



Statement of Environmental Effects

Received
Date: 19/1/26
DA 10.2007.73.4



s.4.55(2) Modification Application: Glenella Quarry

Lot 35 & 44 DP 752935 (Cowra LGA); and Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 (Hilltops LGA)
No. 483 Battery Road, Cowra NSW 2794

Prepared by:

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No.483 Battery Road, Cowra NSW 2794

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Dated: January 2026



ACKNOWLEDGEMENT

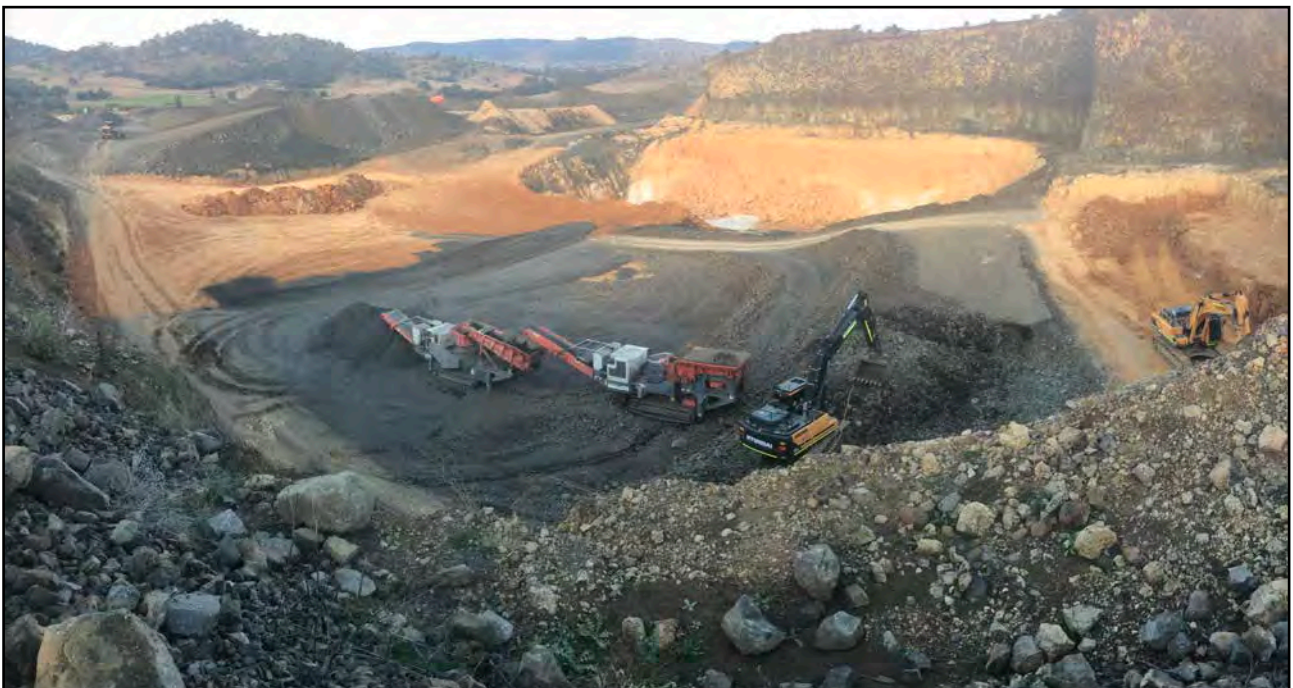
We respect and honour Aboriginal and Torres Strait Islander Elders past, present and future. We acknowledge the stories, traditions and living cultures of Aboriginal and Torres Strait Islander peoples on this land and commit to building a brighter future together.



Glenella Quarry is a certified indigenous business with Supply Nation as well as NSW Indigenous Chamber of Commerce (NSWICC) Assured Member and FACCI Affiliate.



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PHOTOGRAPH 1: View looking north out over existing active quarry pit showing existing quarry processing plant and equipment

(Source: Glenella Quarry Pty Ltd)

Contents

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Section		Page No.
	Executive Summary	7
1	Introduction	8
	1.1 Overview	8
	1.2 Structure of this Modification Report	9
2	Existing Environment	13
	2.1 Site Location, Property Description and Ownership	13
	2.2 Existing Operations: Glenella Quarry	13
	2.3 Planning Approvals History: Glenella Quarry	22
	2.4 EPA Environment Protection Licence No 20632 and ML 1692	23
	2.5 Surrounding Development	23
	2.6 Site Features: Summary	25
3	Modifications Proposed	26
	3.1 Overview	26
	3.2 Details & Justification for Proposed Modifications	27
	3.3 Summary: Consistency with Reasons for Granting of Original Consent	28
4	Proposed Modified Conditions of Consent DA73/2007 & DA117/06	30
	4.1 Summary: Conditions of Consent Affected by Modifications	30
	4.2 Proposed Modification of Development Consents DA73/2007 & DA117/06	30
5	Section 4.55 Modification: Statutory Matters	32
	5.1 Overview: Types of Modifications and Modification Sought	32
	5.2 Other Relevant s.4.55(2) Considerations	33
6	The First Modification 'Test': 'Substantially the Same' Development	35
	6.1 Overview and Comparison of Existing Consent(s) vs Proposed Modifications	35
	6.2 Quantitative and Qualitative Aspects of Proposed Modification vs Existing Consent	36
	6.3 Conclusion: 'Substantially the Same' Development	38
7	The Second Modification 'Test': s.4.15(1) Assessment	40
	7.1 Overview: the Second 'Test' of a Modification	40
	7.2 Consistency with Objects of the EP&A Act 1979	40
	7.3 Section 4.15(1) Compliance: Summary	42
	7.4 Section 4.15(1)(a)(i) Planning instruments	43
	7.5 Section 4.15(1)(a)(ii) Any Development Control Plan	53
	7.6 Section 4.15(1)(a)(iii) Any Planning Agreements	54



	7.7 Section 4.15(1)(a)(iv) The Regulations	54
	7.8 Section 4.15(1)(b) Likely Impacts	55
	7.9 Section 4.15(1)(c) Suitability of the site for the proposed development	68
	7.10 Section 4.15(1)(e) Public Interest	69
8	Project Evaluation and Conclusions	72
9	Glossary of Terms	73
	Appendices	
	Appendix A: Acoustic assessment by Waves Acoustic Consulting Pty Ltd	
	Appendix B: Traffic assessment by Streetwise	
	Appendix C: EPA Compliance History & Environmental Risk Category for Quarry	
	Appendix D: Martens & Associates water assessment and Approved Water Access Licence (WAL)- Zero Share	
	Appendix E: Air quality impact assessment by Northstar Air Quality Pty Ltd	
	Appendix F: NSW Rural Fire Service online portal	



PHOTOGRAPH 2: Drone photography from north-east of quarry over existing quarry stockpiles, active extraction area, and processing areas

(Source: Glenella Quarry Pty Ltd)

Executive Summary

■ Outline Planning Consultants Pty Ltd has been engaged by Glenella Quarry Pty Ltd, the quarry operator/owner, to prepare this Statement of Environmental Effects (SEE) report. As the owner of the land the subject of this modification Glenella Quarry Pty Ltd consents to the making of this application.

■ The approved quarry extraction area and associated uses ('Project Site') straddles the boundary between the Cowra local government area (LGA) and that of the Hilltops LGA, as follows.

Part of Quarry in Cowra LGA	Part of Quarry in Hilltops LGA
Lots 35 & 44 DP 752935 (approx. 35ha)	Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 (approx. 29ha)

■ The quarry operates pursuant to two operative development consents which are almost identical in terms of their approval conditions, namely:

Cowra Council	Hilltops (formerly Boorowa) Council
Development Application No. 73/2007 Consent issued 27 August 2007	Development Application No. 117/06. Consent issued 25 September 2007

■ This SEE report supports an application to both Cowra and Hilltops councils pursuant to the provisions of Section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for a modification to the above two (2) development consents to allow the following:

■ An increase in the maximum allowable rate of extraction, from the current 200,000 tonnes per annum to 499,000 tonnes per annum.

■ The existing development consents (above) allow for a maximum of 35 loaded trucks per day leaving the quarry/mine site. This s.4.55(2) modification application seeks an increase to 50 loaded trucks per day, an increase of 15 loaded trucks per day or an average increase of 1.5 loaded trucks per day.

■ Arising from the noise and air quality impact assessments undertaken in support of the proposed s.4.55(2) modification, changes to permitted daytime noise levels and monitoring. The changes to noise limits also has the benefit of bringing the quarry/mine operation in line with the current NSW *Noise Policy for Industry* (2017), which came into force some 10 years after the above consents were issued.

■ The quarry development proposed by this s.4.55(2) modification application, as detailed in this SEE report, is the same or substantially the same as the approved quarry development in terms of the nature of the development, as modified, and potential environmental impacts. Importantly, no changes are proposed to the currently approved quarry operation generally, and in particular in terms of the approved quarry extraction area, size of the resource to be won, or operating hours, other than to allow the winning of heavy minerals- a by product of the already approved sand processing operations and deletion of dust monitoring.

■ The following report provides the information required by Clause 100 of the *Environmental Planning & Assessment Regulation 2021* (EP&A Regulation 2021). The assessment concludes that the existing management and mitigation measures developed for the quarry have been shown to be effective in minimising and managing environmental impacts arising from the modifications sought by this Section 4.55(2) application, consistent with its current operations, and in particular in terms of noise and blasting, air, water, traffic and amenity values.

1. Introduction

1.1 Overview

Outline Planning Consultants Pty Ltd act for Glenella Quarry Pty Ltd, the quarry operator and owner. The approved quarry (refer to photographs and figures) straddles the boundary between the Cowra local government area (LGA) and that of the Hilltops LGA, as follows. The existing approved DA area covers approximately 54 hectares (ha), 29 ha of which is located within the Hilltops local government area (LGA) with the remaining 35 ha located within the Cowra LGA- refer **Figures 1.2** and **2.1**:

Part of Quarry in Cowra LGA	Part of Quarry in Hilltops LGA
Lots 35 & 44 DP 752935 (approx. 35ha)	Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 (approx. 29ha)

The quarry enjoys a development consent from Cowra and (then) Boorowa (now Hilltops) councils to extract basalt, quartz pebble/sand, gold and clays from the approved extraction areas- the consents being virtually identical. Outline Planning Consultants Pty Ltd have been commissioned to prepare and to lodge an application pursuant to section 4.55(2) of the *Environmental Planning and Assessment Act 1979* ('EP&A Act') to modify the following development consents:

Cowra Council	Hilltops (formerly Boorowa) Council
Development Application No. 73/2007 Consent issued 27 August 2007	Development Application No. 117/06 Consent issued 25 September 2007

Pursuant to Section 4.55(2) of the EP&A Act the following modifications are sought to the above consents:

- An increase in the maximum allowable rate of extraction, from the current 200,000 tonnes per annum to 499,000 tonnes per annum.
- The existing development consents (above) allow for a maximum of 35 loaded trucks per day leaving the quarry/mine site. This s.4.55(2) modification application seeks an increase to 50 loaded trucks per day, an increase of 15 loaded trucks per day or an average increase of 1.5 loaded trucks per day.
- Arising from the noise and air quality impact assessments undertaken in support of the proposed s.4.55(2) modification, changes to permitted daytime noise levels and monitoring. The changes to noise limits also has the benefit of bringing the quarry/mine operation in line with the current NSW *Noise Policy for Industry* (2017), which came into force some 10 years after the above consents were issued.

The quarry development proposed by this s.4.55(2) modification application is substantially the same as the approved quarry development in terms of the nature of the works proposed and potential environmental impacts. Importantly, no changes are proposed to the currently approved quarry operation generally, and in particular in terms of the approved quarry extraction area or operating hours, other than to allow the winning of heavy minerals- a by product of the already approved sand processing operations.

The following report provides the information required by Clause 100 of the *Environmental Planning & Assessment Regulation 2021* (EP&A Regulation 2021). The assessment concludes that the existing management and mitigation measures developed for the quarry will be effective in minimising and managing environmental impacts arising from the modifications sought by this Section 4.55(2) application, consistent with its current operations, and in particular in terms of noise and blasting, traffic and amenity.

This Statement of Environmental Effects (SEE) includes the following information including:

- Reasons for the proposed modifications and benefits of the modifications sought.
- A description of the approved quarry development the subject of development consents DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council) and details of the modifications sought. **Figure 1.1** shows the location of the approved quarry development site (labelled 'Project Site') in a regional context and **Figure 1.2** shows the currently approved quarry footprint.
- Proposed modified conditions of consent.
- Assessment of the proposed modifications pursuant to section 4.55(2)(a) of the EP&A Act: the **first 'test'** applicable to this s.4.55(2) modification application, namely, that it is 'the same or substantially the same' quarry development. This 'test' needs to be first satisfied before the second 'test' is applied per the decisions of Preston CJ in *Arrage v Inner West Council* [2019] NSWLEC 85 (*Arrage*) and *Canterbury-Bankstown Council v Realize Architecture Pty Ltd* [2024] NSWLEC 31 (*Realize Architecture*).
- Assessment of the proposed modification under the heads of consideration set down under s.4.55(3) and s.4.15(1) of the EP&A Act: the **second 'test'** applicable to this s.4.55(2) modification application.
- Our conclusion and recommendations.

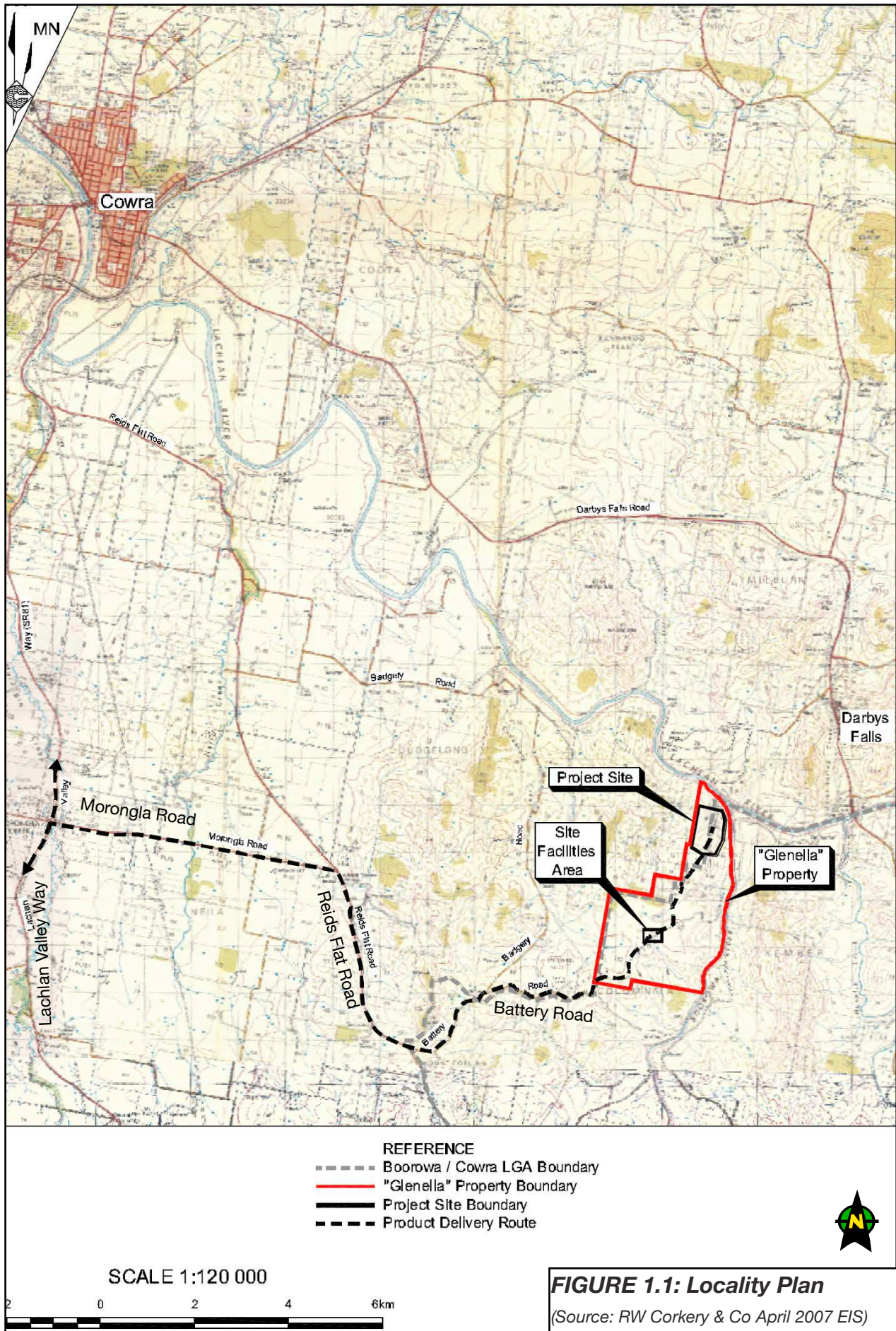
Relevantly, this Section 4.55 application does not seek the grant of a development consent, merely an approval to modify the existing consents issued by both Cowra and (then) Boorowa (now Hilltops) councils. As a result, s.4.12 of the EP&A Act 1979 has no application and neither does Schedule 3 of the *Environmental Planning & Assessment Regulation 2021* (EP&A Regulation 2021).

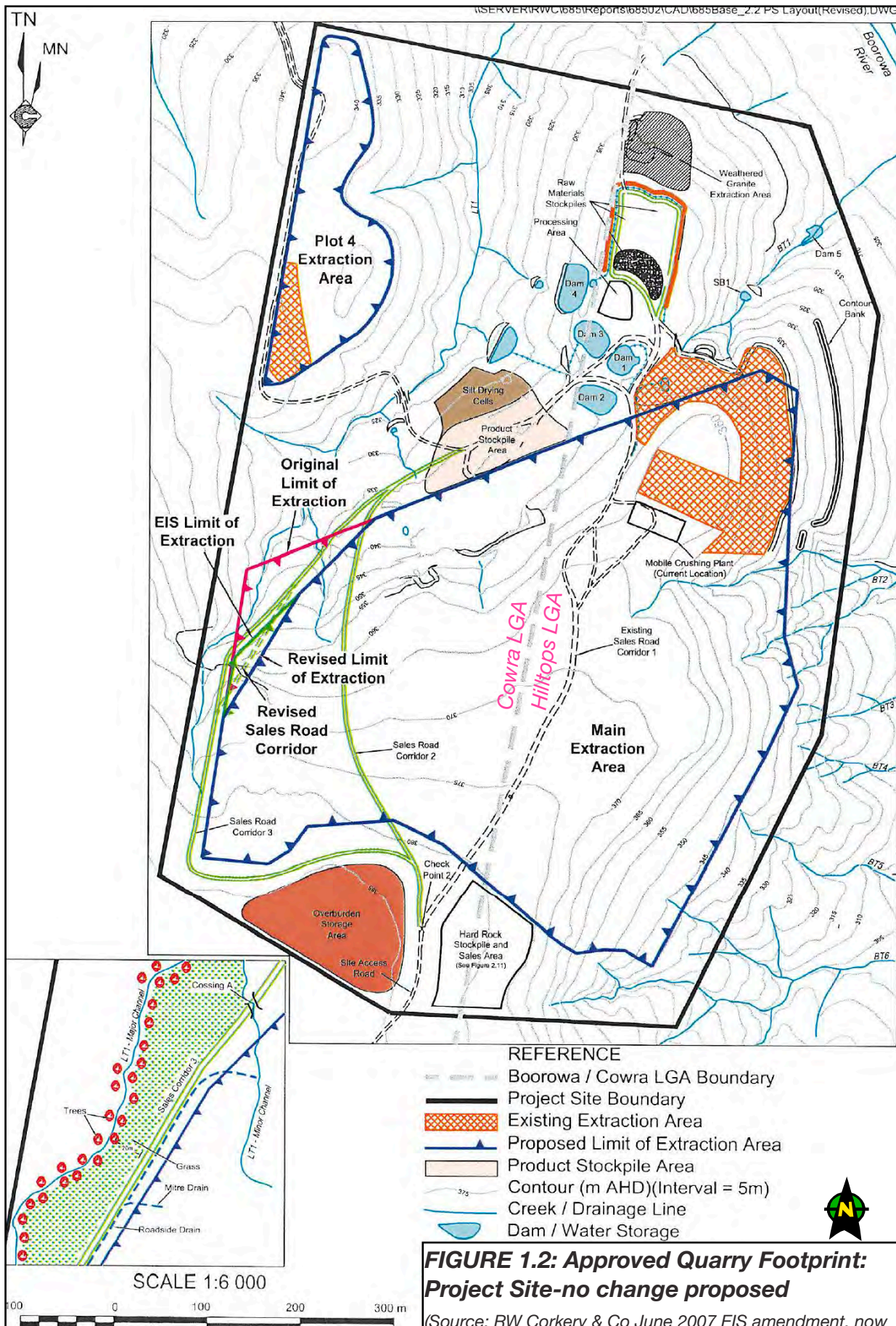
The proposed modification is substantially the same quarry development as that approved (s.4.55(2)(a)) and has acceptable environmental impacts as the approved development (s.4.15(1)), thus satisfying s.4.55(3) of the EP&A Act. Accordingly, Outline Planning Consultants Pty Ltd is of the view that the proposed s.4.55(2) modification is acceptable in this particular instance and warrants approval.

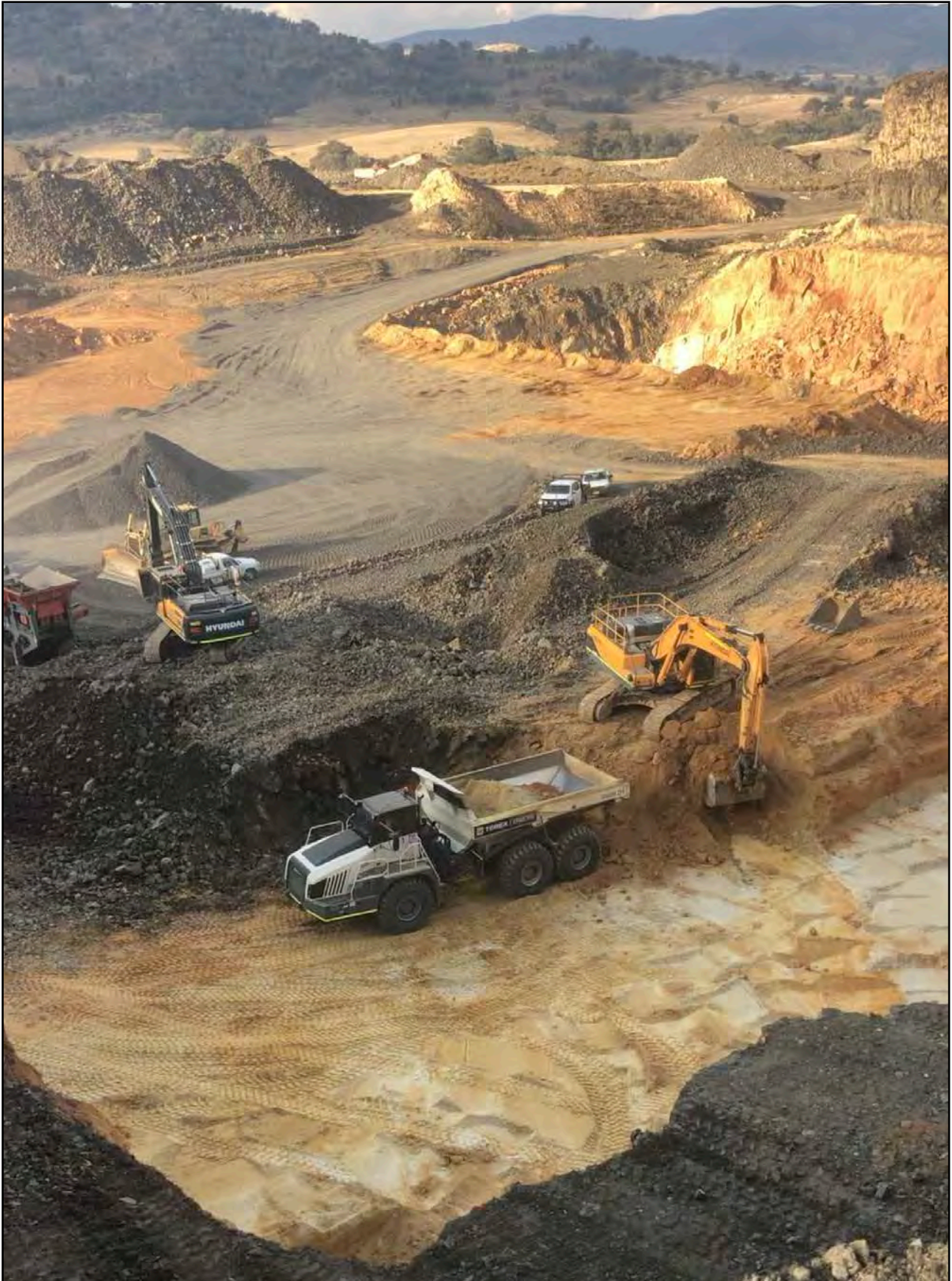
1.2 Structure of this Modification Application Report

This report is divided into five subsequent sections:

- **Section 2** examines the existing quarry by describing its location, ownership, and the local context.
- **Section 3** describes the proposed modification of the two operative consents.
- **Section 4** describes the proposed revised conditions of the two operative consents: DA 73/2007 (Cowra) and DA117/06 (Boorowa, now Hilltops).
- **Section 5** provides an overview of the statutory matters that need to be addressed in any modification application and the consistency with the reasons for the grant of the original consent.
- **Section 6** assesses the proposed modification in terms of the 'first test' of the modification, namely the extent to which the modification is 'substantially the same' development as that approved by DA 73/2007 issued 27 August 2007 and DA117/06 issued 25 September 2007.
- **Section 7** assesses the proposed modification in terms of the 'second test' of the modification, namely the extent to which the modification satisfies the requirements s.4.15(1) of the EP&A Act. This includes an assessment of the compliance of the modification proposal with prevailing planning controls and guidelines applicable to both Cowra and Hilltops LGAs, including *State Environmental Planning Policy (Resources and Energy) 2021*.
- **Section 8** concludes this Statement of the Environmental Effects.







PHOTOGRAPH 3: View looking north out over existing active quarry pit showing existing quarry equipment used in the resource extraction process

(Source: Glenella Quarry Pty Ltd)

■ 2. Existing Environment

2.1 *Site Location, Property Description and Ownership*

The land the subject of this Section 4.55(2) application, Glenella Quarry, is an already approved, lawfully operating quarry and mine owned by the quarry operator- refer to photographs and figures.

Glenella Quarry is located in the Central West region of New South Wales, approximately 18 km south-east of the township of Cowra, NSW. The quarry is situated at the north western end of Battery Road, a 4km long, fully sealed road and links the site to Reids Flat Road. Reids Flat Road in turn provides access to Morongla Road, which then links to Lachlan Valley Way, a sealed public highway which provides access to the rural town of Cowra 18.9km north-north west of the Battery Road /Reids Flat Road intersection-refer **Figure 1.1**.

The approved quarry and mine site, which sits within the larger “Glenella” property, straddles the boundaries of Cowra Shire Council and Hilltops Council LGA’s- refer **Figure 2.1**.

The quarry operator, Glenella Quarry Pty Ltd, currently operates a hard rock quarry/mine from the land, the actual approved quarry (‘Project Site’) covering all or parts of Lot 35 & 44 DP 752935 (in Cowra LGA), and Lots 1 and 2 DP795553, and Lot 106 DP 752935 (in Hilltops LGA). The other lots described in Section 1.1 comprise, in the main, the internal quarry haul route back to Battery Road, as well as the quarry weigh-bridge and site office- the latter identified as ‘Site Facilities Area’ in **Figure 2.1**- all located within the Hilltops (formerly Boorowa) LGA.

2.2 *Existing Operations: Glenella Quarry*

■ **Proponent Details**

Glenella Quarry Pty Ltd is the proponent with the relevant details provided below:

Glenella Quarry Pty Limited
ABN: 75 117 019 155
483 Battery Road
Cowra NSW 2794
Michael Howe (Director-General Manager)
(02) 63 45 4253 or 0488 138 880
Michael@Glenellaquarry.com

Glenella Quarry Pty Ltd was formed in late 2005 to manage the operations of the Glenella Quarry, owned by Michael Howe. The Company’s directors are Mr Michael Scott Howe and Ms Amy Vidmar Howe. Since Glenella Quarry was purchased in December 2005, the Company has focussed on operating Glenella Quarry in an environmentally responsible manner and establishing positive links with the local community, particularly those neighbours fronting onto both Battery Road and Reids Flat Road.

Glenella Quarry is a certified indigenous business with Supply Nation as well as NSW Indigenous Chamber of Commerce (NSWICC) Assured Member and FACCI Affiliate.

The Directors of Glenella Quarry are committed to continue the development of Glenella Quarry in a manner that achieves the responsible outcomes predicted in this document.

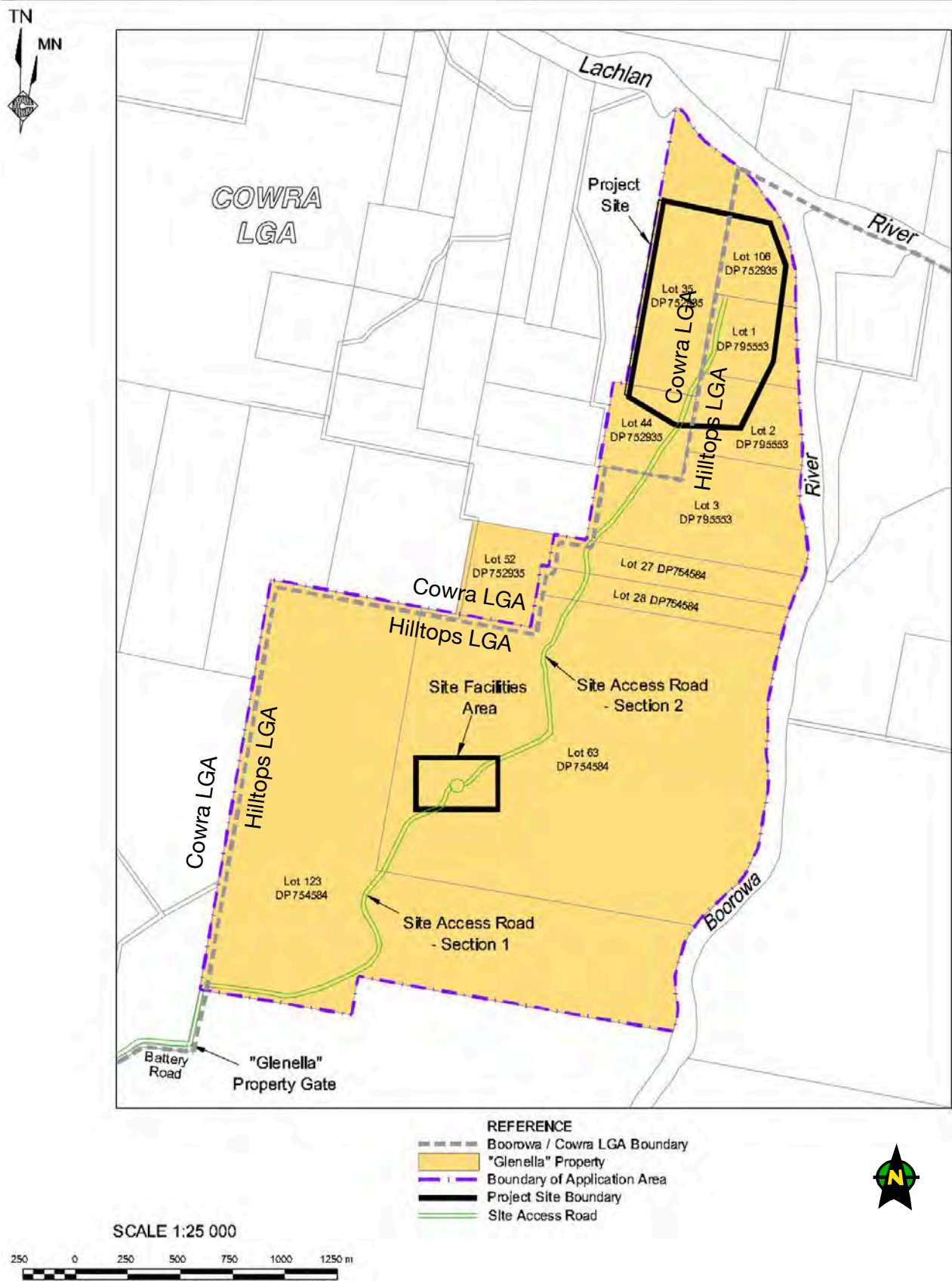
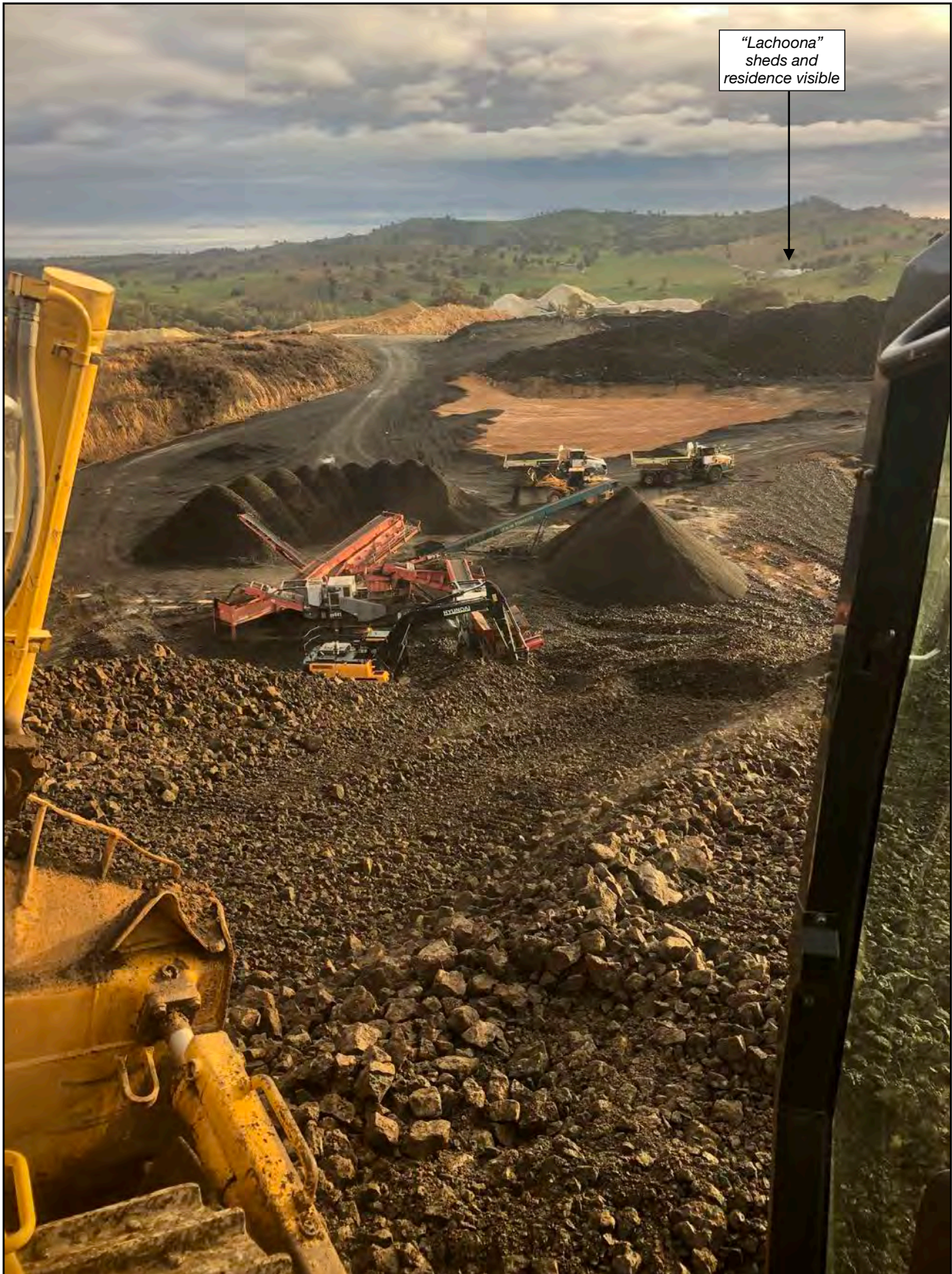


