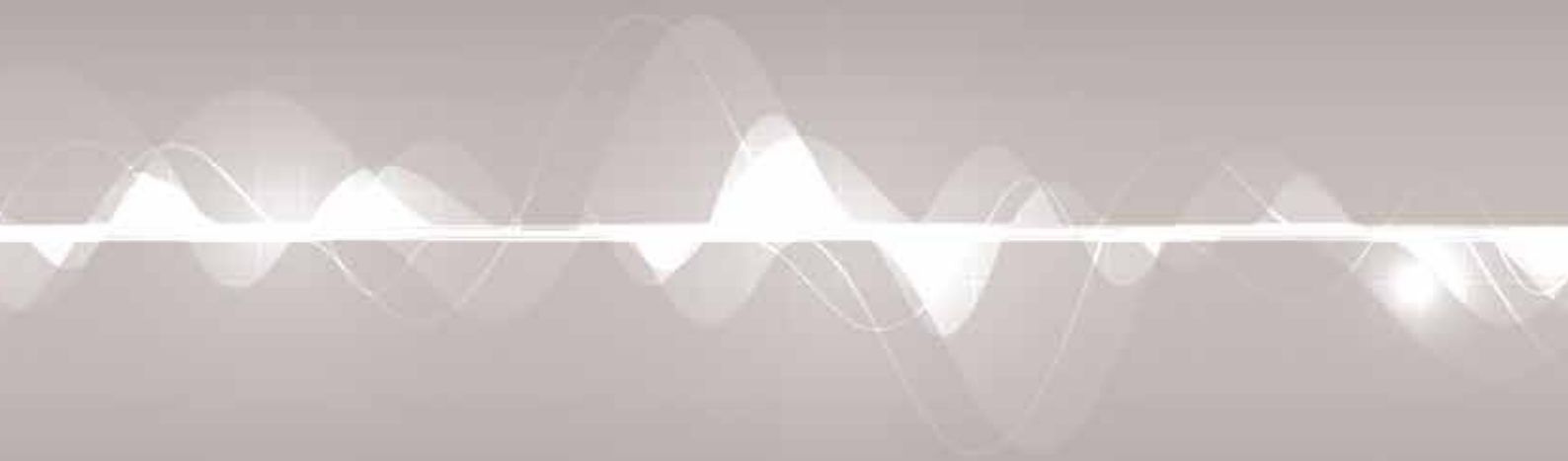


Measured ambient noise levels
537 Cooper Drive, Clandulla
Sunday, 23-12-18



Appendix B

Modelled noise source locations





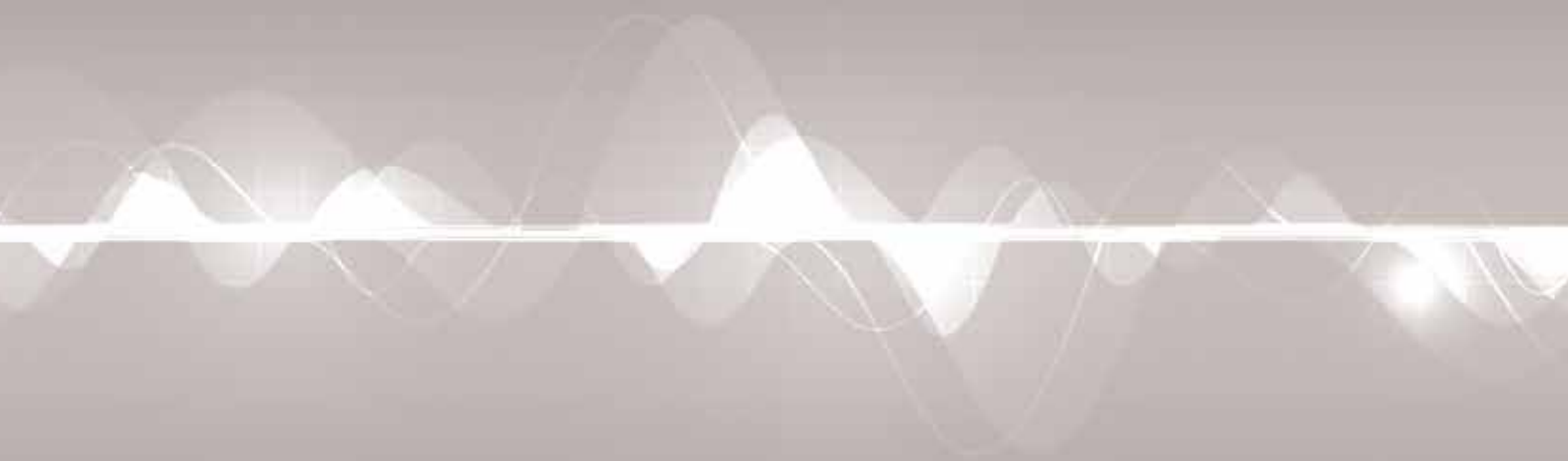




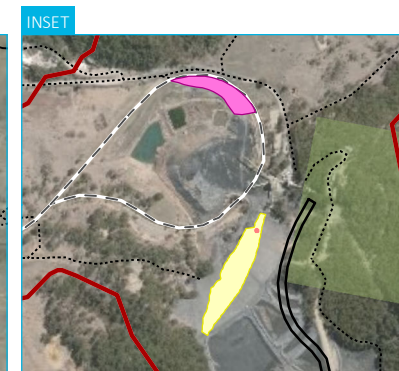
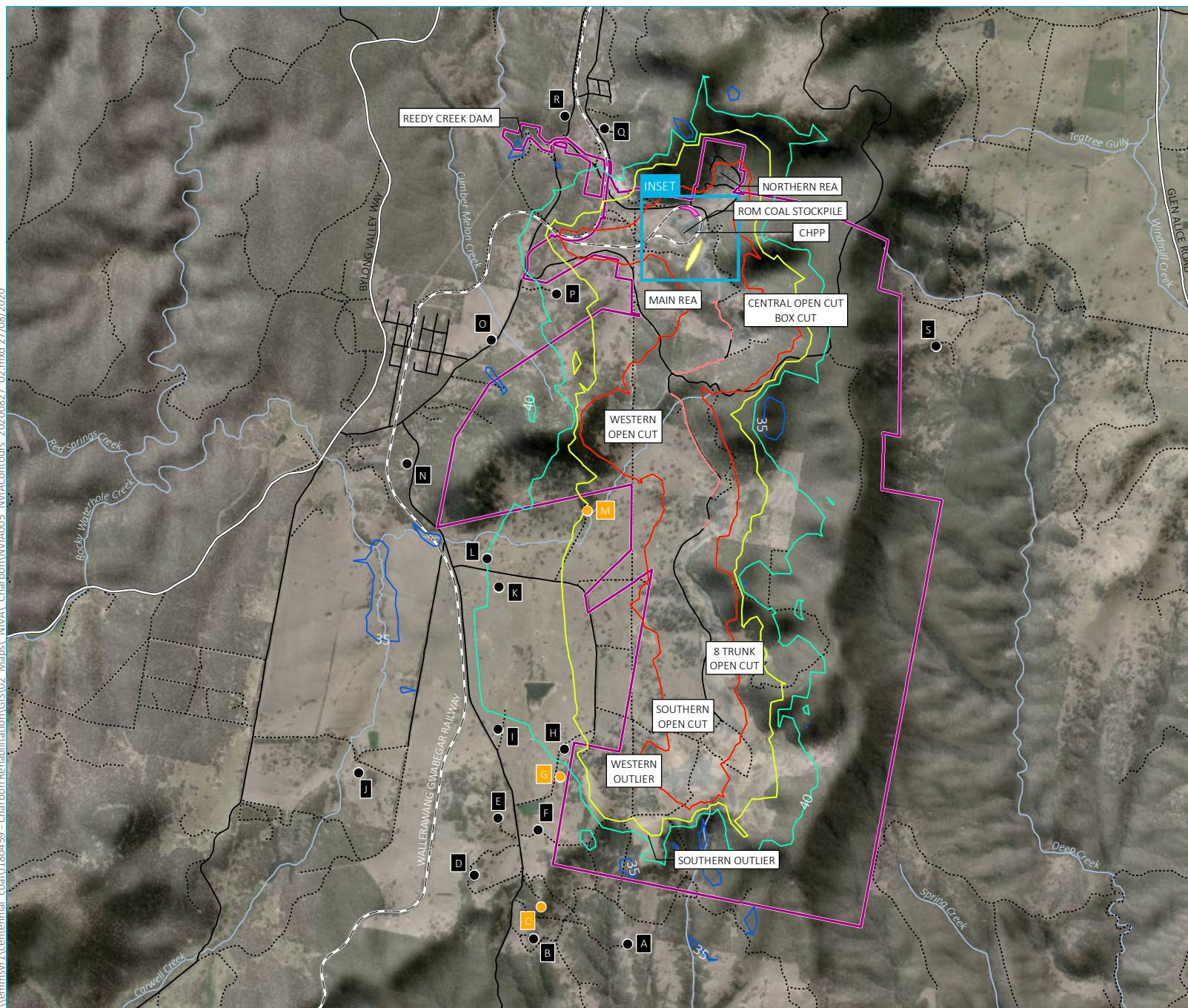


Appendix C

Operational noise contours - proposed modification



\\lemmsvr1\centennial_coal\1180459 - Charbon Rehabilitation\GIS\02 Maps\ NVA\ Charbon\NVA\A005 NV\AContours 202\00827 02.mxd 27/08/2020



- KEY**
- Charbon Colliery project site boundary
 - Sensitive receiver
 - Centennial-owned property
 - Rail line
 - Main road
 - Local road
 - Vehicular track
 - Watercourse
 - Operational noise contour**
 - 35 dB(A)
 - 40 dB(A)
 - 44 dB(A)
 - 50 dB(A)
 - Proposed modification elements**
 - Hardstand
 - Link road
 - Haul road widening

Operational noise contours - noise-enhancing meteorology

Charbon Colliery Modification 2
Noise and vibration impact assessment
Figure C.1