FIGURE 2.1: The Approved Quarry Straddles a Local Government Boundary Between Cowra and Hilltops LGAs, with all of the quarry haul route located within Cowra LGA

(Source:RW Corkery & Co April 2007 EIS)



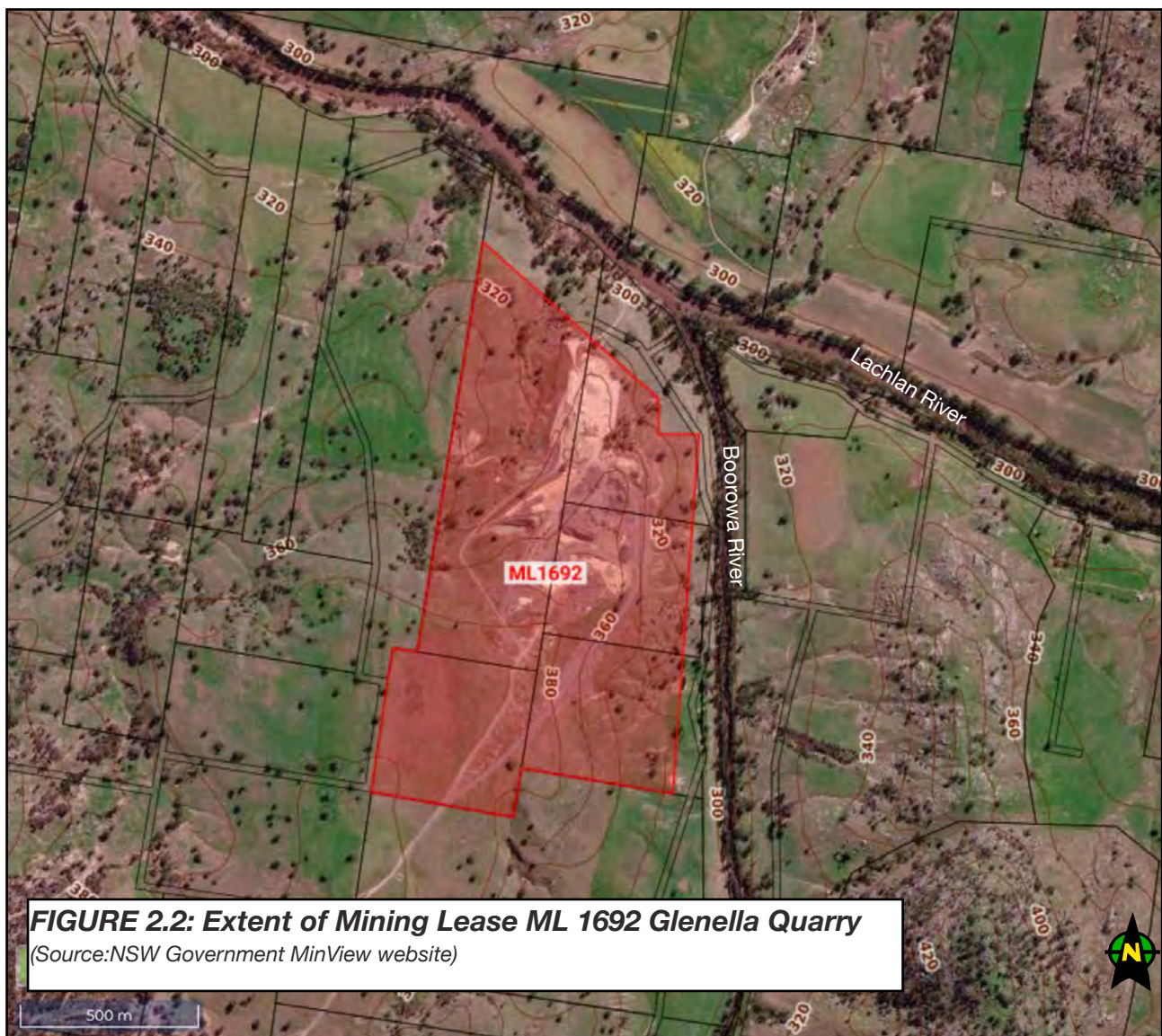
PHOTOGRAPH 4: View looking north out over existing active quarry pit showing existing quarry processing plant and equipment used + view to “Lachoona”

(Source: Glenella Quarry Pty Ltd)

■ Operative Statutory Requirements

Operation of Glenella Quarry is governed by a number of statutory requirements, including:

- Cowra Council consent DA73/2007 issued 27 August 2007 and Boorowa (now Hilltops) Council consent DA117/06 issued 25 September 2007.
- An Environment Protection Licence (EPL) No. 20632 has been obtained from the NSW EPA for a Low Risk quarry of between 100,000 to 500,000 tonnes per annum extraction. EPA records show that Glenella Quarry is a well-run quarry, with records showing no enforcement orders, notices or warnings in the last assessment period (July 2018-to July 2021) - refer **Appendix C**.
- A licence has been obtained under s.61 of the *Water Management Act 2000* in April 2022 for a water access licence (WAL) to extract water from the river system, for use in drier years-refer **Appendix D**.
- On 23 September 2013 a Mining Lease (ML1692) was granted that enables Glenella Quarry to recover (by open cut methods) and sell Group 1 (gold), Group 2 (ores of silicon) and Group 5 (clay minerals). The ML includes the current permitted extraction footprint-refer **Figure 2.1** showing the extent of the operative ML 1692. A Mining Operations Plan applies to the quarry.



■ **Overview: Glenella Quarry**

Glenella Quarry has current approval to extract a maximum of 200,000 tonnes per annum of products comprise the winning of basalt, sand, clay, quartz pebble, weathered granite and gold. Products are excavated from the active extraction area through a combination of load and haul operations for the more fractured basalt and sand/quartz pebble/clay resources, with drill and blast conducted to fracture the more competent and less fractured basalt.

Key components of the current quarry/mine operation include the following:

- Clearing of land ahead of extraction.
- Ripping of weathered rock and blasting of unweathered (hard) basalt rock.
- Inter-burden, i.e. clay of non-economic potential, is removed via ripping, load and haul and either transferred directly to a completed area of the extraction void or stockpiled for later use as backfill of extraction areas.
- Clay identified as having economic potential is ripped and/or removed by excavator and transferred via load and haul to an active product stockpile area. Clay is excavated and either stockpiled for sale (subject to quality and customer requirements) or incorporated as backfill in the exhausted voids.
- Basalt is crushed using a mobile crushing plant and does not produce any processing residues.
- Once exposed following the extraction of the basalt and clay, the pebble and sand material is extracted as a free-dig operation using an excavator and haul trucks. Sand and quartz pebble are washed and wet-screened, including the use of spirals, to produce products to the desired customer specifications, with gold and heavy mineral sands recovered as by-products.
- The sand and gravel layer of the resource is washed, separated and graded in the washing plant, as identified in the Corkery EIS. Gold is periodically recovered from the sand washing equipment. To separate/extract the gold from the primary alluvial sands and gravels, raw material is separated and fed into the sand/wash plant. The washing and screening process then isolates the -2.36mm fraction by way of a wet screening deck. This fraction is then fed into a bank of gravity spirals from which a concentrate is separated and directed to a shaker table. The resulting material from this process is a heavy mineral concentrate that also consists of alluvial gold granules. This heavy mineral concentrate is then fed over specifically designed cleaner table to isolate the heavier gold granules from the resulting heavy mineral concentrate. In essence, the heavy mineral concentrate is but an intermediate step in the multi-stage concentrating process with the end goal to isolate and secure relatively clean gold granules for sale. Currently the issued consents make no allowance for the winning of any heavy mineral sand fraction, despite the fact that it is a by-product of the sand/gravel washing/separating process that is required in order to win the gold fraction found in the sand/gravel resource layer. For good order the existing wash plant is in the same position and performs the same tasks as identified in the R.W Corkery & Co Pty Limited EIS dated 8 June 2007 referred to in the current consents.
- Water used during washing of product is directed to water storage dams to allow suspended sediment to settle and water to be re-used. Consolidated silt contained in washing plant sumps is regularly excavated and placed on evaporation dams, where excess water is allowed to drain to water storage dams, and silt is allowed to dry for incorporation into the rehabilitated landform.
- Transport of product from the site via Battery Road, Reids Flat Road, to Morongla Road, and thence to Lachlan Valley Way.
- Existing stockpiles and storage areas are within the approved quarry area.

■ **Management of Quarry Operations**

Quarrying and mining is carried out on site in accordance with the operative consent development consents, namely, Cowra Council consent DA73/2007 issued 27 August 2007 and Boorowa (now Hilltops) Council consent DA117/06 issued 25 September 2007, EPL No. 20632, and an approved Mining Operations Plan prepared by RW Corkery & Co. Pty Limited. The principal objectives of the Mining Operations Plan include the following:

- Provide controls for the on-going management of the quarry.
- To ensure legislative requirements are met, including any development consent.
- Provides details to manage the quarry to minimise and/or mitigate potential environmental impacts associated with the operation of the quarry/mine.
- To provide further particulars regarding rehabilitation works to be carried out.
- Identify responsibilities for environmental and safety management.

■ **Hours of Operation**

The currently approved hours of operation of Glenella Quarry are as follows:

Table 2.1: Currently approved hours of operation of Glenella Quarry

Activity	Monday to Friday	Saturday	Sunday/public holidays
Extraction of the resource	7.00am- 5.00pm	7.00am- 3.00pm	Not permitted
Blasting	9.00am- 5.00pm	Not permitted	Not permitted
Crushing of the resource	7.00am- 6.00pm	7.00am- 3.00pm	Not permitted
Loading	7.00am- 10.00pm	7.00am- 4.00pm	Not permitted

The following activities may be carried out at the premises outside the hours specified in the table above per EPL No. 20632 condition L5.2 and Council consent condition 9 (common to both DAs issued):

- The delivery of materials as requested by Police or other authorities for safety reasons.
- Emergency work to avoid the loss of life, property and/or to prevent environmental harm.

■ **Transport of Product from Glenella Quarry**

Product from Glenella Quarry loaded onto road-registered trucks, weighed at the Site Facilities Area (refer **Figure 2.1**) prior to then being transported from the “Glenella” property to Lachlan Valley Way via Battery Road, Reids Flat Road and Morongla Road- refer **Figure 1.1**. These local roads, including the Reids Flat Road and Morongla Roads intersection, have been upgraded in accordance with Development Application No. 73/2007. Trucks travel either north or south on Lachlan Valley Way depending on product destination. The quarry/mine internal access roads are routinely maintained by top dressing of road base materials, grading and watering.

Approximately 10km of upgrades to roads on the heavy vehicle access route to Glenella Quarry, namely Morongla and Reids Flat Roads, have been completed. The roads reside in the Cowra LGA and link the mine to Lachlan Valley Way. The 4km upgrade of Battery Road back to the quarry site, within the Hilltops LGA, has also been completed. Overall, the road improvements have included: drainage, culvert, and bridge upgrades; base course overlays; double pack bituminous pre-coat seal; and widening of the entire haul route to a 8m sealed surface.

A Works Authorisation Deed (WAD) has been recently issued for the upgrading of the Lachlan Valley Way intersection to a CHR standard, as requested by Transport for NSW since the issue of consent. The standard of construction differs to that described in the 2007 development consent.

The internal access road system within “Glenella” has also been upgraded in recent years, providing a long term, one-way transport loop, allowing heavy truck traffic to enter from the west and exit to the east, resulting in improvements in terms of reducing transport/customer vehicle traffic to a minimum in and around quarry working areas. Much of the internal haul route has been bitumen sealed.

■ **Haul Road Upgradings Since Grant of Consent**

The approved quarry haul route runs from the quarry back along the local road system, administered by Cowra Shire Council, to Lachlan Valley Way and thence to markets beyond. DA73/2007 consent condition 12 requires that no trucks are permitted to enter the transport route from Lachlan Valley Way prior to 5.00am. In accordance with the consents issued the following road upgrades have been carried out. All local road upgrades have been designed, approved and carried out by Cowra Shire Council, with Glenella Quarry providing material in kind and monetary contributions to give effect to these road works:

- The intersection of Battery, Reids Flat and Bennett Springs Roads constructed to maintain the priority of through-traffic along Reids Flat and Bennet Springs Roads, with Battery Road forming the terminating leg of of the intersection. Included the installation of regulatory signposting and appropriate warning signs to warn drivers of the intersection as well as the 'STOP' control in Battery Road, painted painted median with rumble bar inserts on the Battery Road approach to the intersection, line marking, and provision of sealed pavement at the intersection to accommodate the swept paths of heavy vehicles.
- The intersection of Reids Flat and Morongla Roads constructed to maintain the priority of through-traffic along Reids Flat Road with Morongla Road forming the terminating leg of the intersection. Included the installation of regulatory signposting, line marking, and provision of sealed pavement at the intersection to accommodate the swept paths of heavy vehicles.
- Two (2) box culverts located on Morongla Road have been widened, with a compacted road base and overlay.
- Thirteen (13) box culverts located on Reids Flat Road have been widened, with a compacted road base and overlay.
- Glenella Quarry Pty Limited has entered into a planning agreement with Cowra Shire Council to contribute co the upgrading of Morongla and Reids Flat Roads accordance with the Planning Agreement signed by Glenella Quarry Pty Limited and Cowra Shire Council.
- A Works Authorisation Deed (WAD) entered into by Glenella Quarry Pty Limited and Transport for NSW (TfNSW) for the upgrading of the intersection of Morongla Road and Lachlan Valley Way. Includes the widening of Lachlan Valley way, the provision of regulatory signposting, provision of lie marking and sealed pavements to accommodate the swept paths of heavy vehicles.

- Glenella Quarry Pty Limited entered into a planning agreement with Boorowa (now Hilltops) Shire Council to contribute substantially to the upgrading of approximately 4km of Battery Road, now completed.

■ **Noise, Blasting**

Glenella Quarry Pty Ltd is committed to managing its operations to minimise noise and blast impacts. During the life of the quarry project, the quarry operator will implement suitable management practices to reduce potential impacts due to operational noise and blasting in order to achieve:

- Noise generated by the quarry operations to be within the limits imposed by the applicable development consents.
- To minimise complaints about noise emanating from the quarry.
- All blasts are undertaken in compliance with the air blast overpressure and ground vibration limits contained in the EPA's Environment Protection Licence (EPL) No. 20632 applying to the quarry. Refer to accompanying Table 2.2 below.
- The hours of blasting are restricted to between 9.00am to 3.00pm Monday to Fridays, with a limit of one blast per day.

Table 2.2: EPA Quarry Blasting Limits

Noise/Blasting item	Principal Standard (Limit) Nearest Residence	Maximum Level Permitted Nearest Residence
Airblast Overpressure	Airblast overpressure of 115 dBL (Lin Peak). This level may be exceeded on up to 5% of the total number of blasts over a period of 12 months	Airblast overpressure should not exceed 120 dBL (Lin Peak) at any time
Ground Vibration	Ground vibration level of 5 mm/s peak particle velocity (PPV). This level may be exceeded on up to 5% of the total number of blasts over a period of 12 months	Vibration should not exceed 10 mm/s peak particle velocity (PPV) at any time

The location of the nearest rural residences, not associated with the quarry, are illustrated in the accompanying **Figure 2.4**.

■ **Dust Management**

Glenella Quarry Pty Ltd is committed to managing its quarry operations to minimise impact on the environment and community, including dust management. Various dust control mitigation and management measures have been implemented, including but not limited to the following:

- Use of water sprays on processing plant, trafficked areas and materials stockpiles, to reduce dust nuisance. Regular road maintenance is conducted on the gravelled surfaces on the internal access road with grader and loaders.
- The two-way road section from "Glenella" property gate to the weigh-bridge is sealed in order to minimise dust emissions.
- The one-way road section from load-out area to two-way road section sealed to minimise dust emissions.

- In dry and windy conditions, materials processing and handling is performed in less exposed areas to minimise dust emissions.
- The haul route has been upgraded by the quarry operator, including sealing of a total of approximately 14km of road from the quarry back to Lachlan Valley Way. These measures will ensure that quarry truck traffic will have an acceptable impact on the local road system in terms of safety, noise and dust.
- Proper maintenance of quarry vehicles and equipment.
- All quarry trucks leaving the site to the public road system are to have covered loads, with tailgates effectively sealed. All vehicles on site are to be confined to designated roads with a signposted speed limit.
- Miscellaneous dust sources such as spillages from trucks and silt from sediment controls are to be regularly cleaned up

■ **Quarry Workforce**

Currently the quarry employs eight (8) full time employees and a range of local contractors on the site (fuel, machinery, industrial supply, blasting, waste, and other support services). In addition, the site provides employment for a range of local, regional, and interstate heavy vehicle operators delivering various quarry products from Glenella Quarry.

■ **Water, Sediment and Erosion Control**

The quarry is located on a ridge-line that is significantly elevated above surrounding watercourses. Runoff from the exposed quarry surfaces drains to a number of sediment dams located downstream of the extraction and storage areas of the site. These sediment/water storage basins function as stormwater treatment measures to facilitate the settling and removal of sediment. The sediment basins also function as water harvesting measures that provide water for processing activities and dust suppression, reducing reliance on the 20ML/year Water Access Licence allocated to the site. Refer to **Appendix D**, showing quarry sub-catchments and water management features.

Water stored in these sediment/water storage basins is monitored following rainfall events and treated if required to comply with Glenella Quarry Pty Ltd's (QQPL) *Glenella Quarry Soil and Water Management Plan* (SWMP) (GQPL, 2019), approved by the EPA and Resources Regulator respectively, prior to discharge into receiving waters. Future water needs have been addressed by the quarry operator, who has in place a Zero-Share Water Access Licence (WAL) from Water NSW under section 61 (1)(b) of the *Water Management Act 2000*, thus ensuring a sufficiency of water needs, even during dry periods.

■ **Rehabilitation**

Quarrying is a temporary land use, and quarrying is expected to cease extraction at some point in the future. The closure of the quarry operation typically occurs when the resource is exhausted, and provides opportunities for land disturbed by quarrying to be rehabilitated. Currently Glenella Quarry progressively rehabilitate in line with the Resources Regulator approved Mine Operations Plan (MOP) with substantial overburden stockpiled and used as backfill when areas of the quarry become exhausted. The Department of Planning and Environment holds a \$236,000 bond to ensure that the quarry is rehabilitated once quarrying ceases.

The completed sections of the extraction area would be progressively backfilled with overburden previously removed to expose the resources. The backfilled area would be progressively shaped through placement and profiling of the overburden to create an elevated plateau with an elevation comparable with the existing plateau grading to a moderately sloping landform towards the nearby Lachlan and Boorowa Rivers.

On completion of quarrying the site is to be rehabilitated to form a free draining and sustainable landform as consistent as possible with surrounding landforms. The relevant guidelines note that the primary aim of the closure and rehabilitation phase of a quarry is to minimise long-term erosion through effective revegetation (source: *Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries* (DECC, 2008).

The proposed integrated final land use would be agriculture and native conservation. Accordingly, the steeper areas of the final landform (generally on the northern, eastern and western perimeters of the extraction area) and drainage lines to the Boorowa and Lachlan Rivers would be revegetated using native tree, shrub and grass species. The more elevated areas of the final landform with gentle slopes (generally towards the centre and southern perimeter of the extraction area) would be revegetated using native pasture species suitable for the resumption of grazing. Following completion of extraction (and rehabilitation), project infrastructure would be decommissioned, temporary buildings and other structures demolished, plant and equipment would be removed from the site.

2.3 Planning Approvals History: Glenella Quarry

The accompanying Table 2.3 provides a time-line of the history of development consents issued for quarrying and/or mining operations at Glenella Quarry.

Table 2.3: Planning Approvals History, Glenella Quarry

Date of Development Consent Issued	Approved Development
1984	Quarry Approval for the extraction of the resources within the Glenella Quarry was granted in 1984 by both Boorowa Shire Council and Cowra Shire Council to Glenella Aggregates Pty Ltd (DA4/84 and DA 23/84 respectively) for the extraction of gravel within Portions 55, 106 and 89, Parish of Cocomingla, Shire of Boorowa and Portions 35 and 44, Parish of Cudgegong, Shire of Cowra, to an unlimited quantity over an unlimited time.
November 2000	Notice development consent was granted by the then Minister for Urban Affairs and Planning to Australian Silicon Pty Ltd in November 2000 over an area, the eastern section of which is generally coincident with the Project Site. Australian Silicon Pty Ltd sought approval to recover the high grade quartz pebble within "Glenella" and two adjoining properties for use as the principal raw material in the manufacture of silicon metal. The approved proposal never commenced and the consent subsequently lapsed.
27 August 2007	Notice of determination by Cowra Council of Development Consent DA73/2007 allowing for an expanded quarry with the rate of extraction limited to 200,000 tonnes per annum.
25 September 2007	Notice of determination by Boorowa (now Hilltops) Council of Development Consent DA117/06 allowing for an expanded quarry with the rate of extraction limited to 200,000 tonnes per annum.



PHOTOGRAPH 5: View looking south towards the existing active quarry face

(Source: Glenella Quarry Pty Ltd)

2.4 EPA Environment Protection Licence No 20632 and ML 1692

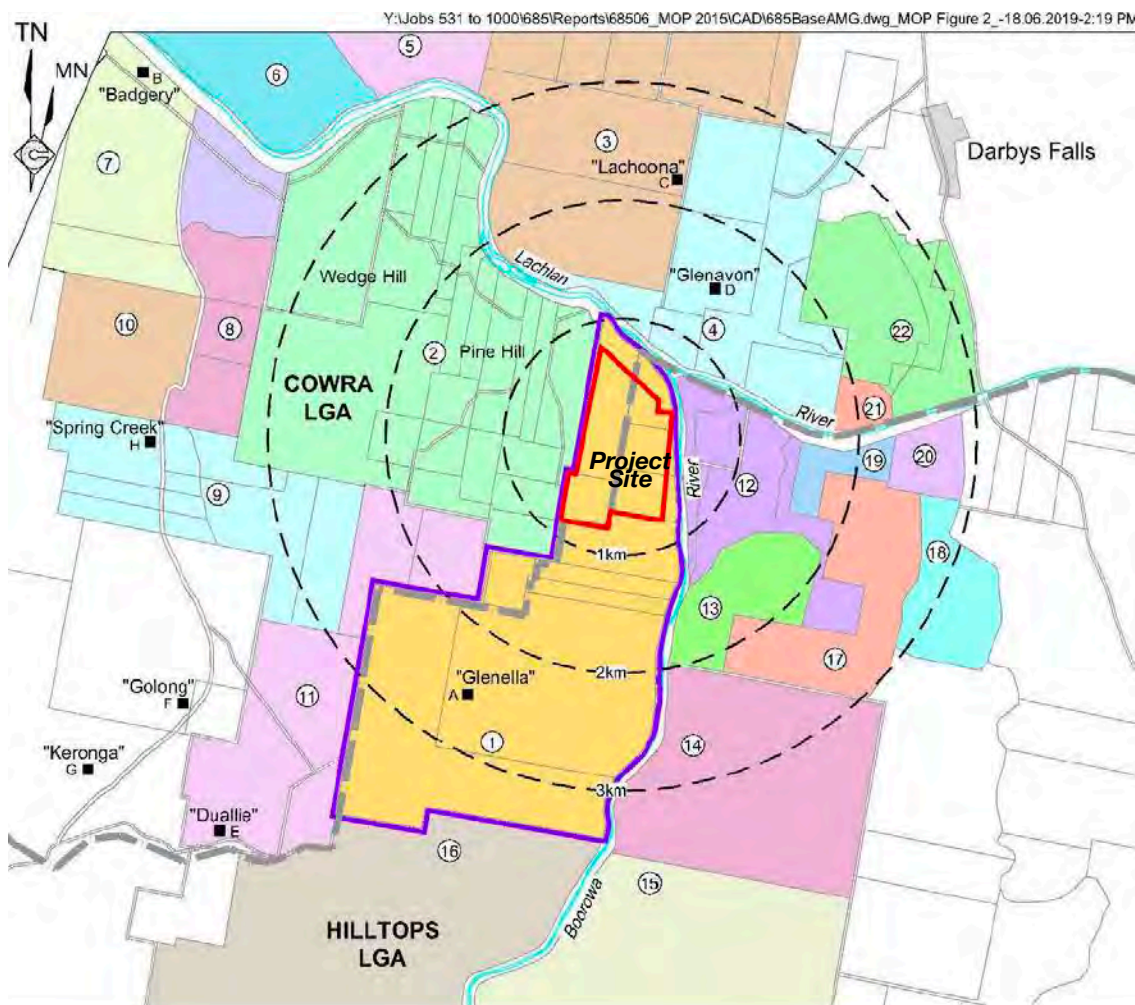
The granting of development consent under the *Environmental Planning and Assessment Act 1979* to develop a quarry of this size and scale does not exhaust the approvals process necessary for the commencement of quarrying operations. A quarry then needs to be licensed under the provisions of the *Protection of the Environment Operations Act, 1997*, once consent has been obtained, as well as a Mining Lease issued. the latter in order to allow recovery by open cut methods and selling of Group 1 (gold), Group 2 (ores of silicon) and Group 5 (clay minerals) a Mining Lease is required under the *Mining Act 1992*. Mining Lease 1692 was issued on 23 September 2013 to enable Glenella Quarry to recover the resources covered by this Act, with a management plan prepared to cover mining activities at Glenella Quarry including mining and rehabilitation operations, as well as details of other approvals and licences.

Glenella Quarry Pty Ltd currently operates under the terms of an Environment Protection Licence (No.20632) (EPL) for a land based extractive activity to crush, grind or separate or extract, process or store) under the provisions of Section 55 of the *Protection of the Environment Operations Act, 1997*. The EPA have deemed Glenella Quarry to be a ‘Low Risk’ quarry operation, with an exemplary compliance record- refer **Appendix C**.

2.5 Surrounding Development

Glenella Quarry is contained entirely within the “Glenella” property, owned by the Managing Director of Glenella Quarry Pty Limited, Michael Scott Howe. Land ownership surrounding the Quarry is shown in **Figure 2.4**. The closest residences to the quarry are also shown in Table 2.4. In accordance with the rural setting, land use surrounding the Project Site is predominantly grazing with some rotation cropping of cereals and other crops.

No other land use of note on surrounding properties has been recorded by the Company during its consultation program with local landowners and residents.



- REFERENCE**
- LGA Boundary
 - ML1692 Boundary
 - Cadastral Boundary
 - "Glenella" Property Boundary
 - ① Landowner Reference (see table)
 - Residence
 - Watercourse/Drainage Line

REFERENCE	LANDOWNER	REFERENCE	LANDOWNER
1	M. Howe	12	Winnunga Pty Ltd
2	J. Dunlop	13	S. Boulter
3	R. Chalker	14	M. Smith
4	R. Chalker	15	K. Craig
5	K. Flint	16	G. Evans
6	J. & Z. Campbell	17	R., J., K. & T. Neville
7	J. Dunlop	18	W. S. Chapman
8	J. Dunlop	19	Winnunga Pty Ltd
9	L. & C. Hore	20	W. & S. Chapman
10	J. Dunlop	21	R. & D. Chalker
11	A. K. Smith	22	J. Roberts

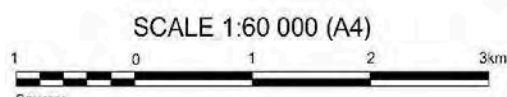


Figure 2
LAND OWNERSHIP AND RESIDENCES
SURROUNDING THE PROJECT SITE

FIGURE 2.4: Glenella Quarry and nearest residences- the approved quarry extraction area identified as 'Project Site'

(Source: Glenella Mining Operations Plan, RW Corkery & Co October 2019)



Table 2.4: Residences Surrounding Glenella Quarry

Residence Identifier- refer Figure 2.5	Distance to nearest quarry activity	Distance to nearest quarry processing plant/ product storage	Visibility of Glenella Quarry from residence
A (“Glenella”)	1.85km	2.6km	Project-related; no quarrying/mining activities visible from this residence.
B (“Badgery”)	1.95km	4.9km	Extraction and processing activities at Glenella Quarry topographically shielded from this residence.
C (“Lachoonna”)	1.65km	2.0km	Visually exposed to existing extraction and processing activities at Glenella Quarry.
D (“Glenavon”)	1.0km	1.25km	Topographically and/or shielded from all activities adjacent, southerly hill and/or vegetation.
E (“Duallie”)	3.7km	4.3km	Topographically and/or shielded from all quarry activities; no quarry activities visible.
F (“Golong”)	3.15km	4.35km	Topographically and/or shielded from all quarry activities; no quarry activities visible.
G (“Keronga”)	4.05km	5.25km	Topographically and/or shielded from all quarry activities; no quarry activities visible.
H (“Spring Creek”)	2.2km	3.95m	Topographically and/or shielded from all quarry activities; no quarry activities visible.

(Source: RW Corkery & Co Mining Operations Plan October 2019)

2.6 Site Features: Summary

The topography of the “Glenella” property is characterised by hilly undulating terrain. Ridge lines grade into flat plateau terrain with moderate to steep-sided valleys to the north, east and west of Glenella Quarry associated with the Lachlan River, Boorowa River, Battery Creek and Cudgegong Creek. Refer to Photograph 2.

The approved quarry is located near the confluence of the Boorowa and Lachlan Rivers and comprises an elevated basalt plateau which slopes moderately steeply towards the two rivers. Elevations range of the approved extraction area/quarry footprint range from approximately 290m AHD along the Lachlan and Boorowa Rivers, to approximately 420m AHD, with isolated hills rising to in excess of 470m AHD.

The approved extraction area/quarry footprint extends over an area of approximately 30ha with additional areas used for processing activities, raw material and product stockpiling and water management. The approved extraction area/quarry footprint is relatively isolated from local roads and surrounding residences with only two residences within a 2.5km radius, with views of the quarry only possible from the “Lachoonna” residence, approximately 1.65km away. A total of 14 residences front onto the product delivery route between Glenella Quarry and Lachlan Valley Way. Battery Road, Reids Flat Road and Morongla Road all carry very low levels of local traffic- refer **Figure 1.1**.

3. Modifications Proposed

3.1 Overview

Glenella Quarry is a major source of high quality quarry products for the region, in particular for road building, concrete and asphalt production, as well as for subdivisions and other infrastructure projects as well as for landscaping and brick making industries. Gold is a minor, although valuable, by-product.

The quarry operates pursuant to two operative development consents which are almost identical in terms of their approval conditions, namely:

Cowra Council	Hilltops (formerly Boorowa) Council
Development Application No. 73/2007	Development Application No. 117/06
Consent issued 27 August 2007	Consent issued 25 September 2007

This application seeks modifications to the above consents pursuant to the provisions of Section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to allow the following:

- An increase in the maximum allowable rate of extraction, from the current 200,000 tonnes per annum to 499,000 tonnes per annum, to meet current and projected market demands for sale-able processed resource products (including gold and heavy mineral sands as by-products) to ensure a continued supply of material for a range of building, infrastructure, landscaping and construction uses in projects within the market catchment of the quarry. NOTE: No change to approved quarry footprint.
- The existing development consents (above) allow for a maximum of 35 loaded trucks per day leaving the quarry/mine site. This s.4.55(2) modification application seeks an increase to 50 loaded trucks per day.
- To ensure that the consent represents updated air quality control measures employed on site.
- Arising from the noise assessment undertaken in support of the proposed s.4.55(2) modification, changes are proposed to consent conditions 8 and 10 of each of the above consents, relating to permitted noise, overpressure and vibration levels generated by the quarry at the residences at “Lachoonna” and “Glenavon”. The change in the noise criterion also has the benefit of bringing the quarry/mine operation in line with the current NSW *Noise Policy for Industry* (2017), which came into force some 10 years after the above consents were issued.

Importantly, no change is proposed to the currently approved quarry extraction footprint. No lateral expansion of the quarry is proposed. No modification to the approved quarry pit is proposed. Moreover, no changes are proposed to the method of processing the resource or to the hours of operation of the quarry, however, to facilitate the increase in the rate of extraction the overall number of blasts will need to be increased to up to two blasts per month. An increase in the amount of processed material stockpiled will also result from the above, however, there is ample space within the existing approved quarry footprint to accommodate this increase in demand. The demand for increased employee parking can also be accommodated on site.

The existing approved quarry haul route has more than sufficient capacity to accommodate the modest increase in loaded truck volumes proposed- refer **Appendix B** for a detailed assessment. Because the limited nature of the modifications proposed the environmental and social impacts of the proposal, as compared to the original application, are considered to be both manageable and satisfactory.

3.2 Details & Justification for Proposed Modifications

An overview of the modifications sought and justification are provided in the accompanying **Table 3.1**.

Table 3.1: Glenella Quarry s.4.55(2) Design Modifications Sought

Proposed s.4.55(2) Modification Element	Details & Justification for the s.4.55 Changes Sought
An increase in the maximum allowable rate of extraction, from the current 200,000 tonnes per annum to 499,000 tonnes per annum (Consent condition 2 of DA 73/2007 (Cowra) and DA 117/06 (Hilltops))	▶ Continued use of an established quarry/mine. ▶ The quarry is located in a remote location with few nearby receptors. ▶ Mining Lease 1692 is in place and current. ▶ The modification is required in order to meet peak demand for processed resource products (including gold and heavy mineral sands as by-products) to ensure a continued supply of material for a range of markets. ▶ The modification is required to accommodate forecast growth and development across the region and to ensure an uninterrupted supply of essential quarry products to local and regional development projects. The clay from Glenella Quarry is of strategic importance for use in the Sydney brick market. ▶ The modification proposed avoids potential land use conflicts and amenity impacts associated with the establishment of a new quarry site to respond to local/regional market demands. ▶ A sufficiency of water needs, even during dry periods. ▶ The quarry already contains existing modern, efficient mobile plant including washing plant. As part of washing process gold and heavy mineral sands are derived as by-products. ▶ The quarry development, as modified, provides for an optimal use of a regionally significant quarry/mine resource. Economic benefits to the local community will also ensue through the purchase of goods and services and local expenditure both directly and indirectly through employee wages. ▶ Glenella Quarry Pty Ltd has demonstrated its commitment to effective environmental management and community engagement in its existing operations over the last 18 years. This management approach will continue under the proposed modification.
Increase daily truck numbers from 35 to 50 loaded trucks per day (Consent condition 2 of DA 73/2007 (Cowra) and DA 117/06 (Hilltops))	▶ The existing local road system can accommodate this modest increase in truck numbers sought. A WAD has been obtained from Transport for NSW (TfNSW) for the upgrading of the intersection of Morongla Road and Lachlan Valley Way. ▶ No adverse traffic noise impacts arise from the heavy vehicle traffic increase sought.
Allow heavy mineral sands to be won (Consent condition 4 of DA 117/06 (Hilltops))	▶ The winning of heavy mineral sands is a by-product of the sand/gravel washing and separating process permitted in order to win relatively clean gold granules- a process already permitted under the existing consent.
Delete reference to dust mitigation measures per Corkery EIS (Consent condition 5 of DA 117/06 (Hilltops))	▶ Glenella Quarry has put into place a raft of additional, more effective dust suppression and/or mitigation measures since the grant of the original consent.
To vary the daytime noise level and monitoring locations (Consent conditions 8,10 and 11 of DA 73/2007 (Cowra) and DA 117/06 (Hilltops))	▶ Arising from the noise assessment undertaken in support of the proposed s.4.55(2) modification. ▶ Brings the quarry/mine operation in line with the current NSW Noise Policy for Industry (2017) noise guidelines, which came into force some 10 years after the above consents were issued.

3.3 Summary: Consistency with Reasons for Granting of Original Consent

Section 4.55(3) of the EP&A Act states:

*“(3) In determining an application for modification of a consent under this section, the consent authority must take into consideration such of the matters referred to in section 4.15(1) as are of relevance to the development the subject of the application. **The consent authority must also take into consideration the reasons given by the consent authority for the grant of the consent that is sought to be modified.**”[our emphasis]*

The development as modified remains consistent with the reasons given to the grant of consent.

The modification seeks to undertaken the extraction of the resource within the same quarry/mine footprint approved in 2007. At that time both Cowra and Boorowa councils considered the land to be suitable for the purpose proposed. For example, the Director Environmental Service report to Cowra Council on 13 August 2007 concluded that: *“Through imposition of appropriate conditions of consent and subject to continued monitoring of the quarry proposal, the site is considered suitable for the development.”*(p.57)

In regard to the above, no changes are proposed in this modification application to the quarry footprint approved at the time or to the operational features of the quarry itself. The technical reports find that acceptable noise, air, water, blasting and traffic impacts can be achieved with the increased rate of extraction proposed at Glenella Quarry.

No change is proposed to the rehabilitation methods currently approved for the quarry operation.

Additionally, the modification seeks a continuation of monitoring of the quarry, as modified, to ensure that acceptable environmental impacts will ensue. This includes the monitoring of blasting impacts as well as water usage.

Both local councils saw the need for upgrading of the quarry haul route. All local road intersections upgrades have since occurred, resulting in a safer, wider, more efficient sealed road between the quarry and Lachlan Valley Way, with a Works Authorisation Deed (WAD) issued for the Lachlan Valley Way/Morongla Road intersection upgrade. The increased truck volumes proposed by this modification application can be satisfactorily accommodated on this upgraded local road system. A Driver Code of Conduct will continue to apply.

As such, there is no inconsistency with the reasons for the granting of the consent resulting from the modification sought.

■ 4. Proposed Modified Conditions of Consent: DA73/2007 & DA117/06

4.1 Summary: Conditions of Consent Affected by Modification

The approved quarry straddles two local government areas. As a result, the quarry development approved in 2007 enjoys virtually identical development consent conditions contained within DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council). The proposed s.4.55 modification application affects a number of the consent conditions common to both DAs, as summarised in the accompanying Table 4.1.

Table 4.1: Conditions of consent affected by proposed modification. Numbering is the same for quarry consents DA 73/2007 (Cowra Council) and DA 117/06 (Hilltops Council)

Consent Condition No.	How Consent Condition is affected by this s.4.55(2) modification
1	[No change]
2	<i>This Statement of Environmental Effects report prepared by Outline Planning Consultants Pty Ltd in support of the s.4.55(2) modification application, together with accompanying specialists reports, will need to be cited in the modified consent.</i>
3	[No changes]
4-7 (Cowra DA73/2007)	[No changes]
4,5 DA117/06 (Hilltops)	<i>Delete reference to Corkery EIS, and add heavy mineral sands as a by-product of existing approved sand/gravel washing/processing.</i>
6 DA117/06 (Hilltops)	[No changes]
8	<i>The table accompanying this condition of consent is proposed to be amended, amending the daytime noise level to 40dBA LAeq(15 minutes), with measurements from nearest residence only: "Glenavon".</i>
9	[No change]
10, 11	<i>Blast monitoring proposed at the nearest residence only: "Glenavon".</i>
12-31	[No changes]

4.2 Proposed Modification of Development Consents DA73/2007 & DA117/06

The consent conditions proposed to be modified in DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council) have the same numbering system, as set down in the following. Words proposed to be deleted are shown in ~~red bold italics strike through~~ (~~omit~~) and words to be inserted are shown in **bold green italics** (add).

■ Proposed Modification of Consent Condition 2 of DA73/2007 (Cowra)

By adding a new sub-clause (iv) to Consent Condition 2 as follows:

"2. The quarry operation shall be undertaken generally in accordance with:

(i) DA 73/2007 lodged with Cowra Shire Council on 30 April 2007;

(ii) Environmental Impact Statement for the Glenella Quarry, prepared by R..W. Corkery & Co Pty Limited dated 30 April 2007; ~~and~~

(iii) Additional information letters prepared by R.W Corkery & Co Pty Limited dated 8 June 2007, 3 July 2007, 12 July 2007, 13 July 2007 and 25 July 2007, ~~unless otherwise modified by the conditions of this consent;~~ and

(iv) The report entitled *Statement of Environmental Effects s.4.55(2) Modification Application: Glenella Quarry Lot 35 & 44 DP 752935 (Cowra LGA); and Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 (Hilltops LGA) No.483 Battery Road, Cowra, NSW 2794, prepared by Outline Planning Consultants Pty Ltd and dated January 2026; with attachments:*

o Air quality impact assessment by Northstar dated 14 August 2025;

o Water Assessment by Martens & Associates dated 13 January 2026;

o Noise and vibration impact assessment by Waves Acoustic Consulting Pty Ltd dated 24 November 2025;

o Roads & traffic assessment by Streetwise dated October 2025

unless otherwise modified by the conditions of this consent."

[Reason for the above modification to consent condition 2:

- ▶ To refer to this modification application, including accompanying technical reports, in the consent].

■ **Proposed Modification of Consent Condition 2 of DA117/06 (Hilltops)**

By adding a new sub-clause (iv) to Consent Condition 2 as follows:

"2. The quarry operation shall be undertaken generally in accordance with:

(i) DA 117/06 lodged with Boorowa Council on 1 May 2007;

(ii) Environmental Impact Statement for the Glenella Quarry, prepared by R..W. Corkery & Co Pty Limited dated 30 April 2007; and

(iii) Additional information letters prepared by R.W Corkery & Co Pty Limited dated 8 June 2007, 3 July 2007, 12 July 2007, 13 July 2007 and 25 July 2007, ~~unless otherwise modified by the conditions of this consent;~~ and

*(iv) The report entitled *Statement of Environmental Effects s.4.55(2) Modification Application: Glenella Quarry Lot 35 & 44 DP 752935 (Cowra LGA); and Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 (Hilltops LGA) No.483 Battery Road, Cowra, NSW 2794, prepared by Outline Planning Consultants Pty Ltd and dated January 2026; with attachments:**

o Air quality impact assessment by Northstar dated 14 August 2025;

o Water Assessment by Martens & Associates dated 13 January 2026;

o Noise and vibration impact assessment by Waves Acoustic Consulting Pty Ltd dated 24 November 2025;

o Roads & traffic assessment by Streetwise dated October 2025

unless otherwise modified by the conditions of this consent."

[Reason for the above modification to consent condition 2:

- ▶ To refer to this modification application, including accompanying technical reports, in the consent].

■ **Proposed Modification of Consent Condition 4 of DA117/06 (Hilltops)**

By amending Consent Condition 4 as follows:

"4. This consent is for the quarry operations only for the extraction of quartz pebble, sand basalt, clay, mineral sands and gold ~~as described in part 2.2 of the EIS. Any other use shall be the subject of a separate Development Application.~~"

[Reason for the above modification to consent condition 2:

- ▶ The Statement of Environmental Effects s.4.55(2) Modification Application: Glenella Quarry Lot 35 & 44 DP 752935 (Cowra LGA); and Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 (Hilltops LGA) No.483 Battery Road, Cowra, NSW 2794, prepared by Outline Planning Consultants Pty Ltd and dated September 2025 provides further, updated details than that provided in the R.W Corkery & Co Pty Limited EIS dated 8 June 2007.
- ▶ Heavy mineral sands are currently being won from the sand and gravel washing plant as a by-product as part of the process of recovering gold].

■ **Proposed Modification of Consent Condition 5 of DA117/06 (Hilltops)**

By amending Consent Condition 5 as follows:

*“4. The premises must be maintained in a condition which minimises or prevent the emission of dust from the premises **as detailed in part 5.3 of the EIS.**”*

[Reason for the above modification to consent condition 2:

- ▶ Glenella Quarry now has in place more extensive dust minimisation measures than those outlined in the R.W Corkery & Co Pty Limited EIS dated 8 June 2007.

■ **Proposed Modification of Consent Condition 8 of of DA73/2007 (Cowra) and DA117/06 (Hilltops)**

By amending the table in Consent Condition 8 of DA2014/0098 to read as follows:

“8. Noise generated at ”the premises must not exceed the noise limits presented in the table below.

Location	Day		Evening		Night		
<i>“Lachooona” Residence and “Glenavon” Residence</i>	L _{Aeq} (15 minute)	L _{Aeq} (day)	L _{Aeq} (15 minute)	L _{Aeq} (Evening)	L _{Aeq} (15 minute)	L _{Aeq} (Night)	L _{A1} (1 minute)
	35 40	NA	35	NA	35	NA	45

Note 1: Day is defined as the period from 7.00am to 6.00pm Monday to Saturday and 8.00am to 6.00pm Sundays and Public Holidays;

Evening is defined as the period from 6.00pm to 10.00pm

Night is defined as the period from 10.00pm to 7.00am Monday to Saturday and 1 0.00pm to 8.00am Sundays and Public Holidays.

Note 2: Noise from the premises is to be measured at the most affected point within 30 metres of the dwelling (to determine compliance with the L_{Aeq} (15 minutes) noise limits.

~~Note 3: Noise from the premises is to be measured at metre from the dwelling facade to determine compliance with L_{A1}(1 minute) noise limits.~~

~~Note 4: The noise emissions limits identified in the condition under meteorological conditions of:~~

- ~~• Wind speed up to 1m/s at 10 metres above ground level.~~*



- ~~Temperature inversion conditions of up to 3°C/100m and wind speed up to 2m/s at 10 metres above the ground.~~

Note 3: Noise generated by the development must be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Noise Policy for Industry (EPA, 2017).

Reasons for the above modification to consent condition 8:

- ▶ To accord with the more recently adopted EPA document entitled *NSW Policy for Industry* (2017).
- ▶ Arising from the noise assessment undertaken (refer **Appendix A**) in support of the proposed s.4.55(2) modification, which identifies a revised noise limit of 40dBA_{Leq}(15 minute) for the daytime.
- ▶ Due to compliant noise monitoring results since establishment of the quarry/mine, future noise monitoring proposed at nearest residence only: "Glenavon".]

■ **Proposed Modification of Consent Condition 10 of of DA73/2007 (Cowra) and DA117/06 (Hilltops)**

By amending Note 1 in Consent Condition 8 of DA2014/0098 to read as follows:

"Ground vibration peak particle velocity from the blasting operations at the premises must not exceed:

- 5mm/s for more than 5% of the total number of blasts over a period of 12 months: and
- 10 mm/s at any time .

Note 1: Ground vibration levels must be measured at the "Glenavon" ~~and "Lachooona"~~ residences for all blasts carried out in or on the premises.

Note 2: Instrumentation used to monitor compliance must meet the requirements of Australian Standard 2187.2 of ~~1993~~ 2006."

Reasons for the above modification to consent condition 8:

- ▶ Arising from the noise assessment undertaken (refer **Appendix A**) in support of the proposed s.4.55(2) modification, which identifies a revised noise limit of 40dBA_{Leq}(15 minute) for the daytime.
- ▶ Due to compliant blast monitoring results since establishment of the quarry/mine, future noise monitoring proposed at nearest residence only: "Glenavon".
- ▶ Reference to updated Australian Standard relating to blasts.]

■ **Proposed Modification of Consent Condition 11 of of DA73/2007 (Cowra) and DA117/06 (Hilltops)**

By amending Note 1 and reference to an updated Australian Standard in Consent Condition 8 of DA2014/0098 to read as follows:

"The overpressure level from blasting operations at the premises must not exceed:

- 115dB (Lin Peak) for more than 5% of the total number of blasts over a period of 12 months; and
- 120dB (Lin Peak) at any time

*Note 1: **Overpressure** ~~Ground vibration~~ levels must be measured at the "Glenavon" ~~and "Lachooona"~~ residences for all blasts carried out in or on the premises.*

Note 2: Instrumentation used to monitor compliance must meet the requirements of Australian Standard 2187.2 of ~~1993~~ 2006"

[Reasons for the above modification to consent condition 8:

- ▶ Arising from the noise assessment undertaken (refer **Appendix A**) in support of the proposed s.4.55(2) modification, which identifies a revised noise limit of 40dBA_{Leq}(15 minute) for the daytime.
- ▶ Due to compliant blast monitoring results since establishment of the quarry/mine, future noise monitoring proposed at nearest residence only: "Glenavon".
- ▶ Error is corrected- the words "Ground vibration" replaced with "Overpressure".
- ▶ Reference to updated Australian Standard relating to blasts.]



■ 5. Section 4.55 Modification: Statutory Matters

5.1 Overview: Types of Modifications and Modification Sought

The NSW *Environmental Planning & Assessment Act 1979* (EP&A Act) establishes the system of development approvals in NSW. The power to modify development consents is provided in Section 4.55 (formerly s.96) of the EP&A Act, which confers three separate powers to modify a development consent:

- Modifications involving errors etc.- contained in s.4.55(1). Not applicable to this application.
- Modifications with minimal environmental impact- contained in s.4.55(1A). Not applicable to this application.
- Other modifications- contained in s.4.55(2). Subs (2) confers the more general and widely based power provided the development is substantially the same development and provided other conditions are fulfilled as set out in s.4.55(2) (c) and (d).

This modification application is one made under s.4.55(2) of the EP&A Act, which is more general in nature and which does not contain any wording that implies “minor” or “minimal” environmental impact. In fact, the Courts have found that even if there is a significant increase in the environmental impact associated with a s.4.55(2) application this does not necessarily preclude approval per *Wolgan Action Group Incorporated v Lithgow City Council* [2001] NSWLEC 199 Talbot J at [23] (*Wolgan*).

Sub-section 4.55(2)(a) relevantly provides:

“(2) Other modifications. A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:

*(a) it is satisfied that the development to which the consent as modified relates is **the same or substantially the same development** as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), “*

s.4.55(2)(b) is not relevant to this application, because no concurrence of the Minister is required. It is relevant to note that the words “to modify a development consent” is used.

Related to the above to ‘modify’ means to alter without radical transformation per *Sydney City Council v Ilenace Pty Ltd* [1984] 3 NSWLR 414 and *Agricultural Equity Investments Pty Ltd v Westlime Pty Ltd (No 3) (Westlime)* at [173] cited by Pain J in *Central Coast Council v 40 Gindurra Road Somersby Pty Ltd (No 2)* [2019] NSWLEC 171 at [147].

The modification power under s.4.55 of the EP&A Act is free-standing, and is unaffected by the prohibitions or restrictions which apply elsewhere in Part 4 of the EP&A Act. Importantly, a modification is not the granting of consent (s.4.55(4)). This is a fundamental characteristic of the power to modify a development consent.

This Section 4.55 application does not seek the grant of a development consent; merely an approval to modify conditions common to both DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council). Refer to Section 4 of this SEE report for details. Importantly, modifications are not ‘development’. As a result, s.4.12 of the EP&A Act has no application and neither does Part 2 of Schedule 3 of the *Environmental Planning & Assessment Regulation 2000* per Lloyd J in *Concrite Quarries Pty Ltd v Wingecarribee Shire Council* [2000] NSWLEC 97 (4 May 2000). Moreover, in considering the language used in s.35 of Schedule 3, it is clear that reference is being made to development involving alterations or additions, not a modification to a consent.



5.2 The First Section 4.55 'Test': 'Same or Substantially the Same' Development

The first 'test' of a modification application is whether or not the proposal is 'the same or substantially the same' development: s.4.55(2)(a) of the EP&A Act. This must be determined first before any assessment under s.4.15(1) of the EP&A Act is undertaken per the decision of Preston CJ in *Arrage v Inner West Council* [2019] NSWLEC 85 (*Arrage*) dated 7 June 2019 at [42].

In short, only after the first 'test' of a modification application is met can the modification be considered in terms of the second 'test', namely, a consideration such of the matters in s.4.15(1) of the EP&A Act as are of relevance to the modification, as required by s.4.55(3) of the EP&A Act.

The nature of Section 4.55 modifications has been considered in the decisions of the NSW Land and Environment Court, and in particular *Westlime* and those of the Chief Justice of the NSW Land and Environment Court, Preston CJ, in *Arrage* and, most recently, in *Canterbury-Bankstown Council v Realize Architecture Pty Ltd* [2024] NSWLEC 31 (*Realize Architecture*) dated 4 April 2024, including the following:

- *"First, the essential elements to be identified are not of the development consent itself, but of the development that is the subject of that development consent. The comparison required by s 4.55(2) is between two developments: the development as modified and the development as originally approved.."* (*Arrage* at [24])
- *"Second, the essential elements are not to be identified "from the circumstances of the grant of the development consent"; they are to be derived from the originally approved and the modified developments. It is the features or components of the originally approved and modified developments that are to be compared in order to assess whether the modified development is substantially the same as the originally approved development."* (*Arrage* at [25]).
- A modified development is substantially the same development as the originally approved development, and must be "essentially or materially" the same or "having the same essence" as the originally approved development. However, a comparison between the essential features of the originally approved and modified developments in order to undertake a comparative exercise is not mandatory (*Arrage* at [27]). [NOTE: The so-called 'Moto test' (*Moto Projects (No 2) Pty Ltd v North Sydney Council* [1999] NSWLEC 280) where qualitative and quantitative elements of the development are to be compared, is no more than dicta and is not a test that a consent authority is obliged to apply when assessing a modification application, per the decision of Preston CJ in *Arrage*]. A comparison of the essential elements of the originally approved development versus that now proposed by the proposed modification is summarised in the accompanying Table 6.1.
- Related to the above, a comparison of the environmental impacts of carrying out the modified development compared to the originally approved development is one potential means of assessing whether or not the modification is 'the same or substantially the same', however, it is an option only, not a mandatory requirement: per Preston CJ in *Arrage* at [28].

"But if that way is selected, then the material and essential features or elements are to be identified from the originally approved and modified developments, not from the circumstances in which the original development consent was granted." (*Arrage* at [29]).

Nevertheless, there are limits to such an approach. Thus, in *Wolgan* Talbot J said at [23]:

"...Even if the present applicant is correct in that there will be a significant increase in the environmental impact of the haul road that, nevertheless, does not necessarily preclude a conclusion that the development, to which the consent as modified relates, is substantially the same development as that already permitted."

■ The modification power is beneficial and facultative (ie. conferring a faculty, privilege, permission, or the power of doing or not doing something). As such, s 4.55 of the EP&A Act “*is to be construed and applied in a way that is favourable to those who seek to benefit from the provision*” per *North Sydney Council v Michael Standley & Associates Pty Ltd* [1998] NSWSC 163 at [440], most recently confirmed by the Chief Judge of the Land and Environment Court in *Arrange* at [51-55]. Stated another way, this means that the statutory provision is to be construed and applied in a way that is favourable to those who seek to benefit from the provision.

In *Realize Architecture* the Chief Justice of the Land and Environment Court, Preston CJ expressly endorsed that a ‘balanced’ approach should be adopted in answering the ‘substantially the same’ test required by s.4.55(2)(a) of the EP&A Act, and went on to clarify that this balanced approach should be undertaken by consent authorities, with regard to the following simple 3 step formula at [7]:

■ **Step 1: Finding the primary facts.** This first step involves identifying the respects in which the originally approved development is proposed to be modified. In this case, the s.4.55(2) modification proposed seeks a clarification in terms of the nature of the quarry/mine operation including a modest increase in the rate of extraction and truck numbers permitted, with modest changes in the nature of monitoring noise and blasting reflecting the past sound track record of Glenella Quarry in complying with relevant EPA requirements. Importantly, no change is proposed in the size or extent of the quarry footprint or mitigation measures already in place.

■ **Step 2: Interpreting the law.** This second step involves interpreting the words and phrases of the ‘same or substantially the same’ test in s.4.55(2)(a) of the EP&A Act as to their meaning. Refer to the points above.

■ **Step 3: Categorising the facts found.** This third (and final) step involves determining whether the facts found, determined as part of the first step, fall within or without the words and phrases of the ‘same or substantially the same’ test in s.4.55(2)(a) of the EP&A Act, determined as part of the second step. Refer Section 4.3.

The Court’s decision in is reminder that determining authorities should not focus only on quantitative (ie. numerical) differences associated with a s.4.55 modification in isolation as it is entirely acceptable for a modification to be approved even if there are large numeric differences between what is proposed versus what was originally approved. Moreover, in evaluating any s.4.55 application a focus only on quantitative (ie. numerical) differences “is inconsistent with the evaluative approach required by s 4.55(2)(a)”: *Realize Architecture* at [32].

In short, only **after** the **first ‘test’** of a modification application is met can the modification be considered in terms of the **second ‘test’**, namely, a consideration such of the matters in s.4.15(1) of the EP&A Act as are of relevance to the modification , as required by s.4.55(3) of the EP&A Act.

5.3 *Comparison of Existing Consent(s) vs Proposed Modification*

The **first ‘test’** of a modification application is whether or not the proposal is ‘substantially the same’ development. The **first ‘test’** must be satisfied prior to any assessment of the relevant heads of consideration under s.4.15(1). A factual analysis will determine whether a development is substantially the same. This is considered in the following.

The following Table 6.1 compares the currently approved quarry development with that now proposed. It is noteworthy that DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council) were approvals for the same quarry development with almost identical conditions (and numbering) of consent.

Table 6.1: Comparison with original Quarry Consents: DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council)

DA Component	Approved Quarry (per DA73/2007 and DA117/06)	Proposed s.4.55(2) Modification
Area Approved for Quarrying	Described in original EIS & Condition 2 of development consents DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council)	No change
Total quarry resource	Described in original EIS	No change
Life of quarry	Described in original EIS	No change
Maximum rate of extraction	Currently 200,000 tonnes per annum	Proposed increase to 499,000 tonnes per annum
Hours of Operation of Quarry	Hours of operation as per Council consent	No change
Quarry truck numbers	Maximum of 35 loaded trucks per day	Proposed increase to a maximum of 50 loaded trucks per day
Quarry Layout	Crushing and processing plant are within the existing approved quarry	Reliance on existing processing plant, including washing plant and spirals. Heavy mineral sand to be added as an additional by-product of washing process.
Quarry Process	Described in original EIS	No change
Blasting	Described in original EIS	No change
Stormwater, soil erosion, dust management	Described in original EIS	No change
Rehabilitation of quarry	Rehabilitation of final worked quarry	No change
Noise generated at quarry	Current daytime limit of 35dBALeq (15 minute) measured at nearest two residences	Proposed daytime limit of 40dBALeq (15 minute) measured at nearest residence: "Glenavon"
Monitoring	Monitoring of noise and blasting at two nearest residences	Proposed monitoring measured at nearest residence: "Glenavon"

The 'same or substantially the same' test has been the subject of case law and is relatively settled. The term "substantially" means "essentially or materially having the same essence" (*Vacik Pty Ltd v Penrith City Council* [1992] NSWLEC 8 and endorsed in *Agricultural Equity Investments Pty Ltd v Westlme Pty Ltd (No 3)* [2015] NSWLEC 7 at [173], and *Ross v Randwick City Council* [2025] NSWLEC 89 dated 26 August 2025).

The proposed modification to the quarry consent is such that the development retains the same fundamental characteristics as the originally approved quarry, and is therefore substantially the same development.

No changes are proposed to the currently approved quarry in terms of the size or the extent of the approved quarry footprint, size of resource, quarrying methods or quarry operating hours. Heavy mineral sands are to be included as an additional by-product of the existing sand/gravel washing process. The modification seeks an increase in the rate of extraction, to 499,000 tonnes per annum, and a modest increase in the number of loaded trucks leaving the site per day carrying the increased volume of quarry products.

Because the limited modifications sought, the environmental and social impacts of the proposal, as compared to the original application, are predicted to be satisfactory. Noise modelling undertaken finds that noise and blasting impacts associated with modification can be appropriately managed to achieve EPA-compliant noise and blasting standards- as is currently the case. Further, the noise assessment finds that a daytime limit of 40dBA LEq(15 minute) is the more appropriate noise goal to apply. Refer to **Appendix A**. Similarly, the traffic impact assessment by Streetwise also finds that acceptable traffic impacts will ensue as a result of the modest increase in daily truck numbers proposed. Refer to **Appendix B**.

5.4 *Quantitative and Qualitative Aspects of Proposed Modification vs Existing Consent*

For the sake of completeness, and notwithstanding the the decision of Preston CJ in *Arrange*, who found that such a test is not required at law, the following compares the qualitative and quantitative elements of the development, as modified, against the existing approved development consents DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council).

■ Quantitative Differences

- The proposed modification does not alter the size of the approved quarry development or size of the resource available. No increase is sought in terms of quarry extraction area or ancillary areas used for such activities as stockpiles, overburden emplacement and the like. No additional extraction area or expansion of the approved quarry footprint or depth of extraction is sought in this modification application.
- The modification seeks approval for the winning of 499,000 tonnes per annum of resource. This represents an increase in extraction of up to 150%.
- This modification seeks a change in truck numbers from a maximum of 35 loaded trucks per day to 50 loaded trucks per day. This represents an increase of up to 42.8% in daily truck numbers, the difference from the percentage increase in the rate of extraction made possible by reliance on the larger carrying capacity of modern quarry haul vehicles since the time of grant of the original consent.
- This modification seeks no change in the approved hours of operation of the quarry.
- The proposed modification gives rise to the need for additional volumes of water, required for dust suppression and for quarry processing plant. In this regard Glenella Quarry has sealed a large part of the internal haul route since the grant of consent and relies on an extensive on-site water storage system and licence capable of meeting forecast water needs- refer **Appendix D**.
- The proposed modification will not give rise to the need for further sediment and erosion controls.
- An appropriate level of blasting will be undertaken in order to minimise the effects of any blast overpressure or vibration impacts on nearby dwellings.
- Allowable noise limits during daytime periods is proposed to be modified, from the current daytime limit of 35dBALEq (15 minute) measured at the nearest residence, to 40dBALEq (15 minute).

A review of similar approved quarry and mining modifications shows that a project can still be 'substantially the same' despite large percentage changes proposed to the scale of that operation. Regardless of the scale of the modification proposed, the Courts have also approved similar modifications provided that there is no radical transformation of the project. Refer to Sections 5.2 and 7.10 of this SEE for details.

■ Qualitative Differences

- The proposed modification does not change the purpose or type of for which the development is being carried out, namely, for a quarry and mine. The changes proposed do not materially change the development or the essence of the approved quarry development, including method of quarrying, method of processing of quarry material or hours of operation.
- The proposed quarry development, as modified, makes use of land which is already approved for quarry purposes. No further clearing or lateral expansion of the quarry is proposed.
- No change is proposed to the approved haul route over which quarry truck traffic is currently permitted to travel
- The proposed development will not result in the loss of amenity or significant visual impact as a result of the nature of the proposed lateral extension of the quarry. The quarry resources will be won from the same approved quarry area.
- Stormwater from within the quarry can be adequately accommodated by existing sediment basin capacity, without detriment to downstream catchments.
- The environmental impacts as previously assessed remain substantially the same and are capable of meeting relevant environmental criteria as a result of the revised modification.

5.5 Conclusion: 'Same or Substantially the Same' Development

From the above, the proposed modification is considered to be 'the same or substantially the same' as the originally approved development and not a 'radical transformation' from the development consents issued in 2007, namely, DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council) and is 'essentially or materially' the same and/or has 'the same essence' as the originally approved development, namely:

- The use remains that of a quarry ('extractive industry') and a mine.
- Save for the modifications proposed, the quarry will continue pursuant to the same terms as the existing consents.
- The same quarry footprint is to be used, with no lateral expansion or deepening of the quarry.
- Given the above, no changes arise in terms of altered visual impacts.
- The same methods of extracting, processing and treating the resource are to be employed as existing on site, with heavy mineral sands to be added as an approved by-product of this process.
- The processed resource will be transported along the same haul route.
- No changes are proposed to the approved sediment and erosion control measures.
- No change is proposed to the approved rehabilitation strategy for the quarry.
- The same hours of operation apply.

In both quantitative and qualitative terms, the proposed modification is 'essentially (and) materially' the same as the original consent (*Westlime*). Therefore, by its nature, the modification proposed for Glenella Quarry will result in a quarry development that is 'substantially the same' as the development for which consent was originally granted, thus satisfying the requirements in Section 4.55(2) of the EP&A Act. Having regard to the above, the proposed modification thus satisfies the **first 'test'**.

As the first 'test' has been satisfied, the modification can now be assessed under the terms of the **second 'test'**, namely, a consideration such of the matters in s.4.15(1) of the EP&A Act as are of relevance to the modification, as required by s.4.55(3) of the EP&A Act- refer Section 7.

■ 6. The Second Modification ‘Test’: s.4.15(1) Assessment

6.1 Overview: the Second ‘Test’ of a Modification

If a modification is shown to be ‘substantially the same development’-as concluded in the preceding Section 6- the **second ‘test’** is thus activated, namely, an assessment pursuant to the relevant provisions of s.4.15(1) of the EP&A Act.

Section 4.55(3) of the EP&A Act provides that a consent authority to take into consideration such of the matters referred to in section 4.15(1) **as are of relevance** [our emphasis] to the development the subject of the application and the reasons given by the consent authority for the grant of the original consent. In other words, not every head of consideration under section 4.15(1) needs to be assessed; only those heads considered to be of relevance to the specific modification application.

Section 4.15(1) provides:

“(1) In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application:

(a) the provisions of:

(i) any environmental planning instrument, and

(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and

(iii) any development control plan, and

(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and

(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph),

(v) Repealed

that apply to the land to which the development application relates,

(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,

(c) the suitability of the site for the development,

(d) any submissions made in accordance with this Act or the regulations,

(e) the public interest.”

6.2 Consistency with Objects of the EP&A Act 1979, ESD

The proposed modification to DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council) is considered to be consistent with the objects of the EP&A Act for the following reasons:

- The site already supports an existing, lawfully established, operating quarry.
- The proposed modification seeks to maximise the efficient and economic recovery of the valuable quarry resource, by increasing the scale of the operation.
- There will be no significant adverse impacts on the environment or the amenity of the neighbourhood resulting from the proposed modification.
- The proposed development will provide ongoing and increased local employment opportunities in association with the proposed future ongoing use of the site as a quarry. Optimal use of a regionally significant quarry/mine.

Glenella Quarry Pty Ltd has demonstrated its commitment to effective environmental management in its existing operations. This management approach will continue under the proposed modification.

In addition to the above, the objects of the EP&A Act at s.1.3 include (b) the facilitation of ecologically sustainable development (ESD).

The accompanying Table 6.1 shows that the modification satisfies the principles of ecologically sustainable development.

Table 6.1: Compliance of the s.4.55(2) modification with ESD principles

ESD Principle	What the Principle provides	How the modification is consistent with the relevant ESD Principle
The Precautionary Principle	<i>Considers any threat of serious and irreversible environmental damage and uncertainty.</i>	<i>The modification enable Glenella Quarry to continue to operate with certainty in a safe and environmentally responsible manner which meets the requirements of local council and State government agencies, accepted industry standards and the conditions of the issued development consent. No serious or irreversible environmental damage results from the modification. The modification does not give rise to any uncertainty in terms of what is proposed, its likely impacts, or relationship to adjoining developments (Oates v Northern Beaches Council [2021] NSWLEC 1684 at [29].)</i>
The Integration Principle	<i>The integration principle states that decision-making processes should effectively integrate both long-term and short-term economic, environmental and social considerations.</i>	<i>The framework for ongoing environmental management, operational performance and rehabilitation of the quarry is provided through the development consents and mine/quarry plan of management framework.</i>
Intergenerational Equity principle	<i>This principle holds that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.</i>	<i>The modification will provide benefits for future generations by providing a secure a significant quarry resource close to committed and future markets and infrastructure projects in the longer term. The current environmental management regime has been developed to minimise the impact of the project on the environment and community to the extent reasonably practicable. The proposal continues to enable elements of the existing environment available to this generation, including the natural environment, water and local biodiversity, would continue to be available to future generations.</i>
Biological Diversity Principle	<i>Under the provisions of this principle, the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.</i>	<i>The proposed modification does not involve any further clearing of land or impacts on ecosystems. As such, there is anticipated to be no additional adverse impacts on the surrounding biological environment arising from the proposed modification.</i>
Valuation and Pricing of Environmental Resources principle	<i>Under this principle, improved valuation, pricing and incentive mechanisms as well as environmental factors should be included in the valuation of assets and services.</i>	<i>Satisfied in that the modification seeks to fully utilise a regionally significant quarry and mine resource. The project optimises the valuation and pricing of the resource with minimal resultant impacts.</i>

6.3 Section 4.15(1) Compliance: Summary

A summary of the overall compliance of the development, as modified, with the preceding s.4.15(1) matters for consideration is set out in the accompanying Table 6.2.

Table 6.2: Compliance of Modification with Relevant Section 4.15 Matters EP&A Act (Summary)

Relevant matters for consideration s.4.15	Compliance of Proposed s.4.55(2) Modification
(a)(i) The provisions of: Any environmental planning instrument	The site enjoys two separate consents for the operation of the quarry and mine. The EP&A Act allows modifications to any consent. The approved quarry development is permitted by both Cowra Local Environmental Plan (LEP) 2012 and by Hilltops Local Environmental Plan (LEP) 2022. Under both LEPs the land is zoned RU1 Primary Production, with “extractive industries” (ie. quarries), a use permitted in this zone. The modification also complies with the relevant provisions of State Environmental Planning Policy (Resources and Energy) 2021. Refer Section 6.4 for details.
(a)(iii) Any development control plan	The applicable development control plans are the Cowra Council Comprehensive DCP and Hilltops Development Control Plan 2025. Neither DCP contains provisions that specifically apply to extractive industries. Refer Section 6.4 for details.
(a)(iv) The regulations	Clause 100 in Part 5 Division 1 of the EP&A Regulation 2021 details the information required to be submitted with an application to modify a Development Consent under section 4.55. These details are contained in this report, and accompanying letter and application form.
(b) Likely impacts	▶ The modified development is substantially the same development as that for which consent was originally granted (refer Section 5), with acceptable environmental impacts and an effective operating quarry/mine management regime already in place. ▶ The modification optimises the quarry operation and enables full economic recovery of the approved quarry and mineral resources found on the project site. Moreover, it enables the servicing of existing markets and infrastructure projects and increase employment for workers -positive social and economic impacts. ▶ If approved, the quarrying/mine operations, as modified, at Glenella Quarry will continue to be subject to conditions of consent which regulate impacts on and provide safeguards to adjoining landholders in the vicinity of the approved development. ▶ No change is proposed to the nature of quarrying on site. ▶ No additional clearing of land is proposed. ▶ There will be no likely adverse impacts on the environment or agriculture, Aboriginal sites or associated heritage values. ▶ The modification will not involve any changes to the nature of extraction or quarrying of the resource. Existing processing facilities will continue to operate. ▶ Additional demand for water can be satisfactorily addressed, even during dry periods. ▶ Acceptable noise, air and blasting impacts are predicted. ▶ Acceptable traffic impacts are predicted.
(c) Suitability of the site	The suitability of the site for a quarry was comprehensively addressed by Cowra and Boorowa councils prior to the grant of the original consent(s) in 2007. No change is proposed to the existing approved quarry footprint authorised by these consents DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council).
(e) Public interest	The proposed modification is considered to be in the public interest as it has positive social and economic outcomes, and has satisfactory environmental impacts. Glenella Quarry is one of the largest quarries in the region. The proposal would contribute to the economy locally and through ongoing employment generation and the provision of materials for industries, building and infrastructure projects in the region and elsewhere in NSW.

6.4 Section 4.15(1)(a)(i) Planning instruments

Two comprehensive environmental planning instruments apply to the the Glenella Quarry:

Cowra Council	Hilltops (formerly Boorowa) Council
Cowra Local Environmental Plan (LEP) 2012 which applies to that part of “Glenella” within the Cowra LGA ie. Lots 35 & 44 DP 752935	HilltopsLocal Environmental Plan (LEP) 2022 which applies to that part of “Glenella” within the Hilltops LGA ie. Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584

■ Cowra Local Environmental Plan (LEP) 2012: Zoning

The Cowra LEP 2012 is the comprehensive environmental planning instrument applying to that part of Glenella Quarry lying within the Cowra LGA, namely, the western half of the approved extraction area and most of the approved quarry haul over the local road system back to Lachlan Valley Way. Under this LEP the land is zoned RU1 Primary Production. Refer **Figure 6.1**. “Extractive industries” (ie. quarries), as defined, are a use permitted in the RU1 zone, as are open cut mines.

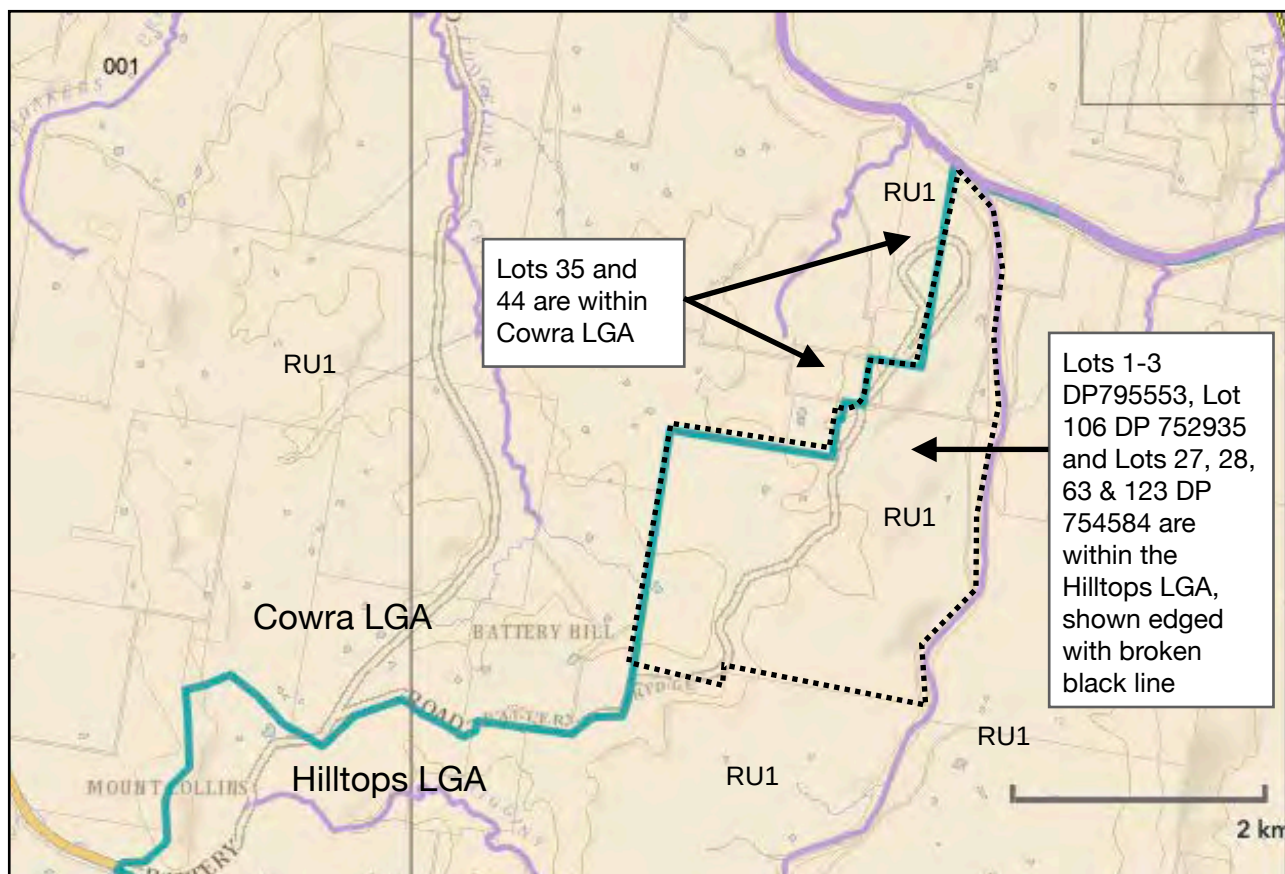


FIGURE 6.1: Existing Zoning of Glenella Quarry Site: RU1 Primary Production and local government boundaries

(Source: NSW Government ePlanning Spatial Viewer August 2025)



■ Hilltops Local Environmental Plan (LEP) 2022: Zoning

Under the provisions of Boorowa LEP 2012 that part of Glenella Quarry lying within the Hilltops LGA is zoned RU1 Primary Production. Refer **Figure 6.1. Extractive industries** (ie. quarries), as defined, are a use permitted in the RU1 zone, as are open cut mines.

■ Compliance with Cowra Local Environmental Plan (LEP) 2012

The compliance of the quarry development, as modified, with the objectives of the RU1 Primary Production zone under Cowra LEP 2012 are set out in the following Table 6.3.

Table 6.3: Compliance of the Modification with RU1 Zone Objectives Cowra LEP 2012

Cowra LEP 2012 RU1 Zone Objectives	Compliance
<i>“To encourage sustainable primary industry production by maintaining and enhancing the natural resource base”</i>	<i>Quarries form an important part of the resource base of any local area. Local and regional roads and infrastructure projects require readily accessible quarry material- hence the need for the continued extraction of quarry material from Glenella Quarry.</i>
<i>“To encourage diversity in primary industry enterprises and systems appropriate for the area”</i>	<i>Not applicable to the project</i>
<i>“To minimise the fragmentation and alienation of resource lands”</i>	<i>The proposed quarry development does not involve the fragmentation and alienation of resource lands. Instead, it seeks to expand the rate of extraction within the existing approved footprint of a regionally significant quarry.</i>
<i>“To minimise conflict between land uses within this zone and land uses within adjoining zones”</i>	<i>The quarry is located in a sparsely populated rural area, is reasonably well buffered from rural dwellings and has access to a regional road system (ie. Lachlan Valley Way) via an approved quarry haul route over a recently upgraded local road system. The nearest residence, “Glenavon”, is located approximately 1.0km to the north of the approved quarry footprint. Noise and blasting at the quarry will be carefully managed, thus assisting in minimising any conflict with neighbouring land uses. Acceptable traffic noise impacts have also been predicted.</i>

Cowra LEP 2012 mapping indicates that Glenella Quarry is free from the following planning or environmental constraints:

- Scenic protection.
- Wetlands (source: Cowra Local Environmental Plan 2012 Wetlands Map Groundwater Vulnerability Map Riparian Lands and Watercourses Map Sheet CL1_004).
- Acid sulfate soils.
- Heritage-listed features, by reference to Cowra LEP 2012 Heritage Map Sheet HER_004.
- Flood prone land.
- Bush fire prone land (source NSW Rural Fire Service online inquiry). Refer **Appendix E**.
- Drinking water catchment.

It is also affected by the following mapping under the Cowra LEP 2012:

- The small valley between the two approved extraction areas on Glenella Quarry are identified as comprising land with biodiversity values (source: *Cowra Local Environmental Plan Terrestrial Biodiversity Map Sheet BIO_004*). The quarry development, as modified, does not seek to extend beyond the footprint that has already been approved for quarry purposes. Moreover, a comprehensive stormwater and erosion control system already forms a part of the current consent. As such, the quarry development, as modified, poses no additional risk or threats to the identified terrestrial values beyond that of the already approved quarry development. Measures are already in place under the current consents to protect any habitats or ecosystems worthy of protection.
- All of Lots 35 & 44 DP 752935 have been identified as comprising lands with groundwater vulnerability (source: *Cowra Local Environmental Plan 2012 Wetlands Map Groundwater Vulnerability Map Riparian Lands and Watercourses Map Sheet CL1_004*). The 2007 RW Corkery EIS concluded that: “groundwater is not expected to be encountered within the extraction area of the Project Site” (page 5-22 of EIS). The quarry development, as modified, does not seek any further clearing or excavation or deepening of the approved quarry. Having regard for the above, the quarry development, as modified, poses no additional risk or threats to groundwater.

The following Table 6.4 summarises the compliance of the proposed modification with other relevant provisions of the Cowra LEP 2012.

Table 6.4: Compliance with other relevant provisions of Cowra LEP 2012

Other Cowra LEP 2012 provisions	Compliance
Clause 4.6	No variation sought.
Clauses 5.1-5.22 Miscellaneous provisions	Not applicable. Extractive industries are not listed under this clause of the LEP. The quarry is not flood prone, nor is the quarry development, as modified, likely to raise any concerns or impacts in terms of the factors considered in clause 5.21(3) of the LEP.
Clauses 6.1-6.2	Not applicable. The quarry development, as modified, does not seek any additional earthworks to be carried out, and the development, as modified, relies on existing infrastructure already in place at the Glenella Quarry site.
Clause 6.3 Terrestrial biodiversity	The quarry development, as modified, does not seek any additional clearing beyond that of the already approved quarry development. Measures are already in place under the current consents to protect any habitats or ecosystems worthy of protection.
Clause 6.4 Groundwater vulnerability	The quarry development, as modified, does not seek any further clearing or excavation or deepening of the approved quarry. As such, the quarry development, as modified, poses no additional risk or threats to groundwater.
Clause 6.5 Riparian land and watercourses	The quarry development, as modified, seeks no lateral expansion of the existing approved quarry footprint. The recent (April 2022) obtaining of a zero share WAL means that the quarry operator will have sufficient water for dust suppression held within the approved sediment basin system already approved on site. The modification poses no additional risks in terms of water quality, stability of the bed and banks of watercourses, aquatic and riparian habitats or ecological processes.
Clause 6.8	The quarry operator's recent obtaining of a zero share WAL means that the quarry operator will have sufficient water for the proposed expanded quarry operation.

■ Compliance with Hilltops Local Environmental Plan (LEP) 2022

The compliance of the quarry development, as modified, with the objectives of the RU1 Primary Production zone under Hilltops LEP 2022 are set out in the following Table 6.5.

Table 6.5: Compliance of the Modification with RU1 Zone Objectives Hilltops LEP 2022

Boorowa LEP 2012 RU1 Zone Objectives	Compliance
<i>“To encourage sustainable primary industry production by maintaining and enhancing the natural resource base”</i>	Quarries form an important part of the resource base of any local area. Local and regional roads and infrastructure projects require readily accessible quarry material- hence the need for the continued extraction of quarry material from Glenella Quarry.
<i>“To encourage diversity in primary industry enterprises and systems appropriate for the area”</i>	Not applicable to the project
<i>“To minimise the fragmentation and alienation of resource lands”</i>	The proposed quarry development does not involve the fragmentation and alienation of resource lands. Instead, it seeks to expand the rate of extraction within the existing approved footprint of a regionally significant quarry.
<i>“To minimise conflict between land uses within this zone and land uses within adjoining zones”</i>	The quarry is located in a sparsely populated rural area, is reasonably well buffered from rural dwellings and has access to a regional road system (ie. Lachlan Valley Way) via an approved quarry haul route over a recently upgraded local road system. The nearest residence, “Glenavon”, is located approximately 1.0km to the north of the approved quarry footprint. Noise and blasting at the quarry will be carefully managed, thus assisting in minimising any conflict with neighbouring land uses. Acceptable traffic noise impacts have also been predicted.
<i>“To encourage competitive rural production and associated economic development by maintaining and enhancing – (a) local and regional transport and communications connectivity, and (b) accessibility to national and global supply chains.”</i>	The quarry/mine services markets as far afield as Sydney, supplying clay for Sydney’s brickworks. The quarry/mine is serviced by a road system capable of accommodating heavy traffic generated by it, existing and proposed.
<i>“To maintain areas of high conservation value vegetation.”</i>	The project Site does not contain any area of high conservation value. Glenella Quarry Pty Ltd has in place an effective site management system that ensures that off-site impacts are minimal. The modification seeks no change in the quarry footprint, nor will it result in any demonstrable impact on any adjoining ecosystems.
<i>“To encourage development that is in accordance with sound management and land capability practices, and that takes into account the natural resources of the locality”</i>	Glenella Quarry Pty Ltd has demonstrated its commitment to effective environmental management in its existing operations. This management approach will continue under the proposed modification. The quarry development, as modified, seeks to optimise the recovery of the valuable resources found on the “Glenella” property.
<i>“To protect and enhance the water quality of receiving watercourses and groundwater systems and to reduce land degradation”</i>	The modification poses no additional risks in terms of water quality, stability of the bed and banks of watercourses, aquatic and riparian habitats or ecological processes. The quarry development, as modified, poses no additional risk or threats to groundwater.
<i>“To encourage the development of non-agricultural land uses that are compatible with the character of the zone and sustain high quality rural amenity.”</i>	Extractive industries and open cut mines are specifically identified as permissible uses in the RU1 zone and, as such, are compatible with the character of the RU1 zone. Monitoring shows that the existing Glenella Quarry operations are undertaken in compliance with applicable EPA and Mining Act guidelines. The proposed development, as modified, is not anticipated to raise any concerns in terms of incompatibility with or visa impacts or amenity.

Hilltops LEP 2022 mapping indicates that Glenella Quarry is free from the following planning or environmental constraints:

- Scenic protection or environmentally sensitive land, including wetlands or flood prone lands.
- Acid sulfate soils or lands affected by salinity.
- Heritage-listed features.
- Bush fire prone land (source: NSW Rural Fire Service online inquiry). Refer **Appendix E**.
- Drinking water catchment.

The following Table 6.6 summarises the compliance of the proposed modification with other relevant provisions of the Boorowa LEP 2012.

Table 6.6: Compliance with other relevant provisions of Hilltops LEP 2022

Other Hilltops LEP 2022 provisions	Compliance
Clause 4.6	No variation sought.
Clauses 5.1-5.25 Miscellaneous provisions	Not applicable. Extractive industries are not listed under this clause of the LEP. The quarry is not flood prone, nor is the quarry development, as modified, likely to raise any concerns or impacts in terms of the factors considered in clause 5.21(3) of the LEP.
Clauses 6.1-6.2	Not applicable. The quarry development, as modified, does not seek any additional earthworks to be carried out, and the development, as modified, relies on existing infrastructure already in place at the Glenella Quarry site.
Clause 6.3 Terrestrial biodiversity	The quarry development, as modified, does not seek any additional clearing beyond that of the already approved quarry development. Measures are already in place under the current consents to protect any habitats or ecosystems worthy of protection.
6.4 Riparian land and watercourses	The quarry development, as modified, seeks no lateral expansion of the existing approved quarry footprint. The recent (April 2022) obtaining of a zero share WAL means that the quarry operator will have sufficient water for dust suppression held within the approved sediment basin system already approved on site. The modification poses no additional risks in terms of water quality, stability of the bed and banks of watercourses, aquatic and riparian habitats or ecological processes.
Clause 6.5 Groundwater vulnerability	The quarry development, as modified, does not seek any further clearing or excavation or deepening of the approved quarry. As such, the quarry development, as modified, poses no additional risk or threats to groundwater.

Glenella Quarry is also affected by the following mapping under the Boorowa LEP 2012:

- A few pockets of “Glenella” are identified as comprising land with biodiversity values (source: *Hilltops Local Environmental Plan 2022 NSW Government ePlanning Spatial Viewer August 2025*). The quarry development, as modified, does not seek to extend beyond the footprint that has already been approved for quarry purposes. Moreover, a comprehensive stormwater and erosion control system already forms a part of the current consent. As such, the quarry development, as modified, poses no additional risk or threats to the identified terrestrial values beyond that of the already approved quarry development. Measures are already in place under the current consents to protect any habitats or ecosystems worthy of protection.

■ Most of the “Glenella” property, including the approved quarry footprint, has been identified as comprising lands with groundwater vulnerability (source: *Hilltops Local Environmental Plan 2022 NSW Government ePlanning Spatial Viewer August 2025*). The 2007 RW Corkery EIS concluded that: “groundwater is not expected to be encountered within the extraction area of the Project Site” (page 5-22 of EIS). The quarry development, as modified, does not seek any further clearing or excavation or deepening of the approved quarry. Having regard for the above, the quarry development, as modified, poses no additional risk or threats to groundwater.

■ State Environmental Planning Policy (Resources and Energy) 2021

State Environmental Planning Policy (Resources and Energy) 2021 applies. The quarry development, as modified, achieves the aims of this SEPP, in particular:

- It facilitates the ongoing development and economic use of a regionally significant quarry containing mineral and extractive resources.
- It facilitates the ongoing use and orderly development of a regionally significant quarry containing mineral and extractive resources.
- It promotes the development of Glenella Quarry through a proposed increase in the rate of extraction and export of quarry and mineral products from the quarry.

Part 2.3 of the SEPP applies to development applications- which this modification application is not. Notwithstanding this fact, the following is provided. Extractive industries and mines are permissible with consent under this State planning policy, permitted on any land where agriculture is permissible. This SEPP provides that if this Policy is inconsistent with any other environmental planning instrument, whether made before or after this Policy, this Policy prevails to the extent of the inconsistency.

- The SEPP requires that mining developments are to comply with the noise, airblast and ground vibration requirements of clause 2.16 of the SEPP.
- The compatibility with surrounding land uses (clause 2.17). Assessed by Cowra and Boorowa (now Hilltops) councils prior to the grant of development consents DA73/2007 and DA117/06 in 2007. The environmental impacts of the most recent quarry development were the subject of a detailed EIS prepared by RW Corkery & Co. Each development consent issued by the above local councils contains a raft of almost identical consent conditions that aim to ensure that the impacts of quarrying the site are satisfactorily mitigated. These mitigation measures will continue apply to the quarry development, as modified.
- The efficiency of resource recovery.
- An increase in daily truck movements will arise as a consequence of the proposed increase in the rate of recovery of this resource. The traffic assessment by Streetwise (refer **Appendix B**) finds that satisfactory traffic impacts will ensue as a result of this increase in heavy vehicle traffic.
- The rehabilitation of the land, including final landforms, will not change from that already approved.
- To encourage ecologically sustainable development through the environmental assessment, and sustainable management of extractive material resources. The two development consents, DA73/2007 and DA117/06, contain numerous conditions that, taken as a whole, will assist in ensuring that these outcomes are achieved.

An assessment of the proposed quarry modification shows that it complies with the provisions of *State Environmental Planning Policy (Resources and Energy) 2021*, as set down in the following Table 6.7.

Table 6.7: Compliance of the Proposed Modification with SEPP (Resources and Energy) 2021

Relevant clause in SEPP	Compliance
Clause 2.9 - Permissibility	Extractive industries and mines are permissible on the subject property.
SEPP Clause 2.16- Criteria	Assessed by Cowra and Boorowa councils prior to the grant of development consents DA73/2007 and DA117/06 in 2007. The existing quarry/mine complies with the noise, airblast and ground vibration requirements of clause 2.16 of the SEPP-refer Appendix A. Clause 2.16(7), which relates to aquifer interference, is not relevant in this case because: ▶ The 2007 EIS by RW Corkery & Co found no evidence of groundwater, stating: "As groundwater is not expected to be encountered within the extraction area of the Project Site, it is deemed there are no major groundwater issues or constraints requiring further consideration." (page 5-22 of the EIS) ▶ No changes are proposed to the approved quarry in terms of the quarry footprint or depth of extraction beyond that already approved and allowed for in the two operative development consents.
SEPP Clause 2.17 - (a) consider: (i) the existing uses and approved uses in the vicinity, and (ii) potential for significant impact on the preferred uses of land in the vicinity of the development, and (iii) compatibility with any existing, approved or likely preferred uses	▶ The compatibility with surrounding land uses (clause 2.17). Assessed by Cowra and Boorowa councils prior to the grant of development consents DA73/2007 and DA117/06 in 2007. The environmental impacts of the most recent quarry development were the subject of a detailed EIS prepared by RW Corkery & Co. ▶ Each development consent issued by the above local councils contains a raft of almost identical consent conditions that aim to ensure that the impacts of quarrying the site are satisfactorily mitigated. These mitigation measures will continue apply to the quarry development, as modified. ▶ The quarry is reasonably well buffered from surrounding rural dwellings and agricultural uses. The proposed development, as modified, is not anticipated to raise any concerns in terms of incompatibility with neighbouring land uses. ▶ The proposed development, as modified, seeks no lateral expansion of the existing approved quarry. No further clearing is proposed. There is no change to the the approved quarry footprint.
(b) public benefits of the development per paragraph (a) (i) and (ii) (c) measures proposed by the applicant to avoid or minimise any incompatibility, per paragraph (a)(iii)	▶ Refer to above. (b) and (c) both assessed by Cowra and Boorowa councils prior to the grant of development consents DA73/2007 and DA117/06 in 2007. ▶ The proposed increase in the rate of resource recovery will result in benefits to the local and regional economy, will help generate employment opportunities, as well as enable continuing reliance on this quarry pit for road making and construction industries as well as major infrastructure projects in the future. ▶ Effective quarry mitigation measures already in place.
Clause 2.19- Compatibility	▶ Refer to the above. ▶ The proposed quarry extension is set back an adequate distance from the nearest rural residence. ▶ The modification seeks no change to the already approved quarry haul route.
Clause 2.20 (a) Impacts on water resources (b) Impacts on threatened species, biodiversity avoided or minimised (c) Greenhouse gas emissions are minimised	▶ Assessed by Cowra and Boorowa councils prior to the grant of development consents DA73/2007 and DA117/06 in 2007. ▶ The quarry operator has sufficient water for dust suppression in place. ▶ There is no change to the existing quarry footprint arising from the modification. The quarry development, as modified, will thus have no likely impact on threatened species. ▶ Greenhouse gas emissions reduced due to fuller utilisation of an existing quarry resource,. The quarry utilises plant and a design that maximises quarry efficiency in terms of travel distances for equipment, efficiency of extraction of the quarry and mineral resources, and handling of materials.

Clause 2.21 -Resource recovery	▶ The s.4.55 modification will enable the optimisation of valuable, high quality resources that provide economic benefit to the region generally as well as to more distant markets. It is considered to be highly efficient as it proposes an increase in the rate of resource recovery from an already operating approved quarry that has effective environmental controls and management in place. ▶ The s.4.55 modification offers benefits including but not limited to the more efficient use of existing quarry processing equipment and optimisation of resource recovery, as well as continuing extraction from an established quarry.
Clause 2.22 - transport	▶ Assessed by Cowra and Boorowa councils prior to the grant of development consents DA73/2007 and DA117/06 in 2007. ▶ Transportation of quarry product will be along the same approved quarry haul route. ▶ A modest, satisfactory increase in quarry truck traffic is proposed.
Clause 2.23 - Rehabilitation	▶ The rehabilitation of the quarry, including final landforms, will not change from that already approved.

The proposed modification thus complies with the relevant provisions of *State Environmental Planning Policy (Resources and Energy) 2021*.

■ Compliance with Other State Environmental Planning Policies

The accompanying Table 6.8 provides a summary of the compliance of the proposed modification with a relevant State Environmental Planning Policies.

Table 6.8: Compliance of the Modification with State Environmental Planning Policies (SEPPs)

State Environmental Planning Policy	Summary of SEPP provisions	Compliance
State Environmental Planning Policy (Transport and Infrastructure) 2021	A planning regime for infrastructure and the provision of development across NSW.	▶ The proposed modification will result in an increase in daily loaded trucks, from 35 trucks to 50 trucks per day. ▶ The traffic assessment by Streetwise finds that the increase in quarry truck traffic can be satisfactorily accommodated on the haul route back to Lachlan Valley Way.
State Environmental Planning Policy (Resilience and Hazards) 2021	▶ Consideration of 'potentially hazardous' or 'potentially offensive' uses. ▶ Remediation of contaminated land.	▶ The proposal is for the continuation of existing established quarrying operations and established quarry management procedures. Mitigation measures are currently in place within the quarry to limit any hazardous or offensive discharges. No contaminated land encountered here. ▶ Blasting and processing of quarry products are undertaken in accordance with EPA criteria.
State Environmental Planning Policy (Biodiversity and Conservation) 2021	▶ Koala habitat protection.	▶ No lateral expansion or deepening of the approved quarry footprint is proposed, with no additional clearing of land or habitats proposed, or any impacts on Kola habitat. ▶ Mitigation measures are currently in place within the quarry to limit any impacts on ecological communities.
State Environmental Planning Policy (Planning Systems) 2021	Defines regional or state significant projects	The project is a modification of consent only. It is not State significant development.
State Environmental Planning Policy (Primary Production) 2021	Identifies significant agricultural land for protection	▶ No expansion of the existing approved quarry footprint is proposed. No further agricultural land impacted. ▶ The site is located within a rural landscape where there is good natural separation between land uses. No land use conflict likely to arise from the proposed modification on nearby agricultural land uses.

■ **Central West and Orana Regional Plan 2041**

The *Central West and Orana Regional Plan 2041* (REP) is a 20-year land-use blueprint to support a prosperous future for the region, including the Cowra LGA. [NOTE: Hilltops LGA forms a part of another region] The plan is not meant to be detailed land use plan, but rather, it provides an overarching framework to guide subsequent and more detailed rezonings/draft LEPs, development proposals and infrastructure funding decisions.

Objective 3 of the REP is to: “*Sustainably manage extractive resource land and grow the critical minerals sector*”. Strategy 3.1 of the REP provides provisions relevant to Glenella Quarry and to this modification application including:

- “*protecting potential mineral and energy resources from land uses that would sterilise this potential.*”
- “*protecting existing and proposed resource extraction projects from land uses that could impact operations.*”
- “*promoting opportunities for minerals processing within the region.*”
- “*addressing water resource constraints and impacts.*”

Glenella Quarry is one of the largest quarries operating in the Cowra LGA. It produces quarry products and high-value minerals like heavy mineral sands and gold as by-products. It already has in place an effective water management system that has more than sufficient capacity to accommodate the increase in rate of extraction proposed in this modification application. The ongoing quarry operation aligns with industry best standards in all aspects, and in particular in terms of air, noise, water, and blast management. The quarry/mine development, as modified, complements the above in that it seeks to optimise the winning of the valuable extractive and mineral resources known to underly the quarry site.

The proposed modification does not seek to expand the quarry footprint, nor will it impinge any further upon important environmental assets (REP Objective 5), rivers and waterways (REP Objectives 6 and 8) or agricultural land (REP Objective 19). The approved quarry contains no heritage sites or landscapes-considered in the regional plan under Objective 9.

The recent improvements to the haul route over the local road system, funded in the main by Glenella Quarry Pty Ltd, strengthens road links that ultimately benefit not only the quarry but also agricultural uses that rely on this road system as well (Objective 4). Quarries provide the essential materials to enable highway upgrades to occur.

Objective 23 of the regional plan aims for collaboration and partnerships with Aboriginal communities. In this regard Glenella Quarry Pty Ltd is a certified indigenous business with Supply Nation as well as NSW Indigenous Chamber of Commerce (NSWICC) Assured Member and FACCI Affiliate.

■ **South East and Tablelands Regional Plan 2036 and Draft 2041 Plan**

The *South East and Tablelands Regional Plan 2036* is a 20-year land-use blueprint to support a prosperous future for the region, including the Hilltops LGA. [NOTE: Cowra LGA forms a part of another region] A revised 2041 plan has also been prepared however this is still in draft form.

The quarry/mine development, as modified, is generally compliant with the following Directions contained within this regional plan [NOTE: Similar to those contained in the *Central West and Orana Regional Plan 2041*, discussed in more detail above]:

- Strengthen the economic self-determination of Aboriginal communities (Direction 10 of 2036 REP and Objectives 1 and 2 of Draft *South East and Tablelands Regional Plan 2041*).

Protection of important environmental assets, including waterways and habitats (Direction ?? of 2036 REP and Objectives 5 and 6 of Draft *South East and Tablelands Regional Plan 2041*).

- Enhance strategic transport links to support economic growth (Direction 11 and of 2036 REP and Objective 21 of Draft *South East and Tablelands Regional Plan 2041*).

- Manage the ongoing use of mineral resources (Direction 13 of 2036 REP and Objective 10 of Draft *South East and Tablelands Regional Plan 2041*).

6.5 Section 4.15(1)(a)(iii) Any Development Control Plan

In addition to the provisions of the Cowra and Hilltops LEPs the provisions of each Council's development control plan(DCP) also apply. DCP controls are fundamental elements and focal points in the decision-making process, which must be taken into account when determining a modification application (s4.55(3) EP&A Act):*Ross v Randwick City Council* [2025] NSWLEC 89 decision dated 26 August 2025. As the quarry straddles two different local government areas- Cowra and Hilltops- the following development control plans (DCPs) apply:

Cowra Council	Hilltops (formerly Boorowa) Council
<i>Cowra Shire Council Development Control Plan 2021</i> which applies to that part of "Glenella" within the Cowra LGA ie. Lots 35 & 44 DP 752935	<i>Hilltops Development Control Plan 2025</i> which applies to that part of "Glenella" within the Hilltops LGA ie. Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 This DCP, adopted on 25 June 2025, replaces the former <i>Boorowa Development Control Plan 2013</i> .]

The purpose and status of development control plans are set down in s.3.42 of the EP&A Act:

"3.42 Purpose and status of development control plans(cf previous s 74BA)

(1) The principal purpose of a development control plan is to provide guidance on the following matters to the persons proposing to carry out development to which this Part applies and to the consent authority for any such development—

- (a) giving effect to the aims of any environmental planning instrument that applies to the development,*
- (b) facilitating development that is permissible under any such instrument,*
- (c) achieving the objectives of land zones under any such instrument."*

Section 4.15(3A) of the EP&A Act requires consent authorities to consider the provisions of any development control plan when determining any DA. It makes clear that if a development control plan sets standards with respect to an aspect of the development and the development application complies with those standards, then the consent authority is not to require more onerous standards with respect to that aspect of the development.

■ **Cowra Shire Council Development Control Plan (DCP) 2021**

The quarry development, as modified, generally complies with relevant sections of the *Cowra DCP 2021* per the land use matrix in Part A of the DCP, considered in the following Table 6.9.

It is noteworthy that there are no provisions within this DCP that specifically apply to extractive industries.

Table 6.9: Compliance of the Modification with Cowra DCP 2021

Cowra DCP 2021 Part	Summary of DCP provisions	Compliance
Part A: Plan Introduction	Identifies what parts of the DCP may be applicable to extractive industries as illustrated in land use matrix ie. Parts A, C, K, M and O.	No further provisions identified in terms of extractive industries.
Part C: Biodiversity Management	Part C of the DCP applies to all development in the Cowra Shire that proposes to directly remove or indirectly impact native vegetation or is in the proximity of an area that contains native vegetation.	- Impacts on biodiversity previously considered by Council prior to the grant of consent to the quarry in August 2007. - No proposal to directly remove or indirectly impact native vegetation in modification. - No proposal to clear any further vegetation or to change the currently approved quarry footprint.
Part K: Land Use Buffers	Part K applies to new development within the Cowra Shire Local Government Area that is located within an identified buffer area.	Quarries are not identified as buffer areas covered by the this Part.N/A
Part M: Access + Mobility	Provides introductory information for car parking, access and mobility associated with new development within the Cowra Shire Local Government Area.	The project, as modified, has more than sufficient space available within the quarry to accommodate parking spaces for the additional employees proposed.[NOTE: No parking standards provided for quarries]
Part O: Environmental Hazard Management	This Part of the DCP outlines Council's development requirements for land that is identified as being located within the flood planning area, bushfire prone lands or contaminated lands	- The quarry is not affected by flooding. - The approved quarry and surrounds is not identified as being bush fire prone land. - The quarry is not contaminated land.

■ Hilltops Development Control Plan (DCP) 2025

The quarry development, as modified, generally complies with relevant sections of the *Hilltops DCP 2025*, considered in the following Table 6.10.

It is noteworthy that there are no provisions within this DCP that specifically apply to the management of extractive industry developments.

Table 6.10: Compliance of the Modification with Hilltops DCP 2025

Boorowa DCP 2013 Section	Summary of DCP provisions	Compliance
Section 2.1A AR3.4	Dwellings to be set back a buffer of 1,000 metres from any extractive industry.	No dwelling proposed. [NOTE: Under the provisions of s.2.19 State Environmental Planning Policy (Resources and Energy) 2021 a Council is required to consider the compatibility of any proposed development in the vicinity of an existing extractive industry or mine,}
Section 4.1 Car parking and vehicle access	Parking at the rate of 1 space per 2 staff employed required for "Industries"	More than 4 parking spaces provided on site ,to service existing 8 employees. Space available for more parking to be provided.

6.6 Section 4.15(1)(a)(iii) Any Planning Agreements

A voluntary planning agreement (VPA) was entered into under the former section 93F (now s.7.4) of the EP&A Act, executed between Cowra Council and Glenella Quarry Pty Ltd. in July 2009 following grant of consent. It required Glenella Quarry Pty Ltd, to carry out various upgrades to the local haul road back to Lachlan Valley Way. Outline Planning Consultants are instructed that all of these local road works have now been completed. Following the completion of these works the condition of the haul road has been significantly improved over that existing at the time of grant of the 2007 consent. Similarly, Glenella Quarry Pty Limited entered into a planning agreement with Boorowa (now Hilltops) Shire Council to contribute substantially to the upgrading of approximately 4km of Battery Road, now completed.

6.7 Section 4.15(1)(a)(iv) The Regulations

The term “the Regulations” applies to the *Environmental Planning & Assessment Regulation 2021* (EP&A Regulation 2021). This modification application complies with the relevant provisions of clause 100 of the EP&A Regulation 2021 in terms of required content, as summarised in the accompanying Table 6.11.

Table 6.11: Compliance with EP&A Regulation 2000

Clause 100 EP&A Regulation 2000 requirement	Compliance
(1)(a) the name and address of the applicant	Outline Planning Consultants on behalf of Glenella Quarry Pty Ltd.
(b) a description of the development that will be carried out under the development consent	Yes, provided.
(c) the address and and folio identifier of the land on which the development will be carried out	Lot 35 & 44 DP 752935 (Cowra LGA); and Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 (Hilltops LGA), No.483 Battery Road, Cowra, NSW 2794
(d) a description of the modification to the development consent, including the name, number and date of plans that have changed..	Yes. Refer to Section 3 of this SEE report for details. No change in folio identifier of the land since the 2007 consents were issued.
(e) whether the modification is intended to: (i) or (ii) have another effect specified in the modification application	Yes. The modification application is one lodged pursuant to s.4.55(2) of the EP&A Act.
(f) a description of the expected impacts of the modification	Yes. Details provided Section 6.8 of this SEE report.
(g) an undertaking that the modified development will remain substantially the same as the development originally approved	Yes. Details provided in Section 5 of this SEE report.
(h) for a modification application that is accompanied by a biodiversity development assessment report—the biodiversity credits information	N/A
(i) if the applicant is not the owner of the land—a statement that the owner consents to the making of the modification application	Yes. The owner, Michael Howe of the Glenella Group, consents to the making of the modification application.

6.8 Section 4.15(1)(b) Likely Impacts

Section 4.55(3) of the EP&A Act requires a consent authority to take into consideration such of the matters in s 4.15(1) of the EPA Act as are of relevance to a modification application. The likely impacts associated with the proposed modification are summarised in the accompanying Table 6.12.

Table 6.12: Likely impacts of the proposed s.4.55(2) modification Glenella Quarry: summary

Environmental impact	Compliance
Impact on vegetation, biodiversity	Yes. The proposed modification seeks no lateral expansion or deepening of the currently approved quarry, with no additional clearing of vegetation proposed. Existing on-site mitigation measures to be retained, to protect ecosystems located outside of and proximate to the approved quarry footprint.
Cultural	Yes. The proposed modification to be undertaken wholly within the currently approved quarry footprint. No additional cultural impacts will thus result.
Agriculture	Yes. The proposed modification to be undertaken wholly within the currently approved quarry footprint, with no additional adverse visual or noise or dust impacts likely to result from the modification proposed.
Noise, blasting impacts	Yes. The assessment by Waves Consulting finds that the proposed quarry, as modified, will result in satisfactory noise and blasting (overpressure and ground vibration) impacts. Refer Appendix A for details.
Air quality impacts	Yes. Existing air quality measures will continue to apply. The quarry operator has secured a zero plan WAL in April 2022 (refer Appendix D) which will ensure that a reliable source of water is available for dust suppression purposes at the quarry at all times. The proposed quarry development, as modified, will result in satisfactory air quality impacts.
Landscape	Yes. No change in visual impacts given that the proposed modification to be undertaken wholly within the currently approved quarry footprint.
Traffic impacts	Yes. It is proposed to increase daily loaded truck numbers from the current 35 to a proposed 50 trucks per day, much of the increased volume of product to be carted in larger trucks than those assumed in the 2007 EIS. The existing approved quarry haul route has more than sufficient capacity to accommodate the modest increase in loaded truck volumes proposed- refer Appendix B .
Stormwater drainage, sediment and erosion control	Yes. No change is proposed in the area to be quarried or stormwater drainage and sediment control measures already in place. All stormwater generated by the existing and proposed quarry operations is to be contained within the quarry pit, with no downstream and/or off-site impacts likely. The proposed intensification in production will increase the demand for process water. The quarry operator has secured a zero plan WAL in April 2022 (refer Appendix D) which will ensure that a reliable source of water is available for all on-site water needs.
Planning and the surrounding rural environment, amenity	Yes. Previously considered and found to be satisfactory when DA73/2007 (Cowra Council) and DA117/06 (Boorowa, now Hilltops Council) were assessed and subsequently approved in 2007. The modified development is substantially the same as that approved in 2007, with no changes proposed to the currently approved quarry footprint. The existing quarry is reasonably buffered from other land uses. The proposed modification will not give rise to any detrimental impacts in terms of amenity, traffic, noise, stormwater, health, safety or security of the locality.

Environmental impact	Compliance
Quarry management generally	<i>Yes. A comprehensive quarry management regime is already in place.</i>
Social, economic impacts	<i>Yes. Glenella Quarry Pty Ltd contributes to underpinning employment and economic development, both locally and regionally.</i>

Section 4.15(1)(b) of the EP&A Act requires an assessment of relevant likely impacts of the development. The EIS by RW Corkery & Co. submitted with the 2007 Development Application (DA) addressed the proposed quarry development's impact on the environment. It is considered that the proposed development, as modified, is capable will result in the same or similar environmental impacts as the approved scheme.

■ **Impact on Vegetation, Biodiversity**

The impact of the original quarry development on vegetation and biodiversity generally was considered at the time of the assessment of the original 2007 EIS, prior to the quarry development being approved by both local councils. At that time, the 2007 EIS identified the need for clearing of 28 trees and highly degraded grassland only. The modification sought, which will involve no change to the size or shape of the currently approved quarry footprint, should not give rise to any change in impacts on vegetation and biodiversity already identified in the 2007 EIS. Additionally, the following are considered to be relevant factors:

- The proposed modification seeks no deepening of the currently approved quarry, with no additional clearing of vegetation proposed.
- Existing on-site mitigation measures are to be retained, to protect ecosystems located outside of and proximate to the approved quarry footprint.
- The need for additional stockpiles arising from increased production at the quarry can be accommodated in the extensive cleared areas already available within the existing approved quarry footprint, without the need to impinge on additional land.
- Any fauna that inhabit bushland around the quarry site are unlikely to be affected by the effects of increased noise and lighting arising from the modification sought given that no change is sought to the currently approved hours of operation of the quarry. In a similar vein, and notwithstanding the proposed increase in daily quarry truck loads, it is noteworthy that most truck traffic flows will occur during daylight hours, thus minimising any increased risk of road-kill.
- As detailed in the April 2007 EIS and subsequent follow up advice by RW Corkery in June and July 2007, the quarry will be comprehensively rehabilitated native trees and shrubs once quarrying is completed, including revegetation of the drainage lines to the Boorowa and Lachlan Rivers. Moreover, a minimum 20m buffer zone is provided along the 1st order stream that runs along the western portion of the quarry site. This buffer zone is a vegetated zone and continues throughout the length of the watercourse. All of these measures remain unchanged with the modification sought.
- Given the above, the quarry development, as modified, will not result in a significant impact to threatened species or ecological communities, pursuant to Section 7.3 of the NSW *Biodiversity Conservation Act 2016* (BC Act). No biodiversity offsets are required as a result of the proposed modification.

Taking into account the above, it is concluded that the modification will not have a significant impact on the biodiversity values of the locality.

■ **Cultural Sites**

The impact of the original quarry development on cultural sites was considered at the time of the assessment of the original 2007 EIS, prior to the quarry development being approved by both local councils. The comprehensive Aboriginal heritage assessment conducted by OzArk in conjunction with the Cowra Local Aboriginal Land Council (LALC) as part of the original EIS undertaken by RW Corkery in 2007 found that there were no Aboriginal or European items or relics of heritage significance occurring within the proposed area of disturbance. The modification sought, which will involve no change to the size or shape of the currently approved quarry footprint, should not give rise to any change in impacts on cultural sites.

■ **Agriculture**

The impact of the original quarry development on agriculture was considered at the time of the assessment of the original 2007 EIS, prior to the quarry development being approved by both local councils. The modification sought, which will involve no change to the size or shape of the currently approved quarry footprint, should not give rise to any change in impacts on agriculture, either on “Glenella” or on surrounding properties. Noise, blasting, dust and traffic impacts arising from the proposed modification are satisfactory- considered in further detail under separate headings in this part of the SEE. The need for additional stockpiles arising from increased production at the quarry can be accommodated in the extensive cleared areas already available within the existing approved quarry footprint, without the need to impinge on additional land. No adverse impacts on animals and livestock are predicted to occur as a result of blasting at the quarry- refer to the noise/blasting assessment at **Appendix A** for further details.

■ **Noise, Blasting Impacts**

The impact of the original quarry development in terms of noise and blasting impacts was considered at the time of the assessment of the original 2007 EIS, prior to the quarry development being approved by both local councils. A noise and blasting impact assessment was prepared as a part of the 2007 EIS, which found that the quarry operations will result in noise and blasting levels that comply with relevant EPA criteria. Importantly, since the grant of consent the quarry has operated without any complaints from neighbours regarding noise or blasting. Moreover, and reflecting this exemplary record, the quarry has been categorised as being a Low Risk quarry operation by the EPA- refer to **Appendix C** confirming this Environmental Risk Category for Glenella Quarry.

The quarry already utilises various noise mitigation measures to ensure that there are acceptable impacts on adjoining neighbours, including the following:

- Strict compliance with approved hours of operation. In this regard the extractive operations are limited to 7.00am to 5.00pm Monday to Friday (ie. 10 hours operation per day) and 7.00am to 3.00pm on Saturdays (ie. 8 hours operation), with blasting limited to 9.00am to 5.00pm Monday to Friday, crushing limited to 7.00am to 6.00pm Monday to Friday (ie. 11 hours operation per day) and 7.00am to 3.00pm on Saturdays (ie. 8 hours operation), with loading limited to 7.00am to 10.00pm Monday to Friday (ie. 15 hours operation per day) and 7.00am to 4.00pm on Saturdays (ie. 9 hours operation).

■ Maintaining access and haul roads in good condition to reduce truck road noise. In this regard a Voluntary Planning Agreement (VPA) between Glenella Quarry Pty Ltd and Cowra Council provided for an upgrading and sealing of the quarry haul route back to Lachlan Valley Way, now completed.

■ Quarry truck numbers on the haul route are currently limited to a maximum of 35 loaded trucks per day. The s.4.55(2) application seeks to increase maximum daily truck numbers to 50 loaded trucks per day. This modest increase in truck numbers is supported by the results of the noise modelling of traffic noise by Waves Consulting- refer **Appendix A** for details. Additionally a Driver Code of Conduct also applies, in order to reduce noise, as well as maximising overall road safety conditions along the quarry haul route.

■ All machinery to meet current guideline noise levels, including haulage vehicles. The quarry regularly upgrades plant and equipment to quieter plant and equipment.

■ Introduction of a one-way system to reduce overall truck movements and avoid reversing manoeuvres.

In addition to the above, the quarry utilises various blast mitigation measures to ensure that there are acceptable impacts on adjoining neighbours, including the following:

■ Strict compliance with approved hours of blasting operation (Hours of blasting restricted to 9.00am to 5.00pm Monday to Friday).

■ Optimisation of drill patterns to reflect good geometrical design and delay sequence to maintain adequate relief. Includes the close examination of the quarry face for weak seams where explosive products may vent to free air and also cause fly rock.

■ Use of good quality stemming material and maintenance of correct stemming height.

Waves Acoustic Consulting Pty Ltd (Waves Consulting) was engaged by Glenella Quarry Pty Ltd to prepare a Noise and Vibration Impact Assessment (NVIA) to demonstrate the noise and vibration impacts associated with the proposed modification- refer **Appendix A** for details.

To characterise the existing acoustic environment in the area, a survey of environmental noise levels was conducted from Tuesday 5 October to Monday 18 October 2021. Two (2) noise monitors were installed adjacent to the nearest residential properties (refer **Figure 7.3**) at:

■ No. 483 Battery Road, Cowra along the quarry haul route, adjacent to the residential property “Duallie” on Battery Road. The noise monitor was installed to represent the worst-case noise at the “Duallie” property as the logger was positioned 7 metres from the centre-line of Battery Road, the main quarry haul route for Glenella Quarry.

■ “Glenavon”, Glenavon Road, Darby Falls, located to the north of the quarry.

The main noise and vibration sources from the proposed increase in extraction, production and export of products from the quarry as proposed will include:

■ Noise emissions from the fixed noise sources associated with the development to any nearby sensitive receivers ie the outdoor crushing / screening plant.

■ Noise emission from vehicle movements on site to any nearby sensitive receivers ie delivery truck, excavator and loader movements.

■ Additional noise emission from vehicle movements on the adjacent roads to any nearby sensitive receivers.

The results of the Waves Consulting assessment of the modification are summarised below:

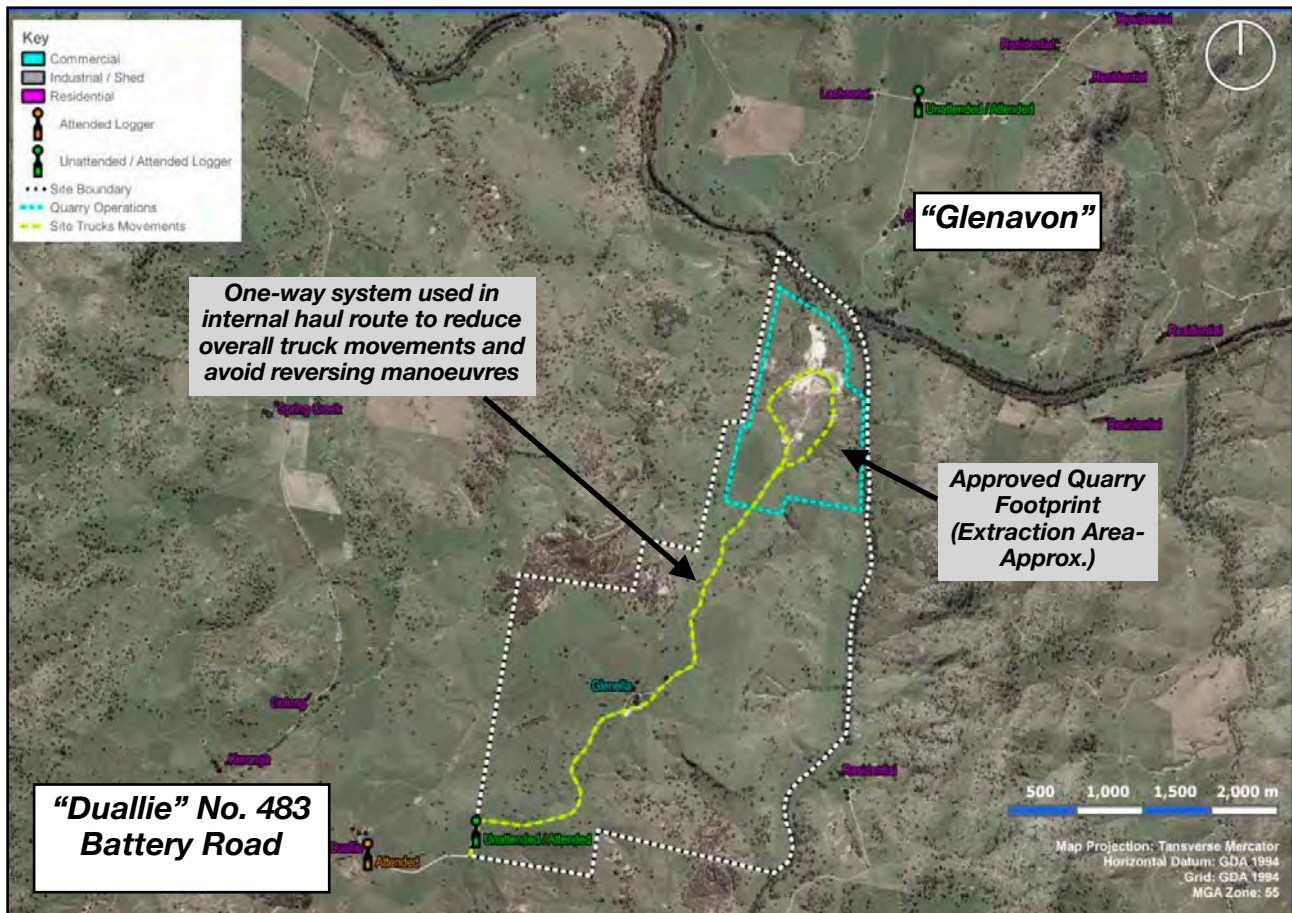


FIGURE 7.3: Noise Monitoring Locations October 2021

(Source: Waves Acoustic Consulting- refer **Appendix A**)



■ **Vibration from quarry operations:** “The potential for vibration impacts due to normal operation of the development are effectively nil. All vibration criteria with respect to cosmetic damage to buildings and human comfort impacts will be satisfied as a result.” (p.7)

■ **Construction impacts:** “The project will not require any construction, since the proposal only seeks to increase production using the existing operational infrastructure on site. Construction impacts will therefore be nil..” (p.8)

■ **Project noise trigger levels PNTL (quarry):** The Waves Consulting assessment adopts a Project Noise Trigger level of 40dBA LAeq (15 minute) for Day periods, 35dBA LAeq (15 minute) for Evenings and 35dBA LAeq (15 minute) at Night., all reflecting the noise standards adopted in the EPA’s Noise Policy for Industry (2017). The results from Table 15 and **Appendix A** demonstrate that the noise emissions from the site to the surrounding environment are low. The proposed development satisfies the PNTLs at all nearby residential receivers during all time periods and will be acceptably low. The proposed development, as modified, thus satisfies the PNTLs at all nearby residential receivers during all time periods. Refer Table 7.13 being an excerpt from the Waves Consulting report.

Table 7.13: Predicted Operational Noise Levels of the proposed s.4.55(2) modification

Location	Worst-Case LAeq,15m			PNTLs Exceedance LAeq,15m			LAeq,15m Sleep Disturbance
	Day	Eve	Night	Day	Eve	Night	
Residential				40	35	35	45
A (Glenella)	30	28	-	0	0	-	-
B (Badgerly)	<20	<20	-	0	0	-	-
C (Lachoonna)	34	31	-	0	0	-	-
D (Glenavon)	39	35	-	0	0	-	-
E (Duellie)	21	<20	-	0	0	-	-
F (Golong)	22	20	-	0	0	-	-
G (Keronga)	<20	<20	-	0	0	-	-
H (Spring Creek)	<20	<20	-	0	0	-	-
Next nearest residential	32	27	-	0	0	-	-

(Source: Waves Consulting report Table 16- refer **Appendix A**)

■ **Noise from quarry truck traffic:** The Waves Consulting assessment adopts External Assessment Criteria (dB re 20 µPa) of 55dBA LAeq (15 hr) for Day periods, and 50dBA LAeq (9 hr) for Night. Where the existing noise levels due to traffic already exceed the assessment criteria then the EPA's *Road Noise Policy* (RNP, January 2011) requires that the total traffic noise level increase should be limited to 2 dB for situations where additional traffic is generated on existing roads by changes to land use developments. The waves Consulting report finds that the additional traffic generated by the development, as modified, "Overall the RNP criteria are satisfied on all roads potentially affected by the development. No further measures are required as a result.." (p.29)

Refer Table 7.14 which summarises the predicted future traffic noise levels adjacent to the nearest affected roads due to the traffic generated by the proposed development, as modified.

Table 7.14: Predicted Traffic Noise on Local Roads arising from proposed s.4.55(2) modification

Road	Nearest Residential Receiver (m)	Existing Traffic			Future Traffic			RNP LAeq,15hr Exceedance	RNP +2dB Increase	Comment
		Vol	HV%	LAeq	Vol	HV%	LAeq			
Battery Road	35	138	51	47.8	176	57	49.2	0	-	RNP LAeq,15hr criteria is not exceeded. RNP +2dB increase criteria is not applicable. Overall RNP satisfied.
Morongla / Reids Flat Road	18	175	33	48.7	217	40	50.3	0	-	RNP LAeq,15hr criteria is not exceeded. RNP +2dB increase criteria is not applicable. Overall RNP satisfied.
Lachlan Valley Way	13.5	1351	33	61.1	1393	34	61.4	+6	+0.3	RNP LAeq,15hr criteria exceeded by +6 dB. RNP +2dB increase criteria applies instead. +2dB increase is not exceeded. Overall RNP satisfied.

(Source: Waves Consulting report Table 17- refer **Appendix A**)

■ **Project blasting criteria:** The blasting records for the site over several years have been reviewed as part of this assessment. Each blast was measured at the closest residential receiver 'Glenavon' which is approximately 1,400 m due North of the free quarry face. All blasts were carried out on the quarry free face in accordance with the requirements of AS 2187.2-2006 *Explosives - Storage and use. Part 2: Use of explosives*. The Waves Consulting report finds that: past blasting results find *"that no exceedances of the blast noise and vibration criteria have been recorded at the site during this period. The blast MICs varied in range from 67 kg to 289 kg.*

An air-blast overpressure and ground-borne vibration computer model were created and calibrated against the historical results. Based on the historical records and our calibrated computer models a Maximum Instantaneous Charge (MIC) of ~290 kg would not exceed the blasting criteria of 115 dB Linear Peak and 5 mm/s PPV. Therefore, an MIC 290 kg should be the upper limit for individual charge sizes at the site. Every blasting event should be monitored at the nearest receiver 'Glenavon'. If blasts with an MIC of 290 kg are found to exceed the established air-blast overpressure and ground vibration." (p.31) The Waves Consulting report also finds that:

- ▶ In terms of the potential for structural damage to buildings caused by blasting at Glenella Quarry: *"The risk of structural damage from blasting is therefore nil. No further remedial measures are required as a result."* (p.30)
- ▶ In terms of the potential for impacts on animals and livestock caused by blasting at Glenella Quarry: *"The effects on livestock are predicted to be negligible and no further remedial measures are required as a result."*(p.34)
- ▶ In terms of risk to infrastructure caused by blasting: *"The risk of structural damage from blasting is therefore nil. No further remedial measures are required as a result."* (p.34)
- ▶ Waves Consulting also note that: *"...the previous consent requires monitoring at receivers 'Glenavon' (closest) and 'Lachooona'. Dual monitoring is not considered necessary in future consent conditions. 'Glenavon' and 'Lachooona' are both located due North of the quarry free face at the site. The 'Glenavon' residence is located 400 m closer to the site than the 'Lachooona' residence as per Table 1 of this report. Blasting noise and vibration compliance at 'Glenavon' ensures compliance at 'Lachooona' because it is 400 m further away from blast events. Any blast noise and vibration measured at 'Lachooona' will always be lower when compared to the 'Glenavon' residence.*

Therefore, blast compliance monitoring at 'Lachooona' is redundant and not considered necessary. We recommend that a single blast monitoring station is located at the 'Glenavon' residence to determine compliance." (p32)

The Waves Consulting report concludes that: *"the proposed development, as modified, is compliant with respect to noise and vibration impacts and is therefore suitable for operation."* (p.35) Moreover, it is relevant to note that quarry plant and equipment are not being modified by this modification application.

■ **Air Quality Impacts**

The impact of the original quarry development in terms of air quality impacts was considered at the time of the assessment of the original 2007 EIS, prior to the quarry development being approved by both local councils. An air quality impact assessment was prepared as a part of the 2007 EIS, which found that the quarry operations will result in air quality outcomes that comply with relevant EPA criteria. Potential hazards are managed under the current consent and existing quarry plan of management regime, including an EPA-approved ***Air Quality Management Plan and Trigger Action Response Plan*** (Northstar 2023).

Dust abatement measures currently applied on site are as follows:

- A water cart will be available when required, to wet down the quarry and haul route.
- Dust abatement carried out in processing plant area where dust is likely to become a nuisance. Water spraying of stockpiles and stockpile transfer points are undertaken.
- All loads leaving the site are covered, to minimise dust and debris.
- Maintaining a high level of repair and servicing for all trucks associated with the quarry.
- Quarry trucks leaving the site to the public road system have covered loads, with tailgates effectively sealed. All vehicles on site are to be confined to designated roads with a signposted speed limit.
- Miscellaneous dust sources such as spillages from trucks and silt from sediment controls are regularly cleaned up.
- Regular maintenance and upgrading of the approved quarry haul route.

Glenella Quarry will continue to undertake air quality management in accordance with the existing quarry management plan. These measures include the regular watering of haul roads and stockpiles. The quarry and processing area is located on private property. The site is fenced, signed and gated.

The haul route over the local road system has been upgraded by the quarry operator since the grant of consent, reducing considerably any dust nuisance to residences located along the haul route.

Air quality impacts were assessed by Northstar Air Quality Pty Ltd- refer **Appendix E** for further details. Northstar's Air Quality Impact Assessment (AQIA) concludes, inter alia: *"The results of the AQIA indicate that the incremental impacts of the Proposal are predicted to be small at all surrounding receptor locations. In relation to annual average criteria (TSP, PM₁₀, PM_{2.5}, and dust deposition) the addition of those minor incremental impacts to existing background air quality results in compliance with NSW EPA air quality criteria. The Proposal is predicted to result in no additional exceedances of the 24-hour maximum PM₁₀ or PM_{2.5} criteria.*

A range of management measures, including an air quality management plan, real-time air quality monitoring, and a trigger action response plan are currently adopted as part of the Quarry operation, which are considered to represent best practice air quality management, and these would continue to be adopted as part of the Proposal." (p.42)

■ **Landform, Visual and Rehabilitation Impacts**

The impact of the original quarry on visual amenity and the landscape was considered at the time of the assessment of the EIS in 2007, prior to approval being granted by both Cowra and Boorowa councils. The visual impact assessment prepared as part of the 2007 EIS found that the quarry operations would result in minimal and acceptable visual impacts. It also found that local unobstructed views of the quarry operation would be possible only from the north and NE from only one residence, namely "Lachoon", located some 1.65km-2.0km to the north- the residence identified in Photograph 4 and **Figure 2.5** of this SEE report.

The proposed modification will not result in any changes to the visual impacts predicted in the 2007 EIS, because no change is proposed to the nature of quarrying the site or extent of the quarry operational footprint. As such, the character of the locality will not change with the introduction of the modifications sought. No changes to visual impacts are likely to arise from the proposed modification.

Glenella Quarry Pty Ltd adopts well established soil stripping, handling, and stockpiling procedures in accordance with their existing *Soil and Water Management Plan* as approved by the EPA and Resources Regulator, respectively. This modification application does not seek to change the anticipated final landform or rehabilitation from that outlined by the original development approved in 2007. The proposed increase in the annual extraction rate would simply result in the utilisation of the permitted resource volume sooner than previously anticipated bringing forward the rehabilitation of the land.

■ **Traffic Impacts**

The quarry operator has placed and will continue to place emphasis upon the safe and efficient delivery of its quarry products along the haul route with the continued objectives of minimising impacts upon other motorists, road users and roadside residents.

The impact of the approved quarry on traffic and roads was considered at the time of the assessment of the 2007 EIS, approved by both Cowra and Boorowa councils. Since then, the quarry operator has upgraded access within the quarry site and along the haul route over the local road system back to Lachlan Valley Way in accordance with the VPA currently in place between the quarry operator and Cowra Council. These road improvements are of benefit to all road users, not just the quarry, and are capable of safely accommodating the small daily increase in quarry truck traffic proposed. Refer to **Appendix B** for details.

Reliance on larger trucks means that over the life of the quarry there is likely to be much less pavement damage than if smaller truck loads were employed. Wear and tear on a road pavement is measured by the impact of the Equivalent Standard Axles (ESAs) on that road from heavy truck traffic. This is then considered in terms of the volume of material to be won from a quarry and type of truck used to transport that load. Research shows that larger haulage vehicles carrying larger loads cause significantly less road pavement damage than smaller haulage vehicles carrying smaller payloads, measured in terms of ESAs per tonne of load. For example,, a 43 tonne B-double produces 224 ESAs per 1,000 tonnes of load, and:

- Up to 58% less ESAs per 1,000 tonnes than a 2 axle rigid truck (payload up to 7.6 tonnes).
- Up to 35% less ESAs than a 3 axle rigid truck (payload up to 13.69 tonnes)..
- Up to 74% less ESAs than a semi-trailer carrying between 24 to 27 tonne payload.

(Source:Australian Trucking Association “*Truck Impact Chart Technical Advisory Procedure*” Developed by the ATA Industry Technical Council 2.2 edition – March 2018.)

Larger quarry trucks carrying larger loads (like that proposed), will result in demonstrably less impacts on the road pavement than that of smaller truck loads. The mere fact that there have been improvements in the carrying capacity of quarry trucks since the grant of consent for the quarry does not mean that the character of the approved use has changed. These improvements have resulted in quieter trucks, with improved braking and safety systems. Such improvements do not result in any change to the character of the use, confirmed by the NSW Court of Appeal in *Archibald v Byron Shire Council* [2003] NSWCA 292 (5 November 2003). In addition to the above, the following matters are of relevance:

- The maximum number of laden haulage truck movements proposed by this modification will be limited to 50 per day, an increase of 15 laden trips per day from the current maximum of 35 laden trips per day – or an increase of 1.5 per hour.
- The quarry operator has placed and will continue to place emphasis upon the safe and efficient delivery of its quarry products along the haul route with the continued objectives of minimising impacts upon other motorists, road users and roadside residents.

■ The approved quarry haul route along the local roads and Lachlan Valley Way utilises an existing approved route that has been upgraded by Council allowing for quarry truck traffic from the approved quarry. The original DA consent (July 2007) included a Voluntary Planning Agreement, which was signed by both parties. The VPA listed a number of improvements to sections of Morongla Road and Reids Flat Road. The VPA states that Council will undertake the work, while the developer will contribute costs and also undertake works in kind (i.e. provide suitable quarry material). Following StreetWise's inspection of the haul road, it appears that the agreed roadworks have not been completed as yet. This local road network is in satisfactory condition and is considered suitable in terms of road geometry, speed zoning and pavement construction for use by traffic generated by the quarry. Subject to the above, the efficiency of the local road network will not be impacted on by the proposed modification.

■ Streetwise conclude that: *"Traffic volumes on Lachlan Valley Way are relatively low, and the local roads currently utilised as part of the existing approved haulage route also have low volumes. The additional laden truck & dog trips arising from the proposed modification will not have a significant impact on the efficiency or safety of the local road network. The local roads and intersections have the capacity to cater for the additional trips generated by the development, with minimal upgrades required (i.e. appropriate linemarking, signage and speed limits of which Cowra Council is obligated to complete as part of an existing agreement). These upgrades had been recognised previously as a means to reduce any potential road safety issues along the currently approved haul route. Once these upgrades are completed, there should be no requirement for Glenella Quarry to undertake any further upgrades along the haul route. Also, the proposed increase in quarry truck traffic, as estimated in the modification application, will not give rise to the need for any additional road works over and above those specified in the original consent."* (pp 25-26)

■ A quarry Driver Code of Conduct applies, ensuring that the conduct of drivers using the haul route is considerate of other users. The designated quarry haul route is included in the Drivers Code of Conduct and ensures that the trucks associated with the project travel in a safe and appropriate manner.

■ Glenella Quarry is not proposing to change the hours of operation for product loading and transport activities.

Streetwise conclude that: *"the proposed development as being a suitable development based on the predicted traffic impacts."* (p.26) Streetwise also recommend changes to the speed limits on the haul route with a view to reducing the existing 100kmh speed zones, along with suitable line-marking and road works in accordance with the current VPA. Streetwise also recommend any outstanding road works should be completed as soon as possible to minimise any perceived road safety issues.

■ **Stormwater and Drainage Impacts**

The impact of the proposal on drainage, soils and erosion controls and water needs was considered at the time of the assessment of the 2007 EIS. All stormwater will continue be directed towards the extensive sediment basin system located on site. 'Clean' water from upslope areas is diverted around the quarry. The proposed intensification of extraction and resultant processing of quarry products within the quarry will increase the demand for process water. A MUSIC model was developed to inform the water balance for the project, as modified. The water balance characteristics of the proposed modification were considered (with the increased water demand associated with the increase in extraction/production).

Martens and Associates, engineers and hydrologists, was engaged by Outline Planning Consultants Pty Ltd to prepare a water balance assessing the water needs of the project, as modified.

This includes an assessment of the potential water balance implications associated with the proposed modifications to the approved quarry operations, including water demand, site runoff, sediment and erosion controls, and water reuse, and to demonstrate that the proposed modifications will not result in any adverse environmental impacts beyond those previously approved.

The water balance assessment by Martens and Associates demonstrates that for all modelled years (average, dry and wet) the site shall generate, capture and store sufficient runoff to provide for all non potable water demands for the project, as modified.

Since approved, the quarry operator has sealed significant lengths of the internal haul route, previously modelled in the original Corkery EIS as a gravelled surface capable of generating potential dust nuisance if not regularly suppressed (assumed to be watered).

Modelled site water demand is summarised in the accompanying Table 7.15.

Table 7.15: Water Surplus/Deficit

Activity	Water Demand (ML/year)
Dust suppression	13.65
Production	2.90
Staff amenities (toilet flushing)	0.05
Total non potable water demand	16.55
Total potable water demand	0.05

(Source: Martens & Associates Table 5)

Table 7.16 provides a summary of the total site water excess/deficit in the wet, dry and average rainfall years.

Table 7.16: Water Surplus/Deficit

Parameter	Wet Year (936.1mm of rain)	Dry Year (488.2mm of rain)	Average Year (699.7mm of rain)
Runoff to sediment basin system Glenella Quarry (ML/yr)	+346.62 ML/year	+173.52 ML/year	+250.27 ML/year
Minus storage losses (ML/yr)	-19.11 ML/year	-19.11 ML/year	-19.11 ML/year
Minus non potable water demand: dust suppression and quarry processing (ML/yr)	-16.55 ML/year	-16.55 ML/year	-16.55 ML/year
Surplus/Deficit non potable water (ML/yr)	+310.96 ML/year SURPLUS	+137.86 ML/year SURPLUS	+214.61 ML/year SURPLUS

(source: Martens & Associates Tables 6,7 and 8)

Based on the results of the water balance assessment presented above, the quarry will operate at a significant water surplus for all non potable water scenarios considered.

Martens and Associates also find that runoff to the rainwater tank should be sufficient to provide for all potable water needs for wet, dry and average rainfall years.

Martens and Associates conclude as follows:

“The water balance analysis results show that the site will be provided with sufficient non-potable and potable water supply from the existing water structures and rainwater tanks (supplied by roof water) under all modelled scenarios including average, dry, and wet years. On this basis, we conclude that surface water collection and re-use within the site will be sufficient to meet site demands without reliance on other sources of water supply.” (p12 of Martens and Associates report)

In terms of other water impacts:

- **Water quality:** There will be a slight reduction in outflow pollutant loads from the quarry development, as modified, as a result of increased drawdown of site dams (due to the additional water demand) and consequent reduction in overflow events.
- **Flooding:** The quarry is located on flood-free land.
- **Sediment and erosion control:** adequate storage volume is provided to comply with the requirements of *Managing Urban: Soils and Construction – Volume 2E Mines and Quarries* (Department of Environment and Climate Change NSW 2008).
- **Groundwater:** it is unlikely that groundwater will be impacted. Current quarrying has not breached existing groundwater levels. It is anticipated that that all future increases in quarrying activity associated with this proposal will not result in the groundwater being encountered and it is therefore unlikely to have any impact on the local groundwater.
- **Riparian watercourses:** None impinge on the approved quarry footprint. The quarry footprint remains unchanged from that already approved.
- **Management:** The quarry operates pursuant to an adopted *Soil and Water Management Plan*, as approved by the EPA and Resources Regulator, respectively.

Having regard for the above, the proposed modification will not result in any additional off-site impacts in terms of hydrology, or stormwater or sediment and erosion control.

■ **Planning and Surrounding Rural Environment, Amenity**

The quarry has operated for approximately 36 years without any significant adverse impacts on neighbouring land uses, nor have there been any issue with the use of the haul route by quarry truck traffic. The development approvals issued in the past permitted the extraction of the resource at Glenella Quarry. Glenella Quarry Pty Ltd was formed in late 2005 to manage the operations of the Glenella Quarry. The Company's directors are Mr Michael Scott Howe and Ms Amy Vidmar Howe.

The existing quarry, as well as the proposed quarry extension, are reasonably buffered from other land uses, the nearest rural residence, namely “Lachoonia”, is located some 1.65km-2.0km to the north- the residence identified in Photograph 4 and **Figure 2.5** of this SEE report. The proposed quarry, development, as modified, has been designed to minimise the social and economic cost on adjoining land owners, local and regional communities.

■ **Quarry Management**

An existing quarry management regime is already in place at Glenella Quarry, including a *Soil and Water Management Plan*, as approved by the EPA and Resources Regulator. The NSW Resources Regulator monitors the progress of mining across the life of a mine, with annual reports submitted, providing updates on the progress of the mining operation.

Glenella Quarry is not situated within a designated bushfire prone zone, and as a result, the proposed increase in extraction (and production) is unlikely to contribute to the increasing of the local bushfire hazard. Glenella Quarry provides for the following bushfire management and reduction measures in and around the working quarry:

- All mobile equipment is fitted with spark arresting mufflers.
- Provision of knapsack spray unit at the site.
- Flammable liquids are stored in a bunded area which is isolated from any vegetation. Fuel storage facilities should be located and designed to prevent potential fire hazards, as required by AS1940-1993- The Storage and Handling of Flammable and Combustible Liquids.
- Fire extinguishers are in all mobile equipment.
- Maintenance of a water truck and pumps suitable for fire fighting at the site.
- Employees are trained in fire awareness and instructed in basic fire fighting procedures.

These measures will continue to be applied with the expanded quarry operation as proposed.

In addition to specific requirements referred to in the development consents and the mining lease, site operations are required to be conducted in accordance with all relevant New South Wales legislation applicable to extraction of hard rock from the project site, and in particular the *Protection of the Environment Operations Act, 1997* and the provisions of the *Work Health and Safety (Mines & Petroleum Sites) Act 2013* and *Work Health and Safety (Mines and Petroleum Sites) Regulation 2022*. In this regard The EPA has issued licence (EPL) No. 20632 for Glenella Quarry. The licence regulates quarrying and processing activities across all areas of the site. Refer also to Section 2.4 of this SEE report.

■ **Employment, Economic Impacts**

Glenella Quarry Pty Ltd has experienced significant growth year-on-year since the company purchased the facility in 2005. Currently the annual rate of extraction and production is reaching the ceiling limit of the current development approvals of 200,000 tonnes per annum. Glenella Quarry seeks approval for an increase in overall extraction to extract and produce to 499,000 tonnes per annum. The proposed increase will allow Glenella Quarry to meet the local, regional (specifically Sydney metro) and interstate demand for the quality quarried/mined products from Glenella Quarry. In addition, the increase will also assist with meeting the substantial rise in demand for construction and high- quality landscaping products in NSW and beyond. It would also allow Glenella Quarry to meet demand for larger-scale regional infrastructure projects eg. Wyangala Dam wall raising, and the Rye Park wind farm.

Quarries are a vital part of the economy and are major employment generators, as confirmed by Cement Concrete & Aggregates Australia in the following:

“Australian quarries support our vital building and construction industries which generate over \$200 billion in revenue each year and directly employ more than one million Australians. The building and construction industry demands more than 200 million tonnes of construction aggregates each year to meet the need for our homes, workplaces, public buildings and roads. As well as providing these essential materials, quarries stimulate local communities through investment and by providing jobs. In fact, the quarry industry creates over 10,000 jobs directly and supports another 80,000 indirectly, often in rural and regional locations.” (Cement Concrete & Aggregates Australia website April 2022)

One of the most visible economic impacts of any quarrying operation on a community is the employment that it generates. Another economic impact is the industries and projects that are reliant on the the supply of processed quarry material from Glenella Quarry to service their projects. Employment is generated through the creation of jobs and economic within the quarry itself: direct employment. These jobs are directly related to the quarrying operation.

Currently the quarry employs eight (8) full time employees and a range of local contractors on the site (fuel, machinery, industrial supply, blasting, waste, and other support services). In addition, the site provides employment for a range of local, regional, and interstate heavy vehicle operators delivering various quarry products from Glenella Quarry. At the proposed maximum rate of extraction, it is anticipated that the quarry will employ up to sixteen (16) full time employees. Additionally, support services as outlined above will be substantially increased as the operation grows and reaches full production; thus, leading to a solid “ripple effect” on local and regional employment as a result. This includes industries and infrastructure projects that a dependent on quarry products from Glenella Quarry, as well as truck drivers employed by other contractors, suppliers and other sub contractors periodically engaged by the quarry.

The ongoing direct and indirect employment provided by Glenella Quarry Pty Ltd’s operations contributes to underpinning the maintenance of employment and economic development, both locally and regionally.

6.9 *Section 4.15(1)(c) Suitability of the site for the proposed development*

The suitability of the site for the development is a key consideration in the assessment of any application under s.4.15(1) of the EP&A Act (*Lippmann Partnership Pty Ltd v Canterbury – Bankstown Council* [2017] NSWLEC 1601 at [42]). In this regard, it is relevant to note that a quarry is already well-established on the site. The suitability of the project site for a quarry was comprehensively addressed by both Cowra and Boorowa councils prior to the grant of the original consents in July 2007. These assessments confirmed the suitability of the site for a large quarry/mining operation. In addition to the above, the following are relevant considerations in support of the proposed modification:

- The quarry has been in operation for approximately 36 years, during which time it has operated responsibly with minimal community complaints over this period.
- The project site has the capacity and is suitable for the modification. Moreover, the receiving environment has the capacity to accommodate the modification sought.
- The proposed modification does not materially change the approved quarry development, including method of quarrying, method of processing of quarry material or hours of operation.
- No change is proposed to the currently approved quarry footprint. No additional clearing or excavation of land arises from the proposed modification.

■ **Public Interest Generally**

The proposed modifications are not expected to give rise to additional environmental or town planning issues beyond those originally raised. The quarry is a lawfully approved quarry. Since Glenella Quarry was purchased in December 2005, Glenella Quarry has operated in an environmentally responsible manner, without significant adverse impact on surrounding neighbours. It has established positive links with the local community, particularly those neighbours fronting onto both Battery Road and Reids Flat Road. Glenella Quarry have made significant improvements to the local road system as a consequence of the 2007 approval of the operating quarry/mine, which have also benefitted local neighbours as well as the quarry.

■ **Public Interest in the Economic Recovery of a Valuable Quarry Resource**

The proposed modification maximises access to and enables the fuller utilisation and economic recovery of a valuable quarry/mine resource. The modification would also benefit allied local industries, including the industries that rely on these quarry products, including local and regional infrastructure projects.

The proposed modification provides for the ongoing removal, processing and despatch of quality quarry products important for the continued growth and prosperity of NSW generally, and existing markets in particular.

In allowing the modification proposed, social and economic benefits to the local economy will accrue in terms of ongoing operational expenditure on local goods and services, as well as generating local employment opportunities.

■ **Precedent**

The proposed modification seeks to increase the rate of extraction from 200,000 tonnes per annum to 499,000 tonnes per annum. This represents an increase in extraction of 299,000 tonnes per annum, equivalent to an increase of up 150%.

In *Goldin & Anor v Minister for Transport Administering the Ports Corporatisation and Waterways Management Act 1995* [2002] NSWLEC 75 Lloyd J held that the precedent effect of a particular proposal is a valid planning consideration. This decision continues to be referred to in numerous, later Land and Environment Court decisions.

There is a precedent for allowing the modification sought.

Other similar modifications involving an increase in the rate of extraction have been approved by either the Minister, planning panels or by local councils, a sample provided in the accompanying Table 6.18. **Some of these modification involved approvals for increases in extraction by up to 600,000 tonnes per annum (Gunlake Quarries and Albion Park quarries) or up to 400% (Birdon Sands).** Outline Planning Consultants have been involved in a number of these successful quarry modification applications.

Table 6.18: Other approved modifications involving increased rates of extraction, truck numbers

Location	Nature of s.4.55 (formerly s.96) modification approval and details	% increase in rate of extraction
Moama sand quarry (Murray River Council)	Approval issued April 2025 to an increase the rate of extraction, from 30,000 tonnes to 80,000 tonnes per annum an increase of 50,000 tonnes pa.	166% increase
Oberon quarry (Oberon LGA)	Approval issued September 2024 to an increase in rate of extraction, from 150,000 tonnes to 200,000 tonnes pa, an increase of 50,000 tonnes pa.	33% increase
Dorrigo Quarry (Bellingen LGA)	Approval for s.4.55 application to increase extraction from 120,000 tonnes per annum (pa) to 310,000 tonnes pa, an increase of 190,000 tonnes pa and an increase in truck numbers. Approved 2 May 2023. <i>Application by Outline Planning Consultants Pty Ltd.</i>	158% increase
Sheridans Hard Rock Quarry Hernani (Clarence Valley LGA)	Approval for s.4.55 application to increase extraction from 198,000 tonnes per annum (pa) to 398,000 tonnes pa, an increase of 200,000 tonnes pa Approved 3 march 2021. <i>Application by Outline Planning Consultants Pty Ltd.</i>	101% increase
Gunlake Quarry (Goulburn Mulwaree Shire)	Land & Environment Court s.4.55 approval June 2021 for an increase in quarry extraction rate at Gunlake Quarry from 2 million tonnes pa to 2.6 million tonnes pa - an increase of 600,000 tonnes pa.	30% increase
Marys Mount Quarry (Gunnedah LGA)	Approval for s.4.55 application to increase extraction from 360,000 tonnes per annum (pa) to 499,000 tonnes pa, an increase of 139,000 tonnes pa. Approved 7 October 2020. <i>Application by Outline Planning Consultants Pty Ltd.</i>	39% increase
Woodview Quarry (Richmond River)	Approval October 2020 for s.4.55 application to increase extraction from 139,000 tonnes pa to 205,000 tonnes pa, an increase of 66,000 tonnes pa.	47% increase
Wyalong Quarry (Bland Council)	s.4.55 approval to increase hard rock quarry extraction from 100,000 tonnes per annum (pa) to 250,000 tonnes pa, an increase of 150,000 tonnes pa. Approved by the Western Regional Planning Panel on 14 July 2020.	150% increase
Dubbo Quarry (Dubbo Regional Council)	s.4.55 approval to increase extraction at a basalt quarry near Dubbo, from 250,000 tonnes pa to 495,000 tonnes pa, an increase of 245,000 tonnes. Approved by the Western Regional Planning Panel in June 2020.	98% increase
Maroota sand (Hornsby Shire)	s.4.55 approval to increase extraction at a sand quarry from 195,000 tonnes pa to 250,000 tonnes pa, an increase of 55,000 tonnes. Approved by the Sydney North Regional Planning Panel in November 2019.	28% increase
Valla Quarry (Nambucca Valley LGA)	Land & Environment Court s.96(2) approval February 2016 for an increase in extraction at Valla Quarry from 50,000 cubic metres pa to 95,000 cubic metres pa - an increase of 45,000 cubic metres pa (approx. 117,000 tonnes).	90% increase
Jandra Quarry, Possum Brush (Greater Taree LGA)	Minister granted s.96(2) approval march 2015 for an increase in extraction at Jandra Quarry from 250,000 tonnes pa to 490,000 tonnes pa - an increase of 240,000 tonnes pa.	96% increase
Central Bucca Quarry (Coffs Harbour City)	Approval 2011 s.96(2) application increase in quarry production Central Bucca Quarry from 45,000 tonnes pa to 199,000 tonnes pa, an increase of 154,000 tonnes pa. <i>Application prepared by Outline Planning Consultants Pty Ltd.</i>	342% increase
Hebden Quarry (Singleton LGA)	s.96(2) (now s.4.55) approval for an increase in quarry extraction at Hebden Quarry, in the Hunter Valley from 350,000 tonnes p.a. to 499,000 tonnes p.a. - an increase of 149,000 tonnes per annum. <i>Application by Outline Planning Consultants Pty Ltd.</i>	43% increase

Location	Nature of s.4.55 (formerly s.96) modification approval and details	% increase in rate of extraction
BD & MC Lewis Quarry (Clarence Valley Council)	Approval granted November 2012 for s.96(2) increase in extraction from 50,000 cubic metres pa to 94,000 cubic metres pa - an increase of 44,000 cubic metres pa. <i>Application by Outline Planning Consultants Pty Ltd.</i>	88% increase
Albion Park (Shellharbour Council)	s.96(2) approval 2009 for an increase in extraction from 400,000 tonnes pa to 600,000 tonnes pa, an increase of 200,000 tonnes pa.. In 2015 the Minister approved a further increase of 300,000 tonnes per annum, to 900,000 tonnes.	50% increase
Birdon Sands (Hawkesbury)	Land & Environment Court s.96(2) approval in 2009 for an increase in sand extraction from 25,000 tonnes pa to 125,000 tonnes pa. Approved by NSW.	400% increase
Central Bucca Quarry (Coffs Harbour City)	Section 96 approval for an increase in extraction at Central Bucca Quarry from 199,000 tonnes pa to 350,000 tonnes pa, an increase of 151,000 tonnes pa. Approved May 2017. <i>Application by Outline Planning Consultants Pty Ltd.</i>	76% increase
Jungs No.2 Quarry (Coffs Harbour City)	Section 96(2) approval for an increase in extraction at Jungs No.2 Quarry from 350,000 tonnes pa to 499,000 tonnes pa- an increase of 149,000 tonnes pa. Approved 2013. <i>Application by Outline Planning Consultants Pty Ltd.</i>	42% increase

8. Project Evaluation and Conclusions

This Section 4.55(2) application seeks approval from both Cowra and Hilltops local councils to modify the following development consents issued for Glenella Quarry:

Cowra Council	Hilltops (formerly Boorowa) Council
Development Application No. 73/2007 Consent issued 27 August 2007	Development Application No. 117/06. Consent issued 25 September 2007

This Statement of Environmental Effects (SEE) report supports an application to both of the above local councils pursuant to the provisions of Section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for a modification to the above consents to approve the following proposed changes:

- An increase in the maximum allowable rate of extraction, from the current 200,000 tonnes per annum to 499,000 tonnes per annum.
- To allow an increase in the current maximum of 35 loaded trucks per day leaving the quarry/mine site, to 50 loaded trucks per day, an increase of 15 loaded trucks per day or an average increase of 1.5 loaded trucks per hour.
- Arising from the noise and air quality impact assessments undertaken in support of the proposed s.4.55(2) modification, changes permitted daytime noise levels, and the deletion of one blast monitoring location, as well as the deletion of condition requiring dust monitoring (Hilltops condition 5).

The proposed modification has been designed to avoid and minimise adverse biophysical, social and economic impacts and is anticipated to result in satisfactory environmental impacts in accordance with the jurisdictional requirements of s.4.55(2), s.4.55(3) and s.4.15(1) of the EP&A Act having regard for:

- The quarry development proposed by this s.4.55(2) modification application, as detailed in this SEE report, is substantially the same as the approved quarry development. Importantly, no changes are proposed to the currently approved quarry operation in terms of the approved quarry footprint or size of the resource or methods of extraction/mining, haul route or operating hours, other than to allow the winning of heavy minerals- a by product of the already approved sand processing operations.
- Other, similar modifications involving increases in the quarry footprint have been regularly approved by either the Minister, planning panels, the Court or by local councils, as summarised in the preceding Section 7.10 of this Statement of Environmental Effects report.
- Existing management and mitigation measures developed for the quarry will be effective in minimising and managing environmental impacts arising from the modifications sought by this Section 4.55(2) application, consistent with its current operations, and in particular in terms of future noise and blasting, water needs, traffic and amenity values.
- If approved, the quarrying operations, as modified, will continue to be subject to conditions of consent which regulate impacts on and provide safeguards to adjoining landholders in the vicinity of the development.
- Approval of the s.4.55(2) modification will support and facilitate the continued supply of quarry and mineral products which are essential to the continued growth and development of the region and elsewhere in NSW, including the delivery to infrastructure projects that will benefit the wider community.

This Section 4.55(2) application is recommended for approval.

9. Glossary of Terms

Term	Meaning
AADT	Annual Average Daily Traffic.
ABS	Australian Bureau of Statistics.
Aboriginal object, place	Has the same meaning as the definition of the term in section 5 of the National Parks and Wildlife Act 1974.
Acoustic	Relating to hearing, noise and sound.
Aggregate	Rock crushed to the required size for use in concrete, masonry products, road sealing, pavement materials and other uses.
AHD	Australian Height Datum. The standard reference level used to express the relative elevation of various features. A height given in metres, AHD is essentially the height above sea level.
AHIP	Aboriginal Heritage Impact Permit.
Air Blast Overpressure	Air vibration or air blasts are the pressure or shock waves that radiate in air from an exploding charge. When a pressure wave passes a given point, the pressure of the air rises rapidly before returning to atmospheric pressure after a period of oscillations. The maximum pressure is the 'Air Blast Overpressure' measured in dB.
Ambient noise	This is the total encompassing sound in a given situation at a given time where no particular sound is dominant. It is composed of sound from all sources near and far, normally experienced in the area. Ambient noise is measured as dB ('A' weighted) over a set period of time.
Amenity	The quality of a local environment.
APZ	Asset Protection Zone is a strategically managed area of reduced vegetation surrounding a built asset, designed to protect it from bushfires.
AS	Australian Standard.
ASS	Acid sulfate soils.
Attenuation	Reduction in sound level between a noise source and another location.
Avoid	Measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on the environment, including biodiversity values, or certain areas of biodiversity.
A-Weighted Sound Level dB(A)	A level of sound pressure in which the sound pressure levels of the various frequency bands have been weighted to accord roughly with human aural system frequency sensitivity.
BAM	Biodiversity Assessment Method
Basalt	Fine grained, dark volcanic igneous rock.
Batter	The face of the slope eg. walls, banks, cuttings, etc.
BC Act	Biodiversity Conservation Act 2016

Bench (in a quarry)	<i>A ledge constructed in a batter or natural slope within a quarry. A step in the face of a quarry.</i>
Biodiversity	<i>The biological diversity of life at genetic, species and ecosystem scales. The maintenance of biodiversity, at all levels, is acknowledged internationally as a high conservation priority. Biodiversity values comprise vegetation integrity, habitat suitability and biodiversity values generally.</i>
BDAR	<i>Biodiversity Development Assessment Report.</i>
Blasting	<i>The operation of breaking rock in a quarry by means of explosives.</i>
Bund	<i>An earthen mound wall which may be used for noise attenuation or visual screens or for redirecting stormwater/runoff around a part of a site. Bunds may also be used to contain spillage of liquid materials.</i>
Blue Book	<i>Means Managing Urban Stormwater: Soils & Construction (4th edition, Landcom, 2004), commonly referred to as the “Blue Book”.</i>
Biodiversity	<i>Biological variety at genetic, species and ecosystem scales. The maintenance of biodiversity, at all levels, is acknowledged internationally as a high conservation priority.</i>
BoM	<i>Bureau of Meteorology (Commonwealth).</i>
BOS	<i>Biodiversity Offsets Scheme</i>
Building Code of Australia	<i>Means means the document, published by or on behalf of the Australian Building Codes Board, that is prescribed for purposes of this definition by the regulations, together with— (a) such amendments made by the Board, and (b) such variations approved by the Board in relation to New South Wales, as are prescribed by the regulations</i>
CC	<i>Construction certificate. A Construction Certificate (CC) is a certificate that is issued by an accredited private certifier or a consent authority under the provisions of Environmental Planning and Assessment Act 1979. The Certificate allows for building work to commence on a project.</i>
Catchment	<i>Drainage area of a river, creek. Can also refer to a visual catchment, which is the area within view of a particular viewing location, or road catchment, which is the area reliant on a particular road in order to gain access to another centre or locality.</i>
CIV	<i>Capital investment value as defined by the Environmental Planning & Assessment Regulation 2021. Includes all costs necessary to establish and operate the project, with some exclusions.</i>
Clay	<i>Clay is a type of fine-grained natural soil material containing clay minerals including kaolinite. Builders Clay is a finely milled, air separated clay used as a plasticiser in mortar and render applications where sands are low in clay content.</i>
Climate change	<i>A change in the state of climate and that persists for an extended period, typically decades or longer.</i>
Consent	<i>Means development consent issued under the Environmental Planning and Assessment Act 1979.</i>
Contributions Plan	<i>Section 7.11 of the Environmental Planning and Assessment Act 1979 allows councils to levy contributions towards the cost of providing local infrastructure. Contributions plans set out the local infrastructure required to meet the demand from new development, and the contributions a council can levy on developers to fund the necessary land and works.</i>

Construction	All physical works to enable operation, including but not limited to the demolition and removal of buildings, the carrying out of works for the purposes of the development, including bulk earthworks, and erection of buildings and other infrastructure permitted by this consent, but excluding the following: •building and road dilapidation surveys; •investigative drilling, investigative excavation or Archaeological Salvage; •establishing temporary site offices (in locations identified by the conditions of this consent); •installation of environmental impact mitigation measures, fencing, enabling works; and minor adjustments to services or utilities.
Contamination	The action or state of makings or being made impure by polluting or poisoning, or the state of containing unwanted or dangerous substances.
Contour Drain	Drainage channel constructed approximately along the contour, and which is designed to slow down and direct the flow of water across a disturbed area to a sediment trap for sediment removal.
Council	Armidale Regional Council.
Crushing	The mechanical process of reducing quarry rock size usually by pressure or impact.
DA	Development Application. A Development Application (DA) is required for various types of development projects under the provisions of NSW Environmental Planning and Assessment Act 1979. It means an application for consent under Part 4 to carry out development but does not include an application for a complying development certificate. Sometimes also referred to as Development Approval.
Daytime	Means between the hours of 7.00am to 6.00pm.
dB (A)	To approximate the human response to sound, noise level meters have weighting networks which correspond approximately with subjective loudness. The 'A- Weighting' is used to simulate human hearing.
DBYD	Dial Before You Dig.
DCP	Development Control Plan. A development control plan provides detailed planning and design guidelines to support the planning controls in an environmental planning instrument.
Department, DP&E	NSW Department of Planning and Environment.
Designated development	Means development that is declared to be designated development by an environmental planning instrument or the regulations. All applications for designated development in NSW need to be accompanied by an EIS.
Development	The development described in the development application. For the purposes of the NSW Environmental Planning and Assessment Act 1979, "development" is any of the following: "(a) the use of land, (b) the subdivision of land, (c) the erection of a building, (d) the carrying out of a work, (e) the demolition of a building or work, (f) any other act, matter or thing that may be controlled by an environmental planning instrument." (2) However, development does not include any act, matter or thing excluded by the regulations (either generally for the purposes of this Act or only for the purposes of specified provisions of this Act). (3) For the purposes of this Act, the carrying out of development is the doing of the acts, matters or things referred to in subsection (1). (sub clauses 1.5(1)(2) and (3) of the NSW Environmental Planning and Assessment Act 1979).

Development Consent	<i>Means consent under the provisions of NSW Environmental Planning and Assessment Act 1979 to carry out development and includes, unless expressly excluded, a complying development certificate.</i>
Deposited Plan (DP)	<i>Deposited Plans (DP) define legal boundaries of land and often record subdivisions, easements and the like.</i>
Designated Development	<i>Section 4.10 of the Environmental Planning and Assessment Act 1979 states that "Designated development is development that is declared to be designated development by an environmental planning instrument or the regulations." Schedule 3 of the Environmental Planning and Assessment Regulation 2021 defines the type of development which is classified as designated development.</i>
Drainage Line	<i>A natural depression with no stream bed channel, which may only carry surface water during rainfall events.</i>
Dust or particulate matter	<i>Dust or particulate matter are terms used to define solid or liquid particles that may be suspended in the atmosphere. The potential affect of particulate matter on the environment, human health and amenity depends on the size of the particles, the concentration of particulate matter in the atmosphere and the rate of deposition.</i>
Earthworks	<i>Bulk earthworks, site levelling, import and compaction of fill material, excavation for installation of drainage and services, to prepare the site for construction.</i>
EEC	<i>Endangered Ecological Community listed as Endangered under Commonwealth and/or State legislation.</i>
Ecologically Sustainable Development (ESD)	<i>Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Ecologically sustainable development can be achieved through the implementation of the following principles and programs including: the precautionary principle; inter-generational equity; conservation of biological diversity and ecological integrity; improved valuation, and pricing and incentive mechanisms.</i>
EIS	<i>Environmental Impact Statement submitted with the application for consent for the development.</i>
Emission	<i>The release of material into the environment (eg dust).</i>
Evening period	<i>Means the period from 6.00pm to 10.00pm.</i>
Environment	<i>Includes all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings.</i>
Environmental Planning Instrument (EPI)	<i>An environmental planning instrument is the collective name for local environmental plans (LEPs) and state environmental planning policies (SEPPs) but does not include development control plans (DCPs). The provisions of EPIs are legally binding on both government and developers.</i>
Environment Protection License (EPL)	<i>Has the same meaning as the definition of the term in the Dictionary to the NSW Protection of the Environment Operations Act, namely: "a licence authorising the carrying out of scheduled development work or scheduled activities or controlling the pollution of water arising from non-scheduled activities, being a licence issued under Chapter 3 and in force."</i>
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979.</i>
EP&A Regulation ("regulations")	<i>NSW Environmental Planning and Assessment Regulation 2021.</i>
EPA	<i>NSW Environment Protection Authority constituted by the Protection of the Environment Administration Act 1991.</i>

EPL	<i>Environment Protection Licence.</i>
Erosion	<i>The process of wearing away of the land surface (whether natural or artificial) by the action of water, wind.</i>
ESCP	<i>Erosion and sediment control plan.</i>
Excavator	<i>Item of earth moving equipment either tracked or wheeled fitted with a bucket on an articulated boom and used for digging material from a quarry pit face in front of, or below the machine.</i>
Extraction	<i>A term synonymous with quarrying. Under the Environmental Planning and Assessment Act, 1979, quarrying is defined as "extractive industries".</i>
Feasible	<i>Means what is possible and practical in the circumstances.</i>
Flora and fauna	<i>Plants and animals.</i>
Flyrock	<i>Rock that is ejected from beyond a blast site, typically with the potential to cause injury or damage to property. Proper planning can reduce the incidence of flyrock.</i>
Gravel	<i>A gravel resource refers to naturally occurring accumulations of gravel and sand that are valuable for extraction and use in construction and development. These resources can be found in riverbeds, beaches, floodplains, and land-based quarries.</i>
Groundwater	<i>Water found in the subsurface in the saturated zone below the water table or piezometric surface i.e. the water table marks the upper surface of groundwater systems.</i>
ha	<i>hectare.</i>
Habitat	<i>The place where an organism normally lives; habitats can be described by their floristic and physical characteristics.</i>
Haul Road	<i>Road used for haulage of material from/to the worked quarry face to/from markets beyond.</i>
Hazard	<i>A source of potential harm; a potential occurrence or condition that could lead to injury, damage to the environment, delay or economic loss.</i>
Heritage	<i>Encompasses both Aboriginal and historic heritage including sites that predate European settlement, and a shared history since European settlement.</i>
Heritage item	<i>A place, building, work, relic, archaeological site, tree, moveable object or precinct of heritage significance, that is listed under one or more of the following registers: the Heritage Act 1977 (NSW), a state agency heritage and conservation register under section 170 of the Heritage Act 1977 (NSW), a Local Environmental Plan under the EP&A Act, the World, National or Commonwealth Heritage lists under the Environment Protection and Biodiversity Conservation Act 1999 (Cth), and an "Aboriginal object" or "Aboriginal place" as defined in section 5 of the National Parks and Wildlife Act 1974 (NSW). An item as defined under the Heritage Act 1977, and assessed as being of local, State and/ or National heritage significance, and/or an Aboriginal Object or Aboriginal Place as defined.</i>
IBRA	<i>Interim Biogeographic Regionalisation for Australia.</i>
Integrated development	<i>Development (not being State significant development or complying development) that, in order for it to be carried out, requires development consent and one or more approvals from the government agencies listed in s.4.46 of the NSW Environmental Planning and Assessment Act 1979.</i>
Incident	<i>An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance with an issued consent.</i>
km	<i>Kilometre.</i>

kV	Kilovolt.
Land	Has the same meaning as the definition of the term in section 1.4 of the NSW Environmental Planning and Assessment Act 1979.
Land Capability	The ability of land to support agriculture on a sustainable basis.
Land Use Table	A table in an environmental planning instrument (EPI) listing the objectives of any land use zone, along with uses permitted and prohibited under any zoning.
Landscaped area	Means a part of a site used for growing plants, grasses and trees, but does not include any building, structure or hard paved area.
L_{Aeq}(time)	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
L_{A90}(time)	The A-weighted sound pressure level that is exceeded for 90 per cent of the time over which a given sound is measured. This is considered to represent the background noise e.g. LA90 (15 min).
Lithosol	An azonal soils having no clearly expressed soil morphology and consisting of a freshly and imperfectly weathered mass of rock fragments; largely confined to steep hillsides or areas where rock tends to outcrop close to the surface.
Local Environmental Plan (LEP)	Local Environmental Plans are planning documents prepared by a Council which detail the zoning of land and the type of development which is permitted with consent in a particular zone. Controls on development are also provided.
Management Plan	A plan which demonstrates how the management objectives for an environmental matter will be achieved. Also referred to as Environmental Management Plan (EMP).
Mining Act	The Mining Act 1992 is the principal legislation in New South Wales (NSW) that regulates the exploration and mining of mineral and coal resources.
Minister	NSW Minister for Planning (or delegate).
Mitigation	Activities associated with reducing the impacts of the development prior to or during those impacts occurring.
ML	Megalitre: 1,000,000 litres.
ML	Mining Lease required under the Mining Act.
m/s	Metres per second
MIC	Maximum instantaneous charge for blasting, measured in kg per drill hole.
Modification	A change to a project that is implemented by modifying an existing development consent. An application must be made under s.4.55 of the EP&A Act before the modification can be approved.
Monitoring	The regular measurement of components of the environment to ensure that environmental guidelines standards are being met.
Night	Means the period between 10.00pm and 7.00am.
NSW planning portal	Means the website with the URL of www.planningportal.nsw.gov.au , or any other website, used by the Planning Secretary to provide public access to documents or other information in the NSW planning database.
OEH	(former) NSW Office of Environment & Heritage



Overburden	Subsoil and decomposed rock overlying the main quarry rock body- a low value quarry material.
Peak Particle Velocity	A measure of ground vibration caused by quarry blasting reported in millimetres/second (mm/sec)
Plan of Management/ Environmental Management Plan	A document that details the management measures (including controls, monitoring and other safeguards) to be implemented during a the life of a development eg. for a quarry, landfill or resource recovery facility.
(Quarry) Processing Plant & Facilities	In the case of a quarry extraction operation, the combination of crushers, screens, conveyors, washing plant and the like used to reduce the size of the resource and separate it into various sized products. Used in association with other quarry plant that includes aggregate pre-coating facility, fuel storage, sheds, offices, haul roads, weigh bridge and sediment basins, collectively forming a part of a quarry infrastructure area.
Planning Secretary/ Secretary	Planning Secretary under the EP&A Act, or nominee.
PCT	Plant Community Type: refers to a specific and recurring assemblage of native plant species found in a particular environment.
POEO Act	Protection of the Environment Operations Act 1997.
Project	The development the subject of an application for consent or approval on a site ("project site").
Proponent	The person or entity seeking consent or approval for a project, including any associated entities that have been engaged to assist with project delivery.
Reasonable	Means applying judgement in arriving at a decision, taking into account: mitigation, benefits, costs of mitigation versus benefits provided, community views, and the nature and extent of potential improvements.
RL	Reduced Level means height above the Australian Height Datum, being the datum surface approximating mean sea level that was adopted by the National Mapping Council of Australia in May 1971.
Rehabilitation	The restoration of land disturbed by the development to a good condition, to ensure it is safe, stable and non-polluting. Typically involves the preparation of a final landform after a project is completed and its stabilisation with grasses, trees and/or shrubs.
REP	Regional Environmental Plan.
REZ	Renewable Energy Zone. The future of energy production is renewable. The NSW Government has declared a number of Renewable Energy Zones throughout NSW.
Risk, Risk Assessment	The chance of something happening that will have an impact on objectives. Risk assessment is the overall process of risk identification, risk analysis and risk evaluation.
Road	Means a public road or a private road within the meaning of the Roads Act 1993, and includes a classified road.
SAII	Serious and irreversible impact.
Sensitive receivers	Means a location where people are likely to work, occupy or reside, including a dwelling, school, hospital, office or public recreational area.
Scenic quality/visual	The values of visible components of landscape which contribute to its scenic characteristics.

Sediment pond/ basin	<i>Collects waterborne sediment from disturbed areas within a development site and stores that water while suspended sediments fall out of solution (settle).</i>
SEE	<i>Statement of Environmental Effects, required for a development application (DA) lodged pursuant to the provisions of the (NSW) EP&A Act 1979.</i>
SEARs	<i>The Secretary's Environmental Assessment Requirements set out clear expectations on the level of assessment required for each relevant matter which must be addressed by the proponent in the EIS.</i>
SEPP	<i>State Environmental Planning Policy.</i>
Screening	<i>A process which separates quarry product into various sizes, usually involving a mechanical vibration of the rock over a series of decks fitted with steel mesh, steel plate and/or polyurethane and/or rubber mats with fixed sized apertures.</i>
Sealing aggregate	<i>Crushed rock usually of uniform size bonded by bitumen on the surface of the road to form a wear surface.</i>
Shot rock	<i>Rock won from blasting at a hard rock quarry.</i>
Siltstone	<i>Siltstone is a clastic (ie. rocks composed of broken pieces of older rocks) sedimentary rock that is mostly composed of silt-sized particles. It forms where water, wind, or ice deposit silt, and the silt is then compacted and cemented into a rock.</i>
Spirals	<i>Spiral separators re a gravity-based device used to extract heavy mineral sands or other heavy minerals from sand or gravel. A slurry containing the mix is fed into the top of a spiral-shaped chute, where gravity and centrifugal force cause heavier particles to settle to the bottom, with lighter particles carried to the outer edge, allowing for their collection at different points along the spiral.</i>
State Significant Development (SSD)	<i>Development projects which have State significance due to their size, economic value or potential impacts assessed and approved under the EP&A Act.</i>
State Significant Project	<i>A State significant development or State significant infrastructure project as defined under the EP&A Act. Defined in State Environmental Planning Policy (State and Regional Development) 2011 requiring the consent of the Minister for Planning or delegate.</i>
Soil Landscape	<i>An area of land that has recognisable and describable topography and soils that are capable of being represented on maps and of being described by concise statements. The Soil Conservation Service of NSW has published a Soil Landscapes Series, describing the soils of NSW.</i>
Stakeholder	<i>Persons, groups, government and semi-government agencies, and non-government organisations with a legitimate interest in the process of assessment, its inputs and outcomes, as described in the Director General's Requirements.</i>
State Environmental Planning Policy (SEPP)	<i>A planning instrument made by the State. These Plans deal with planning issues of State significance.</i>
Scheduled Activity	<i>Has the same meaning as the definition of the term in the Dictionary to the POEO Act, namely: "means an activity listed in Schedule 1 [of the PIEO Act]." An Environment Protection License (EPL) is required for the operation of any schedule premises.</i>
The Site, or Project Site	<i>Refers to the land within which the proposed development is to take place.</i>
Subdivision (of land)	<i>Means the division of land into two or more parts that, after the division, would be obviously adapted for separate occupation. Subdivision of land includes the procuring of the registration in the office of the NSW Registrar-General of a plan of subdivision.</i>

SWL	<i>Standing water level is the distance from the ground surface to the water surface for a well or bore.</i>
TEC	<i>Threatened Ecological Community.</i>
Tertiary	<i>Period of geological time, prior to the Quaternary, 65 million years ago- usually associated with volcanic activity.</i>
TfNSW	<i>Transport for New South Wales.</i>
Threatened species	<i>Species of flora and fauna that are listed as endangered species or vulnerable species.</i>
Use of land	<i>Includes a change of use of building use.</i>
Visual Analysis	<i>Landscape analysis based on visual qualities only, excluding consideration of heritage, cultural or social values</i>
Visual Catchment	<i>Land within view-sheds. View-sheds are edges or limits to views from a single place or combination of viewpoints.</i>
vpd, vph	<i>Abbreviations of vehicles per day (vpd), vehicles per hour (vph).</i>
WAD	<i>Works Authorisation Deed is a formally executed common law agreement between Transport for NSW (TfNSW) and a Developer to carry out road works or other works for which TfNSW has a statutory interest under the Roads Act 1993, subject to a series of prescribed requirements and conditions . It is entered into after a DA has been approved and before approval of design documentation.</i>
WAL	<i>Water Access Licence, issued under Section 95 of the (NSW) Water Management Act 2000.</i>
Water Balance	<i>Means an assessment to determine the adequacy of water stored at a quarry site in meeting future water needs for that development in 'dry', 'average' and 'wet' years.</i>
Waterfront Land	<i>Means the bed of any river, lake or estuary and land within 40 metres of a river bank, lake shore or estuary mean high-water mark. Any proposed development fronting waterfront land, as defined, is a 'controlled activity' for the purposes of the Water Management Act 2000 and 'integrated development', requiring approval from the responsible agency listed in s.4.46 of the NSW Environmental Planning and Assessment Act 1979.</i>
Water Sensitive Urban Design (WSUD)	<i>Water-sensitive urban design (WSUD) is a and planning and engineering design approach which integrates the urban water cycle, including stormwater, groundwater and wastewater management and water supply, into urban design to minimise environmental degradation and improve aesthetic and recreational appeal.</i>
WM Act	<i>Water-Management Act 2000.</i>
Weathered Rock	<i>Rock affected to any degree by the processes of chemical or physical weathering.</i>
Wind rose	<i>Means a graphics tool that summarises winds at any location, showing strength, direction and frequency.</i>
Zoning, Zoning Map	<i>A planning tool used to apply planning policy and provisions of an environmental planning instrument to specific areas of land within a local or state government area.</i>

APPENDIX A

Acoustic assessment by Waves Acoustic Consulting Pty Ltd



APPENDIX B

Traffic assessment by Streetwise



APPENDIX C

EPA Compliance History & Environmental Risk Category for Glenella Quarry



Environmental Risk Category Summary



LICENCE NO	20632
LICENCE HOLDER	GLENELLA QUARRY PTY LTD
ASSESSMENT NO	4015195

Environmental Media

Regulatory Priority

Air/Odour - day to day activities

Low

Water - day to day activities

Low

Noise - day to day

Low

Pollution from incidents or unplanned events - acute pollution risk

Low

Overall Regulatory Priority Low

Environmental Management Category



LICENCE NO	20632
LICENCE HOLDER	GLENELLA QUARRY PTY LTD
ASSESSMENT NO	4016482
ASSESSMENT PERIOD	28/07/2018 to 27/07/2021

Regulatory score

Enforcement history

Successful prosecutions	0
Enforceable undertakings	0
Penalty notices	0
Official cautions	0
Formal warning	0

Regulatory actions and tools

Suspension of licence	0
Clean up notices	0
Prevention Notices	0
Mandatory environmental audits	0
Pollution reduction programs (PRPs)	7
Site inspections - incident related	0

Enforcement history	0
Regulatory actions and tools	0
Environmental improvement - systems and practices	-60

Total score of Environmental management category 0

Environmental management category A

Locked Bag 5022, Parramatta NSW 2124
4 Parramatta Square, 12 Darcy Street, Parramatta NSW 2150

Telephone (02) 9995 5700

ABN 43 692 265 758
www.epa.nsw.gov.au



APPENDIX D

Martens Associates water assessment and approved Water Access Licence (WAL)-
Zero Share (Excerpt only)





Notice of Decision

Water Management Act 2000

Application details

Application number	D1022055
Application type	New water access licence - zero share component (s61) under the <i>Water Management Act 2000</i> .
Applicant/s	HOWE, MICHAEL SCOTT

Decision

Decision

Granted, subject to conditions

This decision was made under section 63 of the *Water Management Act 2000*.

For the terms and conditions of the new water access licence, see Schedule 1.

Reference number 70AL617392

Date of decision 27 April 2022

Date of notice 28 April 2022

Registration expiry date 26 October 2022

Determining officer Georgina Tuaoimalii

by delegation from the Minister administering the *Water Management Act 2000* under the *Instrument of Delegation (Water Management Act) 2011*

Reasons for decision

This water access licence was granted on the basis WaterNSW is satisfied adequate arrangements are in force to ensure that no more than minimal harm will be done to any water source as a consequence of water being taken from the water source under the licence.

Any conditions identified with the first letter "D" were applied for the purpose of protecting the environment from impacts associated with the licence, or to give effect to any agreement between the applicant and a person who objected to the application.



APPENDIX E

Air quality impact assessment by Northstar Air Quality Pty Ltd



APPENDIX F

NSW Rural Fire Service online portal 25 November 2025

Check if you're in bush fire prone land

You can check here if your land is in a bush fire prone area.

This tool is best viewed on a desktop web browser.

- Enter your address including house number, street and suburb or town. Select your address from the drop down options provided.
- Check the map has correctly located your property. If not drag and drop the red marker on to your property.
- Click the 'Get Results' button to see if you're in a designated bush fire prone area.
- You should consider seeking expert advice before commencing any development.

Your Property



Your search result

You have conducted a search of the online bush fire prone land tool for the land in the map above. This search result is valid for the date the search was conducted. If you have any questions about the Bush Fire Prone Land Tool please contact bushfireprone.mapping@rfs.nsw.gov.au

The parcel of land selected is not identified as bush fire prone however you could still be affected by a bush fire.

APPENDIX B

9. Glossary of Terms

Term	Meaning
AADT	Annual Average Daily Traffic.
ABS	Australian Bureau of Statistics.
Aboriginal object, place	Has the same meaning as the definition of the term in section 5 of the National Parks and Wildlife Act 1974.
Acoustic	Relating to hearing, noise and sound.
Aggregate	Rock crushed to the required size for use in concrete, masonry products, road sealing, pavement materials and other uses.
AHD	Australian Height Datum. The standard reference level used to express the relative elevation of various features. A height given in metres, AHD is essentially the height above sea level.
AHIP	Aboriginal Heritage Impact Permit.
Air Blast Overpressure	Air vibration or air blasts are the pressure or shock waves that radiate in air from an exploding charge. When a pressure wave passes a given point, the pressure of the air rises rapidly before returning to atmospheric pressure after a period of oscillations. The maximum pressure is the 'Air Blast Overpressure' measured in dB.
Ambient noise	This is the total encompassing sound in a given situation at a given time where no particular sound is dominant. It is composed of sound from all sources near and far, normally experienced in the area. Ambient noise is measured as dB ('A' weighted) over a set period of time.
Amenity	The quality of a local environment.
APZ	Asset Protection Zone is a strategically managed area of reduced vegetation surrounding a built asset, designed to protect it from bushfires.
AS	Australian Standard.
ASS	Acid sulfate soils.
Attenuation	Reduction in sound level between a noise source and another location.
Avoid	Measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on the environment, including biodiversity values, or certain areas of biodiversity.
A-Weighted Sound Level dB(A)	A level of sound pressure in which the sound pressure levels of the various frequency bands have been weighted to accord roughly with human aural system frequency sensitivity.
BAM	Biodiversity Assessment Method
Basalt	Fine grained, dark volcanic igneous rock.

Batter	<i>The face of the slope eg. walls, banks, cuttings, etc.</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>
Bench (in a quarry)	<i>A ledge constructed in a batter or natural slope within a quarry. A step in the face of a quarry.</i>
Biodiversity	<i>The biological diversity of life at genetic, species and ecosystem scales. The maintenance of biodiversity, at all levels, is acknowledged internationally as a high conservation priority. Biodiversity values comprise vegetation integrity, habitat suitability and biodiversity values generally.</i>
BDAR	<i>Biodiversity Development Assessment Report.</i>
Blasting	<i>The operation of breaking rock in a quarry by means of explosives.</i>
Bund	<i>An earthen mound wall which may be used for noise attenuation or visual screens or for redirecting stormwater/runoff around a part of a site. Bunds may also be used to contain spillage of liquid materials.</i>
Blue Book	<i>Means Managing Urban Stormwater: Soils & Construction (4th edition, Landcom, 2004), commonly referred to as the “Blue Book”.</i>
Biodiversity	<i>Biological variety at genetic, species and ecosystem scales. The maintenance of biodiversity, at all levels, is acknowledged internationally as a high conservation priority.</i>
BoM	<i>Bureau of Meteorology (Commonwealth).</i>
BOS	<i>Biodiversity Offsets Scheme</i>
Building Code of Australia	<i>Means means the document, published by or on behalf of the Australian Building Codes Board, that is prescribed for purposes of this definition by the regulations, together with— (a) such amendments made by the Board, and (b) such variations approved by the Board in relation to New South Wales, as are prescribed by the regulations</i>
CC	<i>Construction certificate. A Construction Certificate (CC) is a certificate that is issued by an accredited private certifier or a consent authority under the provisions of Environmental Planning and Assessment Act 1979. The Certificate allows for building work to commence on a project.</i>
Catchment	<i>Drainage area of a river, creek. Can also refer to a visual catchment, which is the area within view of a particular viewing location, or road catchment, which is the area reliant on a particular road in order to gain access to another centre or locality.</i>
CIV	<i>Capital investment value as defined by the Environmental Planning & Assessment Regulation 2021. Includes all costs necessary to establish and operate the project, with some exclusions.</i>
Clay	<i>Clay is a type of fine-grained natural soil material containing clay minerals including kaolinite. Builders Clay is a finely milled, air separated clay used as a plasticiser in mortar and render applications where sands are low in clay content.</i>
Climate change	<i>A change in the state of climate and that persists for an extended period, typically decades or longer.</i>
Consent	<i>Means development consent issued under the Environmental Planning and Assessment Act 1979.</i>
Contributions Plan	<i>Section 7.11 of the Environmental Planning and Assessment Act 1979 allows councils to levy contributions towards the cost of providing local infrastructure. Contributions plans set out the local infrastructure required to meet the demand from new development, and the contributions a council can levy on developers to fund the necessary land and works.</i>

Construction	All physical works to enable operation, including but not limited to the demolition and removal of buildings, the carrying out of works for the purposes of the development, including bulk earthworks, and erection of buildings and other infrastructure permitted by this consent, but excluding the following: •building and road dilapidation surveys; •investigative drilling, investigative excavation or Archaeological Salvage; •establishing temporary site offices (in locations identified by the conditions of this consent); •installation of environmental impact mitigation measures, fencing, enabling works; and minor adjustments to services or utilities.
Contamination	The action or state of makings or being made impure by polluting or poisoning, or the state of containing unwanted or dangerous substances.
Contour Drain	Drainage channel constructed approximately along the contour, and which is designed to slow down and direct the flow of water across a disturbed area to a sediment trap for sediment removal.
Council	<i>Cowra Council, Hilltops Council.</i>
Crushing	The mechanical process of reducing quarry rock size usually by pressure or impact.
DA	Development Application. A Development Application (DA) is required for various types of development projects under the provisions of NSW Environmental Planning and Assessment Act 1979. It means an application for consent under Part 4 to carry out development but does not include an application for a complying development certificate. Sometimes also referred to as Development Approval.
Daytime	Means between the hours of 7.00am to 6.00pm.
dB (A)	To approximate the human response to sound, noise level meters have weighting networks which correspond approximately with subjective loudness. The 'A- Weighting' is used to simulate human hearing.
DBYD	Dial Before You Dig.
DCP	Development Control Plan. A development control plan provides detailed planning and design guidelines to support the planning controls in an environmental planning instrument.
Department, DP&E	NSW Department of Planning and Environment.
Designated development	Means development that is declared to be designated development by an environmental planning instrument or the regulations. All applications for designated development in NSW need to be accompanied by an EIS.
Development	The development described in the development application. For the purposes of the NSW Environmental Planning and Assessment Act 1979, "development" is any of the following: "(a) the use of land, (b) the subdivision of land, (c) the erection of a building, (d) the carrying out of a work, (e) the demolition of a building or work, (f) any other act, matter or thing that may be controlled by an environmental planning instrument." (2) However, development does not include any act, matter or thing excluded by the regulations (either generally for the purposes of this Act or only for the purposes of specified provisions of this Act). (3) For the purposes of this Act, the carrying out of development is the doing of the acts, matters or things referred to in subsection (1). (sub clauses 1.5(1)(2) and (3) of the NSW Environmental Planning and Assessment Act 1979).

Development Consent	Means consent under the provisions of NSW Environmental Planning and Assessment Act 1979 to carry out development and includes, unless expressly excluded, a complying development certificate.
Deposited Plan (DP)	Deposited Plans (DP) define legal boundaries of land and often record subdivisions, easements and the like.
Designated Development	Section 4.10 of the Environmental Planning and Assessment Act 1979 states that "Designated development is development that is declared to be designated development by an environmental planning instrument or the regulations." Schedule 3 of the Environmental Planning and Assessment Regulation 2021 defines the type of development which is classified as designated development.
Drainage Line	A natural depression with no stream bed channel, which may only carry surface water during rainfall events.
Dust or particulate matter	Dust or particulate matter are terms used to define solid or liquid particles that may be suspended in the atmosphere. The potential affect of particulate matter on the environment, human health and amenity depends on the size of the particles, the concentration of particulate matter in the atmosphere and the rate of deposition.
Earthworks	Bulk earthworks, site levelling, import and compaction of fill material, excavation for installation of drainage and services, to prepare the site for construction.
EEC	Endangered Ecological Community listed as Endangered under Commonwealth and/or State legislation.
Ecologically Sustainable Development (ESD)	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Ecologically sustainable development can be achieved through the implementation of the following principles and programs including: the precautionary principle; inter-generational equity; conservation of biological diversity and ecological integrity; improved valuation, and pricing and incentive mechanisms.
EIS	Environmental Impact Statement submitted with the application for consent for the development.
Emission	The release of material into the environment (eg dust).
Evening period	Means the period from 6.00pm to 10.00pm.
Environment	Includes all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings.
Environmental Planning Instrument (EPI)	An environmental planning instrument is the collective name for local environmental plans (LEPs) and state environmental planning policies (SEPPs) but does not include development control plans (DCPs). The provisions of EPIs are legally binding on both government and developers.
Environment Protection License (EPL)	Has the same meaning as the definition of the term in the Dictionary to the NSW Protection of the Environment Operations Act, namely: "a licence authorising the carrying out of scheduled development work or scheduled activities or controlling the pollution of water arising from non-scheduled activities, being a licence issued under Chapter 3 and in force."
EP&A Act	NSW Environmental Planning and Assessment Act 1979.
EP&A Regulation ("regulations")	NSW Environmental Planning and Assessment Regulation 2021.
EPA	NSW Environment Protection Authority constituted by the Protection of the Environment Administration Act 1991.

EPL	<i>Environment Protection Licence.</i>
Erosion	<i>The process of wearing away of the land surface (whether natural or artificial) by the action of water, wind.</i>
ESCP	<i>Erosion and sediment control plan.</i>
Excavator	<i>Item of earth moving equipment either tracked or wheeled fitted with a bucket on an articulated boom and used for digging material from a quarry pit face in front of, or below the machine.</i>
Extraction	<i>A term synonymous with quarrying. Under the Environmental Planning and Assessment Act, 1979, quarrying is defined as "extractive industries".</i>
Feasible	<i>Means what is possible and practical in the circumstances.</i>
Flora and fauna	<i>Plants and animals.</i>
Flyrock	<i>Rock that is ejected from beyond a blast site, typically with the potential to cause injury or damage to property. Proper planning can reduce the incidence of flyrock.</i>
Gravel	<i>A gravel resource refers to naturally occurring accumulations of gravel and sand that are valuable for extraction and use in construction and development. These resources can be found in riverbeds, beaches, floodplains, and land-based quarries.</i>
Groundwater	<i>Water found in the subsurface in the saturated zone below the water table or piezometric surface i.e. the water table marks the upper surface of groundwater systems.</i>
ha	<i>hectare.</i>
Habitat	<i>The place where an organism normally lives; habitats can be described by their floristic and physical characteristics.</i>
Haul Road	<i>Road used for haulage of material from/to the worked quarry face to/from markets beyond.</i>
Hazard	<i>A source of potential harm; a potential occurrence or condition that could lead to injury, damage to the environment, delay or economic loss.</i>
Heritage	<i>Encompasses both Aboriginal and historic heritage including sites that predate European settlement, and a shared history since European settlement.</i>
Heritage item	<i>A place, building, work, relic, archaeological site, tree, moveable object or precinct of heritage significance, that is listed under one or more of the following registers: the Heritage Act 1977 (NSW), a state agency heritage and conservation register under section 170 of the Heritage Act 1977 (NSW), a Local Environmental Plan under the EP&A Act, the World, National or Commonwealth Heritage lists under the Environment Protection and Biodiversity Conservation Act 1999 (Cth), and an "Aboriginal object" or "Aboriginal place" as defined in section 5 of the National Parks and Wildlife Act 1974 (NSW). An item as defined under the Heritage Act 1977, and assessed as being of local, State and/ or National heritage significance, and/or an Aboriginal Object or Aboriginal Place as defined.</i>
IBRA	<i>Interim Biogeographic Regionalisation for Australia.</i>
Integrated development	<i>Development (not being State significant development or complying development) that, in order for it to be carried out, requires development consent and one or more approvals from the government agencies listed in s.4.46 of the NSW Environmental Planning and Assessment Act 1979.</i>
Incident	<i>An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance with an issued consent.</i>
km	<i>Kilometre.</i>

kV	Kilovolt.
Land	Has the same meaning as the definition of the term in section 1.4 of the NSW Environmental Planning and Assessment Act 1979.
Land Capability	The ability of land to support agriculture on a sustainable basis.
Land Use Table	A table in an environmental planning instrument (EPI) listing the objectives of any land use zone, along with uses permitted and prohibited under any zoning.
Landscaped area	Means a part of a site used for growing plants, grasses and trees, but does not include any building, structure or hard paved area.
L_{Aeq}(time)	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
L_{A90}(time)	The A-weighted sound pressure level that is exceeded for 90 per cent of the time over which a given sound is measured. This is considered to represent the background noise e.g. LA90 (15 min).
Lithosol	An azonal soils having no clearly expressed soil morphology and consisting of a freshly and imperfectly weathered mass of rock fragments; largely confined to steep hillsides or areas where rock tends to outcrop close to the surface.
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OEH	(former) NSW Office of Environment & Heritage

Overburden	Subsoil and decomposed rock overlying the main quarry rock body- a low value quarry material.
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Reasonable	Means applying judgement in arriving at a decision, taking into account: mitigation, benefits, costs of mitigation versus benefits provided, community views, and the nature and extent of potential improvements.
RL	Reduced Level means height above the Australian Height Datum, being the datum surface approximating mean sea level that was adopted by the National Mapping Council of Australia in May 1971.
Rehabilitation	The restoration of land disturbed by the development to a good condition, to ensure it is safe, stable and non-polluting. Typically involves the preparation of a final landform after a project is completed and its stabilisation with grasses, trees and/or shrubs.
REP	Regional Environmental Plan.
REZ	Renewable Energy Zone. The future of energy production is renewable. The NSW Government has declared a number of Renewable Energy Zones throughout NSW.
Risk, Risk Assessment	The chance of something happening that will have an impact on objectives. Risk assessment is the overall process of risk identification, risk analysis and risk evaluation.
Road	Means a public road or a private road within the meaning of the Roads Act 1993, and includes a classified road.
SAII	Serious and irreversible impact.
Sensitive receivers	Means a location where people are likely to work, occupy or reside, including a dwelling, school, hospital, office or public recreational area.
Scenic quality/visual	The values of visible components of landscape which contribute to its scenic characteristics.

Sediment pond/ basin	Collects waterborne sediment from disturbed areas within a development site and stores that water while suspended sediments fall out of solution (settle).
SEE	Statement of Environmental Effects, required for a development application (DA) lodged pursuant to the provisions of the (NSW) EP&A Act 1979.
SEARs	The Secretary's Environmental Assessment Requirements set out clear expectations on the level of assessment required for each relevant matter which must be addressed by the proponent in the EIS.
SEPP	State Environmental Planning Policy.
Screening	A process which separates quarry product into various sizes, usually involving a mechanical vibration of the rock over a series of decks fitted with steel mesh, steel plate and/or polyurethane and/or rubber mats with fixed sized apertures.
Sealing aggregate	Crushed rock usually of uniform size bonded by bitumen on the surface of the road to form a wear surface.
Shot rock	Rock won from blasting at a hard rock quarry.
Siltstone	Siltstone is a clastic (ie. rocks composed of broken pieces of older rocks) sedimentary rock that is mostly composed of silt-sized particles. It forms where water, wind, or ice deposit silt, and the silt is then compacted and cemented into a rock.
Spirals	Spiral separators re a gravity-based device used to extract heavy mineral sands or other heavy minerals from sand or gravel. A slurry containing the mix is fed into the top of a spiral-shaped chute, where gravity and centrifugal force cause heavier particles to settle to the bottom, with lighter particles carried to the outer edge, allowing for their collection at different points along the spiral.
State Significant Development (SSD)	Development projects which have State significance due to their size, economic value or potential impacts assessed and approved under the EP&A Act.
State Significant Project	A State significant development or State significant infrastructure project as defined under the EP&A Act. Defined in State Environmental Planning Policy (State and Regional Development) 2011 requiring the consent of the Minister for Planning or delegate.
Soil Landscape	An area of land that has recognisable and describable topography and soils that are capable of being represented on maps and of being described by concise statements. The Soil Conservation Service of NSW has published a Soil Landscapes Series, describing the soils of NSW.
Stakeholder	Persons, groups, government and semi-government agencies, and non-government organisations with a legitimate interest in the process of assessment, its inputs and outcomes, as described in the Director General's Requirements.
State Environmental Planning Policy (SEPP)	A planning instrument made by the State. These Plans deal with planning issues of State significance.
Scheduled Activity	Has the same meaning as the definition of the term in the Dictionary to the POEO Act, namely: "means an activity listed in Schedule 1 [of the PIEO Act]." An Environment Protection License (EPL) is required for the operation of any schedule premises.
The Site, or Project Site	Refers to the land within which the proposed development is to take place.
Subdivision (of land)	Means the division of land into two or more parts that, after the division, would be obviously adapted for separate occupation. Subdivision of land includes the procuring of the registration in the office of the NSW Registrar-General of a plan of subdivision.

SWL	<i>Standing water level is the distance from the ground surface to the water surface for a well or bore.</i>
TEC	<i>Threatened Ecological Community.</i>
Tertiary	<i>Period of geological time, prior to the Quaternary, 65 million years ago- usually associated with volcanic activity.</i>
TfNSW	<i>Transport for New South Wales.</i>
Threatened species	<i>Species of flora and fauna that are listed as endangered species or vulnerable species.</i>
Use of land	<i>Includes a change of use of building use.</i>
Visual Analysis	<i>Landscape analysis based on visual qualities only, excluding consideration of heritage, cultural or social values</i>
Visual Catchment	<i>Land within view-sheds. View-sheds are edges or limits to views from a single place or combination of viewpoints.</i>
vpd, vph	<i>Abbreviations of vehicles per day (vpd), vehicles per hour (vph).</i>
WAD	<i>Works Authorisation Deed is a formally executed common law agreement between Transport for NSW (TfNSW) and a Developer to carry out road works or other works for which TfNSW has a statutory interest under the Roads Act 1993, subject to a series of prescribed requirements and conditions . It is entered into after a DA has been approved and before approval of design documentation.</i>
WAL	<i>Water Access Licence, issued under Section 95 of the (NSW) Water Management Act 2000.</i>
Water Balance	<i>Means an assessment to determine the adequacy of water stored at a quarry site in meeting future water needs for that development in 'dry', 'average' and 'wet' years.</i>
Waterfront Land	<i>Means the bed of any river, lake or estuary and land within 40 metres of a river bank, lake shore or estuary mean high-water mark. Any proposed development fronting waterfront land, as defined, is a 'controlled activity' for the purposes of the Water Management Act 2000 and 'integrated development', requiring approval from the responsible agency listed in s.4.46 of the NSW Environmental Planning and Assessment Act 1979.</i>
Water Sensitive Urban Design (WSUD)	<i>Water-sensitive urban design (WSUD) is a and planning and engineering design approach which integrates the urban water cycle, including stormwater, groundwater and wastewater management and water supply, into urban design to minimise environmental degradation and improve aesthetic and recreational appeal.</i>
WM Act	<i>Water-Management Act 2000.</i>
Weathered Rock	<i>Rock affected to any degree by the processes of chemical or physical weathering.</i>
Wind rose	<i>Means a graphics tool that summarises winds at any location, showing strength, direction and frequency.</i>
Zoning, Zoning Map	<i>A planning tool used to apply planning policy and provisions of an environmental planning instrument to specific areas of land within a local or state government area.</i>



Noise & Vibration Impact Assessment

Glenella Quarry

Proposed Rate of Extraction Increase

24 November 2025
Document No. 60.00893.03 RPT1R1.DOCX

Glenella Quarry Pty Ltd
483 Battery Road
Cowra
NSW 2974

Noise & Vibration Impact Assessment

Glenella Quarry

Proposed Rate of Extraction Increase

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This report has been prepared by Waves Acoustic Consulting Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid. This report is for the exclusive use of Glenella Quarry Pty Ltd. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Waves Consulting. Waves Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

TABLE OF CONTENTS

1	INTRODUCTION	3
1.1	Background.....	3
1.2	Relevant Guidelines	4
2	DEVELOPMENT DESCRIPTION	5
2.1	Overview of the Development and Potential for Impacts	5
2.2	Existing Quarrying Operations.....	9
2.3	Operational Noise Levels	11
2.4	Operational Hours.....	11
2.5	Operational Traffic Generation	12
3	NOISE MEASUREMENTS	14
3.1	Unattended Noise Monitoring	14
3.2	Unattended Noise Monitoring Results.....	14
3.3	Attended Noise Measurements	17
4	OPERATIONAL NOISE ASSESSMENT GUIDELINES.....	18
4.1	NSW Noise Policy for Industry (NPI)	18
4.2	Project Noise Trigger Level - Introduction	18
4.3	Project Intrusiveness Noise Level.....	19
4.4	Project Amenity Noise Level.....	19
4.5	Recommended Amenity Noise Level – Residential Receiver Classification.....	21
4.6	Recommended Amenity Noise Level – Existing Background Noise Corrections	21
4.7	Recommended Amenity Noise Level - Time Period Correction	22
4.8	Maximum Noise Level Assessment - Sleep Disturbance.....	22
4.9	NPI Project Noise Trigger Levels (PNTL).....	23
4.10	NPI Criteria Supersedes Consent Criteria (INP)	23
4.11	NSW Road Noise Policy (RNP)	24
4.12	Blasting Noise & Vibration Criteria.....	24
5	OPERATIONAL NOISE MODELLING	25
5.1	Model Inputs & Parameters	25
5.2	Noise Enhancing Meteorological Conditions	25
5.3	Operational Scenarios.....	26
5.4	Fixed Operational Noise Source Levels	27
5.5	Mobile Operational Noise Source Levels	27
5.6	Corrections for Annoying Noise Characteristics	27
6	PREDICTED OPERATIONAL NOISE IMPACTS	28
6.1	Predicted Operational Noise Impacts.....	28
6.2	Predicted Operational Noise Impacts – RNP	29
7	BLASTING NOISE AND VIBRATION IMPACTS.....	30
7.1	Blasting Assessment Methodology	30
7.2	Blasting Impacts – Nearest Sensitive Receiver	31
7.3	Blast Monitoring Requirements.....	32
7.4	Blasting Impacts – Infrastructure	33
7.5	Blasting Impacts – Animals and Livestock	34
8	CONCLUSION.....	35

APPENDIX A: Graphical Noise Logger Data

APPENDIX B: Noise Level Maps

1 Introduction

1.1 Background

Waves Acoustic Consulting Pty Ltd (Waves Consulting) has been engaged by Glenella Quarry Pty Ltd to prepare a Noise and Vibration Impact Assessment (NVIA) in support of a Section 4.55(2) modification application for the proposed increase in the annual rate of extraction and daily truck numbers at the existing approved Glenella Quarry, near Cowra NSW.

Glenella Quarry is an operational quarry / mine that extracts high quality basalt, weathered basalt, clay, and gravel (pebbles and sand) and some gold, supplying quarry products to the local and regional construction and landscaping markets. Glenella Quarry and its associated resource is located within the larger "Glenella" Freehold owned property which extends over an area of approximately 700 Ha of land.

The quarry straddles two local government areas- Cowra and Hilltops- and enjoys similarly worded consents from both councils, issued in August 2007 (DA73/2007) and September 2007 (DA117/06), respectively. The existing development consents permit an annual extraction rate of up to 200,000 tonnes per annum of quarry and mining products, a daytime noise limit of 35 dB LAeq,15min with a limit of 35 loaded trucks per day.

The s.4.55(2) modification application seeks to modify the above consents by:

- Increasing the rate of extraction limit at the quarry from the current limit of 200,000 tonnes per annum to 499,000 tonnes per annum from within the currently approved extraction/mining footprints.
- Reflecting the above increase in the rate of extraction, increasing the maximum daily truck numbers to 50 loaded trucks per day. The modest increase in maximum daily truck numbers is made possible due to the use of larger loads capable of being carried by quarry trucks. Trucks used are truck and dog combinations with the applicant seeking a future use of B-doubles.
- Arising from our noise assessment undertaken in support of the proposed s.4.55(2) modification, changes to each consent relating to permitted daytime noise levels. This modification also has the benefit of bringing the quarry / mine operation in line with the current NSW Noise Policy for Industry (2017) (NPI), which came into force some 10 years after the above consents were issued.

This report addresses the following aspects relating to noise and vibration:

- Background noise assessment at all nearby noise sensitive receivers.
- Operational noise modelling and assessment in accordance with the NSW Noise Policy for Industry (NPI) to include spectral / octave band data of proposed plant, noise modification factors and weather impacts on noise propagation.
- Operational traffic noise analysis in accordance with the NSW Road Noise Policy (RNP).
- Operational vibration modelling and analysis in accordance with the EPAs NSW Assessing Vibration: A Technical Guidelines (2006).
- Blasting impacts in accordance with the Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZECC, 1990)

1.2 Relevant Guidelines

Noise from the operation of the proposal has been assessed in accordance with the NSW Noise Policy for Industry (NPI) 2017.

Noise from additional traffic movements on the local road network has been assessed in accordance with the NSW Road Noise Policy (RNP), NSW EPA 2011.

Vibration from the operation and construction of the proposal has been assessed in accordance with Assessing Vibration: a technical guideline (DEC 2006).

Blasting impacts in accordance with the Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZECC, 1990).

Blast air overpressure and ground vibrations have been calculated in general accordance with AS 2187.2-2006 Explosives - Storage and use. Part 2: Use of explosives.

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

2 Development Description

2.1 Overview of the Development and Potential for Impacts

Glenella Quarry Pty Ltd was formed in late 2005 to manage the operations of the Glenella Quarry located at 483 Battery Road, Cowra, NSW. Glenella Quarry was purchased in December 2005. After the purchase the Company has focussed on operating the Glenella Quarry in an environmentally responsible manner and establishing positive links with the local community, particularly those neighbours fronting onto both Battery Road and Reids Flat Road.

Glenella Quarry is an operational quarry / mine that extracts high quality basalt, weathered basalt, clay, and gravel (pebbles and sand) and some gold, extracting up to the consented limit of 200,000 tonnes per annum to the local and regional construction and landscaping markets. Glenella Quarry and its associated resource is located within the larger "Glenella" Freehold owned property which extends over an area of approximately 700 Ha of land.

A Section 4.55(2) modification approval is sought for an increase in the annual rate of extraction from 200,000 tonnes to 499,000 tonnes per annum inside their existing development consent boundary within their current Freehold property. This increase will assist with meeting the ongoing demand for various construction and decorative aggregate materials in both the local and regional market. Glenella Quarry Pty Ltd are not proposing to alter the operational profile of the quarry when seeking approval to increase annual production limits to 499,000 tonnes. Associated with this increase in the rate of extraction will be an increase in truck loads, to a maximum of 50 loads per day. Arising from our noise assessment undertaken in support of the proposed s.4.55(2) modification, changes to each consent relating to permitted daytime noise levels. This modification also has the benefit of bringing the quarry / mine operation in line with the current NSW Noise Policy for Industry (2017) (NPI), which came into force some 10 years after the above consents were issued.

The proposed increase in the rate of extraction at the quarry / mine will allow Glenella Quarry Pty Ltd to meet the local, regional (specifically Sydney metro) and interstate demand for the high-quality quarried / mined products. In addition, the increases in the rate of extraction will also assist with meeting the substantial rise in demand for construction and high- quality landscaping products in NSW and beyond.

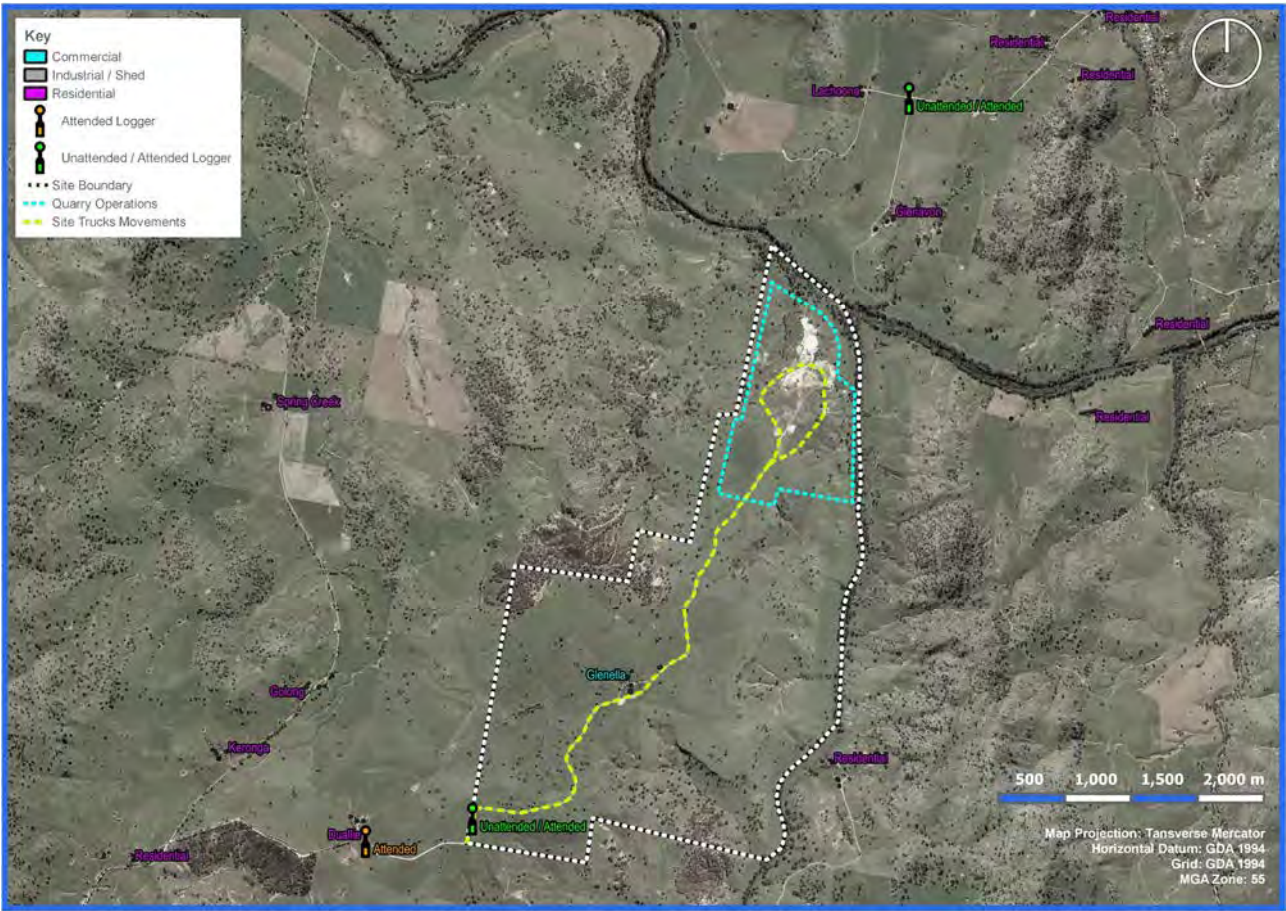
The existing quarry development is well established and is currently operating to the highest environmental standards. The proposal to increase the rate of extraction from the current limit of 200,000 tonnes per annum to 499,000 tonnes per annum will be designed in such a way to manage various relevant environmental issues during the quarrying, processing and transportation of the basalt, quartz pebble, sand, gold and clay products. This will ensure that the proposed development will have minimal adverse impact on the surrounding environment and local community.

The main noise and vibration sources from the above proposed modifications to the approved quarry / mine operation will include:

- Offsite vehicle movements on the nearby road network.
- Onsite vehicle movements - mainly delivery trucks, excavators and loaders.
- Quarry material processing / crushing.
- Quarry material washing (wash plant).
- Screening and sorting of materials.
- Stockpiling of refined products.
- Increased frequency of explosive blasts.

Figure 1 below illustrates the Glenella Quarry site including the proximity of the residential buildings in the surrounding area. Figure 1 also shows key features labelled including the noise monitoring locations used for this assessment.

Figure 1. Site Location, Surrounding Area & Noise Logging Location



Aerial photography courtesy of NSW Imagery

The site is situated in a rural area and is surrounded by a mix of agricultural industries and rural residential dwellings. Rural residential zones with residential dwellings surround the boundaries of the site. The closest residential dwellings are located as summarised in Table 1 below:

Table 1. Summary of Residential Directions and Offset Distances

Identifier (Name)	Direction	Approximate Distance (m) to Nearest Proposed Extraction Activity	Approximate Distance (m) to Proposed Processing Plant / Product Storage	Comments
Residential				
A (Glenella)	South	1,850	2,600	Project-related, no activities visible
B (Badgery)	North West	1,950	4,900	Extraction and processing activities topographically shielded
C (Lachoonna)	North	1,650	2,000	Visually exposed to existing extraction and processing activities
D (Glenavon)	North	1,250	1,250	Topographically and / or shielded from all activities adjacent, southerly hill and / or vegetation
E (Duallie)	South	3,700	4,300	Topographically shielded, no activities visible
F (Golong)	South West	3,150	4,350	Topographically shielded, no activities visible
G (Keronga)	South West	4,050	5,250	Topographically shielded, no activities visible
H (Spring Creek)	West	2,2200	3,950	Topographically shielded, no activities visible
Next nearest residential	East	2,100	2,200	Topographically shielded, no activities visible

No other noise sensitive receivers are located in close proximity to the proposed development.

2.1.1 Potential Operational Noise Impacts

Potential noise impacts from operation of the proposed development which will be assessed in this report include:

- Noise emission from the fixed noise sources associated with the development to any nearby sensitive receivers ie the outdoor crushing / screening plant.
- Noise emission from vehicle movements on site to any nearby sensitive receivers ie delivery truck, excavator and loader movements.
- Additional noise emission from vehicle movements on the adjacent roads to any nearby sensitive receivers.

2.1.2 Potential Operational Vibration Impacts

The offset distances (in all directions) between the vibrationally intensive equipment and any sensitive receivers is large (> 500 m). The potential for vibration impacts due to normal operation of the development are effectively nil. All vibration criteria with respect to cosmetic damage to buildings and human comfort impacts will be satisfied as a result.

No further consideration of operational vibration impacts (from normal plant / equipment) is given in this assessment as a result.

2.1.3 Potential Blasting Overpressure & Ground Vibration Impacts

Potential airblast overpressure and ground vibration impacts from explosive blasts will be assessed in this report. We note that the size and type of the explosive blasts will remain unchanged, only the frequency of the explosive blasts may change due to the proposed development.

2.1.4 Potential Construction Noise and Vibration Impacts

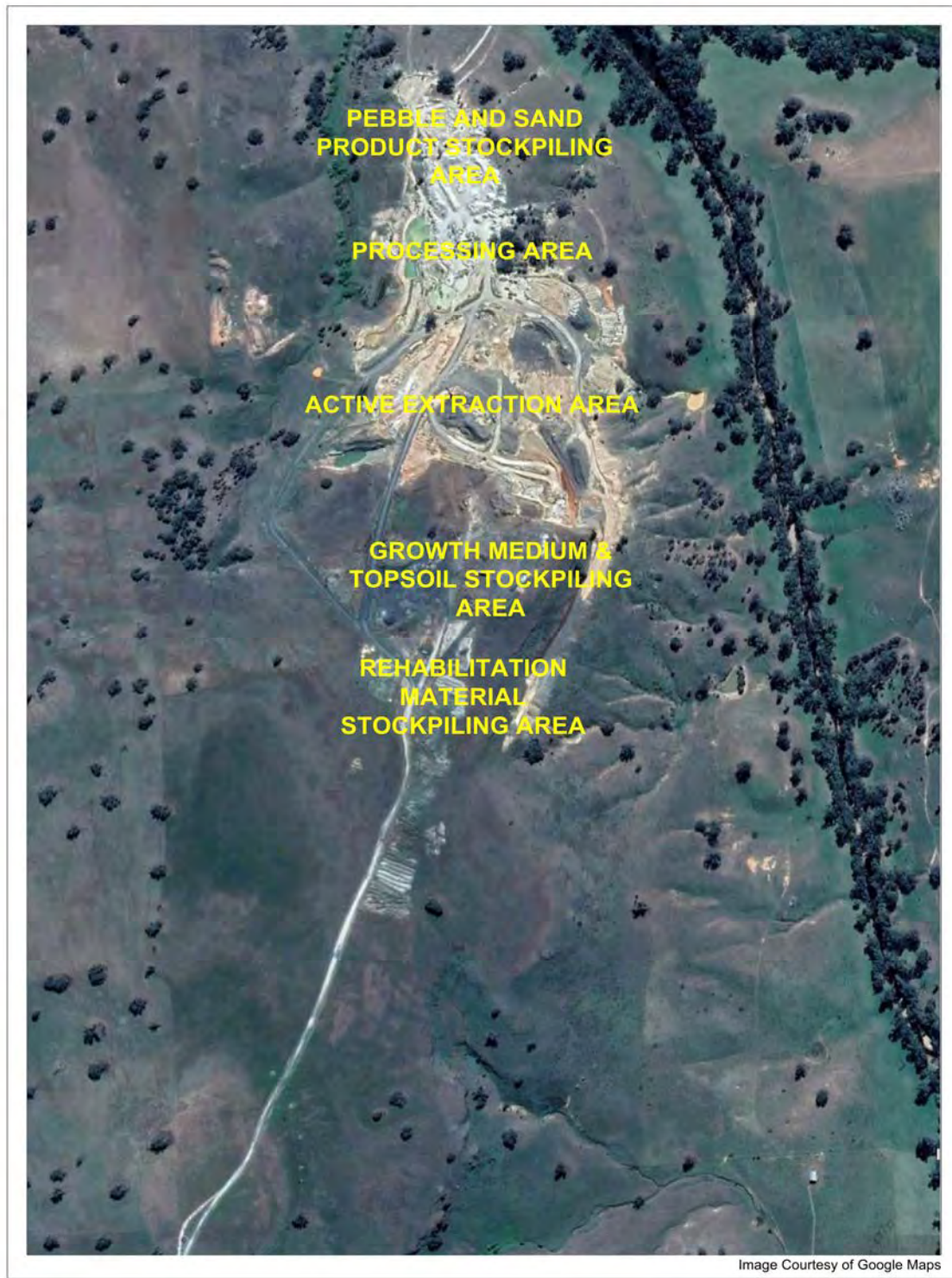
The project will not require any construction, since the proposal only seeks to increase production using the existing operational infrastructure on site. Construction impacts will therefore be nil.

No further consideration of construction noise and vibration impacts are given in this assessment as a result.

2.2 Existing Quarrying Operations

Figure 2 illustrates the existing quarry layout and zoning of the operational activities.

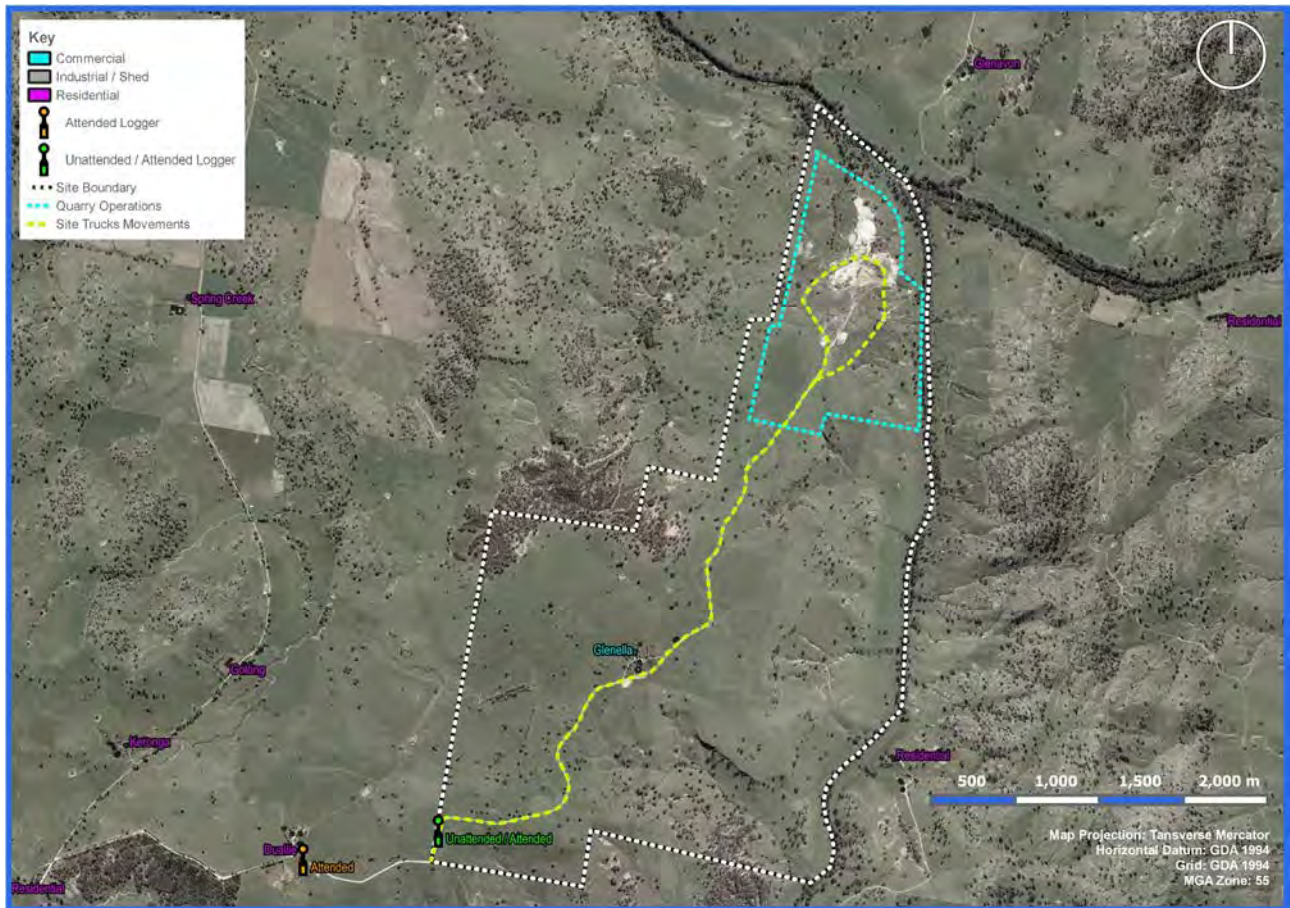
Figure 2. General Layout of the Quarry Operations



Source: Glenella Quarry Pty Ltd

Figure 3 illustrates the physical extents of the existing quarry operations within the site boundary. The operational truck movements are indicated by the dashed green outline which shows a one-way system to reduce overall truck movements and avoid reserving manoeuvres.

Figure 3. Site Aerial and Operational Extents within the Site Boundary.



Source: Glenella Quarry Pty Ltd

2.3 Operational Noise Levels

Table 2 provides the measured overall and octave band sound power levels for the proposed outdoor equipment / activities which have been used in this assessment. The equipment noise levels were measured in the field on 18 October 2021 using a calibrated Svan 977 (Type 1) Sound Level Meter (Serial No 45741) in general accordance with ISO 3744:2010.

Table 2. Field Measured Worst-Case Sound Power Level of the Proposed Outdoor Plant

Description	Equipment	Octave Band Centre Frequency (Hz) Lw (dB re 1 pW)								Overall LwA (dB re 1 pW)
		63	125	250	500	1000	2000	4000	8000	
Loader	Hyundai 770-G	119	116	111	111	108	107	101	90	114
Excavator	Hyundai 480	111	115	106	106	105	101	99	95	110
Crusher / Screen Plant	Sandvik QJ341 Jaw Crusher, QH441 cone crusher, QA440 screener & and QE342 scalping screen	123	127	114	111	110	109	106	100	117
Dump truck	Terex TA400	119	122	108	110	107	107	104	97	114
Wash Plant	-	108	122	110	110	106	102	98	93	112
Generator (enclosed) ¹	Cummins C550D5	94	108	96	96	92	88	84	79	98
B-Double / Semi Trailer – Maximum Engine Load	-	108	109	104	103	101	98	95	92	106
B-Double / Semi Trailer - Reversing Beeper	-					102				102

Notes: 1. Provided by the manufacturer.

2.4 Operational Hours

The existing (approved) operational hours were provided by Glenella Quarry Pty Ltd and are summarised in Table 3. No change to operational hours are proposed for the increased production.

Table 3. Summary of Operational Hours

Operational Activity	Monday to Friday	Saturday	Sunday
Extraction Activities	0700 to 1700 hrs	0700 to 1500 hrs	Not permitted
Blasting	0900 to 1700 hrs	Not permitted	Not permitted
Crushing	0700 to 1800 hrs	0700 to 1500 hrs	Not permitted
Loading	0700 to 2200 hrs	0700 to 1600 hrs	Not permitted

2.5 Operational Traffic Generation

Existing traffic data was obtained from analysis of two (2) weeks of weighbridge data from the site. We note the existing loaded trucks are typically less than the current licence allowance of 35 loaded trucks (or 70 trips). This assessment will use the measured existing vehicle movements (not the current licence allowance) as this provides a more conservative traffic noise assessment.

At full capacity the site will be capable of processing and delivering 499,000 tonnes per annum of assorted quarry and mine materials. The proposed traffic movements for the site were taken from the Traffic Impact Assessment report by Streetwise Road Safety and Traffic Services Pty Ltd (Streetwise). Up to 50 loaded truck movements (100 trips) are proposed for the site.

The existing and future traffic volumes (from the traffic report) for the site are summarised in Table 4 below.

Table 4. Daily Vehicle Trips Summary

Operational Activity	Maximum Heavy Vehicles Trips	Light Vehicle Trips	Total Vehicle Trips
Existing Quarrying Activities (Battery Road)	70	68	138
Proposed Quarrying Activities (Battery Road)	100	76	176

Vehicles accessing and egressing the site will travel to and from the main transport route on Lachlan Valley Way via Morongla / Reids Flat Road and Battery Road. The Streetwise traffic report advises that the existing vehicle traffic will be distributed on the local road network as follows:

- Lachlan Valley Way:
 - a. North of Morongla Rd. AADT 1351 with 33% heavy vehicle mix.
 - b. South of Morongla Rd. AADT 1144 with 51% heavy vehicle mix.
- Morongla Road:
 - a. East of Lachlan Valley Way. AADT 175 with 33% heavy vehicle mix.
 - b. West of Lachlan Valley Way. AADT 122 with 18% heavy vehicle mix.

Figure 4 below illustrates the local road network plan.

Figure 4. Local Road Network Plan



Image courtesy of NSW Imagery

3 Noise Measurements

3.1 Unattended Noise Monitoring

To characterise the existing acoustic environment in the area, a survey of environmental noise levels was conducted from Tuesday 05 October to Monday 18 October 2021. Two (2) noise monitors were installed adjacent to the nearest residential properties at:

- 483 Battery Road, Cowra, NSW (see Figure 1). Adjacent to the residential property Duallie on Battery Road. The noise monitor was installed to represent the worst-case noise at the Duallie property as the logger was positioned 7 m from the centre-line of Battery Road (ie main access road for Glenella Quarry).
- Glenavon, Glenavon Road, Darby Falls, NSW (see Figure 1).

The monitor locations were selected with consideration of other noise sources which may have influenced the measurements, security issues for the equipment and access permission from residents and landowners. Instrumentation for the survey comprised the following:

- Svan 977 (Type 1). Serial No. 45741.
- Svan 977 (Type 1). Serial No. 45730.

Each noise monitor was fitted with an environmental windshield and was programmed to continuously record the ambient noise levels. The sample time interval was set at 15 minutes with a Fast (125 ms) time weighting function. Calibration of the logger was checked prior to and after the measurements. Drift in calibration did not exceed ± 0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The measured noise data has been filtered to remove erroneous data and any data measured during adverse weather conditions following review of historical weather reports from the Bureau of Meteorology (BOM) Cowra (ID 95721) weather station, which is the nearest weather station.

Daily graphs for the noise monitors are attached in Appendix A. The graphs represent each 24-hour period of the LAF1, LAF10 and LAF90 together with the LAeq levels for the corresponding 15-minute periods, as well as relevant weather data.

3.2 Unattended Noise Monitoring Results

To define the applicable environmental criteria at nearby noise sensitive receivers the measured data has been processed in accordance with the time periods stipulated by the EPA NSW Noise Policy for Industry (NPI). Table 5 and Table 6 summarise the background and ambient noise levels recorded during the NSW NPI daytime, evening and night-time assessment periods for each noise monitoring location.

Table 5. Measured Noise Levels Corresponding to NSW NPI Assessment Periods – Dullie, Battery Road, Cowra

Date	LAF90 Background Noise Levels			LAeq Ambient Noise Levels		
	Day	Evening	Night	Day	Evening	Night
Tuesday, 5 October 2021	43	19	17	57	41	37
Wednesday, 6 October 2021	22	25	19	57	41	40
Thursday, 7 October 2021	29	26	18	54	43	38
Friday, 8 October 2021	21	26	18	50	41	45
Saturday, 9 October 2021	26	31	23	56	40	39
Sunday, 10 October 2021	24	32	19	43	39	40
Monday, 11 October 2021	22	26		54	39	
Tuesday, 12 October 2021		24	19		44	40
Wednesday, 13 October 2021	24	27	19	53	43	38
Thursday, 14 October 2021		25	20		37	48
Friday, 15 October 2021			31			44
Saturday, 16 October 2021	36	22	19	50	42	32
Sunday, 17 October 2021	21	27	18	41	42	39
Monday, 18 October 2021	23	0	0	54		
RBL	24	26	19	-	-	-
Log Ave	-	-	-	54	41	42
Total Valid Periods	11	13	13	11	13	13
Total Invalid Periods	3	1	1	3	1	1
Total Periods	14	14	14	14	14	14

Note 1. For Monday to Saturday, Daytime 0700 to 1800 hrs, Evening 1800 to 2200 hrs, Night-time 2200 to 0700 hrs.

For Sundays and Public Holidays, Daytime 0800 to 1800 hrs, Evening 1800 to 2200 hrs, Night-time 2200 to 0800 hrs.

Note 2. The RBL noise level is representative of the *median background sound level* (in the absence of the source under consideration), or simply the background level.

Note 3. The LAeq is essentially the *average sound level*. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound of the same duration.

The environmental noise in the area is typically dominated by heavy vehicle traffic on Battery Road with additional flora and fauna noise. The noise characteristics and trend in the noise data are shown in Appendix A are typical of those found in *Rural* areas.

Table 6. Measured Noise Levels Corresponding to NSW NPI Assessment Periods – Glenavon, Glenavon Road, Darby Falls

Date	LAF90 Background Noise Levels			LAeq Ambient Noise Levels		
	Day	Evening	Night	Day	Evening	Night
Tuesday, 5 October 2021	42	25	19	58	47	31
Wednesday, 6 October 2021	25	27	24	54	47	33
Thursday, 7 October 2021	33	25	21	54	49	34
Friday, 8 October 2021	26	26	22	55	42	41
Saturday, 9 October 2021	27	26	21	55	51	43
Sunday, 10 October 2021	26	27	18	48	40	31
Monday, 11 October 2021	25	27		45	38	
Tuesday, 12 October 2021		24	20		43	30
Wednesday, 13 October 2021	27	25	21	46	50	59
Thursday, 14 October 2021		28	23		49	42
Friday, 15 October 2021			31			47
Saturday, 16 October 2021	32	23	23	57	51	42
Sunday, 17 October 2021	25	26	25	45	44	50
Monday, 18 October 2021	27	0	0	50		
RBL	27	26	21	-	-	-
Log Ave	-	-	-	54	48	49
Total Valid Periods	11	13	13	11	13	13
Total Invalid Periods	3	1	1	3	1	1
Total Periods	14	14	14	14	14	14

Note 1. For Monday to Saturday, Daytime 0700 to 1800 hrs, Evening 1800 to 2200 hrs, Night-time 2200 to 0700 hrs.

For Sundays and Public Holidays, Daytime 0800 to 1800 hrs, Evening 1800 to 2200 hrs, Night-time 2200 to 0800 hrs.

Note 2. The RBL noise level is representative of the *median background sound level* (in the absence of the source under consideration), or simply the background level.

Note 3. The LAeq is essentially the *average sound level*. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound of the same duration.

The environmental noise in the area is typically dominated by flora and fauna noise. The noise characteristics and trend in the noise data are shown in Appendix A are typical of those found in *Rural* areas.

The RBLs from both measurement locations are very low. RBLs below 30 dB LAF90 are not suitable to be used to define environmental criteria. To define the applicable environmental criteria at nearby noise sensitive receivers the minimum background noise levels from the EPA NSW Noise Policy for Industry (NPI) will be used. These represent the minimum RBLs levels that can be used in any NPI assessment, so will generate the most conservative noise criteria possible under this legislation.

3.3 Attended Noise Measurements

Attended measurements of ambient noise were taken at several representative locations on 18 October 2021. These have been used to determine the various noise sources that influence the existing noise environment. During each measurement, the observer noted the various noise sources and the contributing noise level.

At each location, the attended measurements were performed for up to 15 minutes using a calibrated Svan 977 Type 1 Sound Level Meter and Logger (Serial No. 45741) fitted with an environmental windshield. Wind speeds were less than 5 m/s and all measurements were performed at a height of 1.5 metres above ground level.

Calibration of the logger was checked prior to and after the measurements. Drift in calibration did not exceed ± 0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates. The noise environment at each of the attended monitoring location is described Table 7.

Table 7. Attended Noise Monitoring Results

Measurement Location	Measured Noise Levels (dB re 20 μ Pa)			Character of the Ambient Noise
	LAeq,15min	LAFMax	LAF90	
483 Battery Road, Cowra (7 m from road centre-line)	55	78	24	Flora and fauna noise with occasional heavy vehicle from Glenella Quarry. Distant agricultural noise from Duallie.
Glenavon, Glenavon Road, Darby Falls	41	60	26	Flora and fauna noise, distant agricultural noise from the adjacent farms at Lachoona and Glenavon.
Duallie, Battery Road, Cowra (7 m from road centre-line)	57	81	28	1 x B double, 1 x 2 axel dump truck from Glenella, (Duallie) farm truck small dozer + reversing beeper, flora and fauna, dog barking occasionally in the distance.
Bingari, Reids Flat Road, Cowra (7 m from road centre-line)	59	83	34	1 x ATV, 2 x car, 1 x 2 axel truck and flora and fauna noise.
Neila Creek, Morongla Road, Cowra (4 m from road centre- line)	56	85	29	1 x car, 1 x light aircraft, flora and fauna noise.

Overall, the environmental noise in the area is typically dominated by flora and fauna noise with occasional heavy vehicle traffic on the local roads.

4 Operational Noise Assessment Guidelines

4.1 NSW Noise Policy for Industry (NPI)

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the NSW Environment Protection Authority (EPA).

The EPA oversees the NSW Noise Policy for Industry (NPI) 2017 which provides a framework and process for deriving noise trigger levels. The NPI replaced the Industrial Noise Policy (INP) at the end of October 2017.

The NPI sets out the procedure to determine the *project noise trigger levels* relevant to a particular industrial development. The project noise trigger level applies to existing noise-sensitive receivers; however, it may also be used in strategic planning processes for proposed land uses.

If it is predicted that the development is likely to cause the project noise trigger level to be exceeded at existing noise-sensitive receivers, management measures are required to reduce the predicted noise level.

4.2 Project Noise Trigger Level - Introduction

The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so *trigger* a management response; for example, further investigation of mitigation measures.

The project noise trigger level, feasible and reasonable mitigation, and consideration of residual noise impacts are used together to assess noise impact and manage the noise from a proposal or site. It is the combination of these elements that is designed to ensure that acceptable noise outcomes are determined by decision makers.

The trigger level is tailored for each specific circumstance to take into account a range of factors that may affect the level of impact, including:

- Background noise environment.
- Time of day of the activity.
- Character of the noise.
- Type of receiver and nature of the area.

The scientific literature indicates that both the increase in noise level above background levels (that is, 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. The project noise trigger level established in the NPI addresses each of these components of noise impact.

The project noise trigger level is the lower (that is, the more stringent) value of the *project intrusiveness noise level* and the *project amenity noise level*. The project intrusiveness noise level aims to protect against significant changes in noise levels, whilst the project amenity noise level seeks to protect against cumulative noise impacts from industry and maintain amenity for particular land uses.

Applying the most stringent requirement as the project noise trigger level ensures that both intrusive noise is limited and amenity is protected and that no single industry can unacceptably change the noise level of an area. Typically, the intrusiveness level will inform the project noise trigger level in areas with little industry (and/or ambient noise levels), whereas the amenity level will inform the project noise trigger level in areas with higher existing background noise levels. Intrusive noise levels are only applied to residential receivers (residences). For other receiver types only the amenity levels apply.

4.3 Project Intrusiveness Noise Level

The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.

The project intrusiveness noise level is determined as follows:

$$L_{Aeq,15min} = \text{rating background noise level} + 5 \text{ dB}$$

where:

- $L_{Aeq,15min}$ - represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes.
- Rating Background Noise Level (RBL) - represents the background level to be used for assessment purposes, as determined by the methodology in Factsheets A & B of the NPI.

Intrusiveness noise levels are not used directly as regulatory limits. They are used in combination with the amenity noise level to assess the potential impact of noise, assess reasonable and feasible mitigation options and subsequently determine achievable noise requirements.

4.3.1 Minimum Project Intrusiveness Noise Levels

The NPI applies minimum RBLs to any project. These result in minimum intrusiveness noise levels as follows:

Table 8. Minimum RBLs and Project Intrusiveness Noise Levels

Time of Day	Minimum RBL (dB)	Minimum Project Intrusiveness Noise Level $L_{Aeq,15min}$ (dB)
Day	35	40
Evening	30	35
Night	30	35

The minimum levels are provided to recognise that rural locations which have low RBLs (< 30 dB) during all periods should not have the same intrusiveness criteria for all periods. Noise impacts are typically lower during the day time period when compared to the night-time period and the minimum intrusiveness levels reflect this difference.

4.4 Project Amenity Noise Level

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 9 where feasible and reasonable.

The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance. The *recommended amenity noise levels* represent the objective for total industrial noise at a receiver location, whereas the *project amenity noise level* represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

$$\text{Project amenity noise level} = \text{recommended amenity noise level (from Table 9)} \text{ minus } 5 \text{ dB}$$

Table 9. Recommended Amenity Noise Level as per Table 2.2 of the NPI

Receiver Type	Noise Amenity Area	Time of Day	Recommended Amenity Noise Level L _{Aeq,period} (dB)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35
Hospital ward	All	Noisiest 1-hour	35
internal	All	Noisiest 1-hour	50
external	All	Noisiest 1-hour	50
Place of worship – internal	All	When in use	40
Area specifically reserved for passive recreation (eg national park)	All	When in use	50
Active recreation area (eg school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5 dB to recommended noise amenity area

4.5 Recommended Amenity Noise Level – Residential Receiver Classification

Residential receivers must have the area type defined in order to select the applicable recommended amenity noise level. Table 10 below illustrates how the NPI classifies the rural, suburban and urban noise amenity area categories.

Table 10. Residential Receiver Category as per Table 2.3 of the NPI

Receiver Category	Typical Planning Zone	Typical Background Noise Levels (RBL)			Description
		Day	Eve	Night	
Rural residential	RU1, RU2, RU4, R5, E4	<40	<35	<30	Rural – 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. Note: Where background noise levels are higher than those presented in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.
Suburban residential	RU5, RU6, R2, R3, E2, E3	<45	<40	<35	Suburban – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban residential	R1, R4, B1, B3, B4	>45	>40	>35	Urban – an area with an acoustical environment that: - is dominated by ‘urban hum’ or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources - has through-traffic with characteristically heavy and - continuous traffic flows during peak periods - is near commercial districts or industrial districts - has any combination of the above

For this development the *rural* classification will apply to the residential receivers when defining the recommended amenity noise level.

4.6 Recommended Amenity Noise Level – Existing Background Noise Corrections

The recommended amenity noise level applicable to residential receivers can be changed in the following circumstances:

- When existing traffic noise levels are dominant, are 10 dB above the recommended noise amenity level and are unlikely to decrease, then the project amenity noise levels become the $L_{Aeq,period(traffic)} - 15$ dB.
- At industrial / residential interfaces where a project seeks to make minor changes to an existing development. In this case, the recommended amenity noise levels can be increased by 5 dB in the region that is in close proximity to existing industrial premises and that extends out to a point where the existing industrial noise from the source has fallen by 5 dB or an area defined in a planning instrument.
- As per the information given in Table 10 for residential receivers in the rural category.

For this development, none of the circumstances described above are present so background noise level corrections will not be applied.

4.7 Recommended Amenity Noise Level - Time Period Correction

The L_{Aeq} is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, the NPI assumes the following conversion:

$$L_{Aeq,15min} = L_{Aeq,period} + 3 \text{ dB}$$

(unless robust evidence is provided for an alternative approach for the particular project being considered)

4.8 Maximum Noise Level Assessment - Sleep Disturbance

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development / premises night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB or the prevailing RBL plus 5 dB, whichever is the greater.
- and/or
- L_{AFmax} 52 dB or the prevailing RBL plus 15 dB, whichever is the greater.

a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the extent of impacts on sleep include:

- How often high noise events will occur.
- The distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development.
- Whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods).
- Current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

Maximum noise level event assessments should be based on the L_{AFmax} descriptor on an event basis under *fast* time response. The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels.

4.9 NPI Project Noise Trigger Levels (PNTL)

Since the background noise levels as per Section 3.2 show RBLs below 30 dB LAF90 the minimum background noise levels as per the NSW NPI will be used – see Table 8 above. Based on these minimum RBLs the intrusive and amenity noise levels for nearby noise-sensitive receivers are presented in Table 11. These criteria are nominated for the purpose of assessing potential noise impacts from the onsite sources of noise associated with the proposed development.

For each assessment period, the lower (ie the more stringent) of the amenity or intrusive trigger levels are adopted (if applicable), as marked in **bold**, as the project noise trigger levels (PNTL).

Table 11. NPI Project Noise Trigger Levels

Receiver	Time of Day	RANL ¹ LAeq,period	RBL ² LAF90,15min	Project Noise Trigger Levels		
				Intrusive LAeq,15min	Amenity LAeq,15min	Sleep Disturbance LAeq,15min
Rural Residential	Day	50	35	40	48	-
	Evening	45	30	35	43	-
	Night	40	30	35	38	40

Note 1. RANL = Recommended Amenity Noise Level for residences in Rural areas.

Note 2. RBL = Rating Background Level taken from the minimum allowable RBL levels in the NPI as discussed shown in Table 8.

However, we note that the site only operates during the daytime and evening periods. Therefore, the night-time and sleep disturbance noise impacts will be nil and considered no further in this assessment.

4.10 NPI Criteria Supersedes Consent Criteria (INP)

The existing development consent from 2007 permits daytime, evening and night-time noise limits of 35 dB LAeq,15min at the nearest residential receivers of Glenavon and Lachoona. The same noise limits are repeated in NSW EPA Environmental Protection Licence (No. 20632) for the site granted in January 2020.

These noise limits are based on the Environmental Impact Assessment (EIS) from the original development application. In 2007 the applicable noise legislation was the NSW Industrial Noise Policy (INP).

This EIS was prepared by R.W Corkery & Co Pty Ltd and the noise limits use the Intrusiveness criteria which have been derived from the Rating Background Levels (RBLs) which for this rural local would be equivalent for the day, evening and nighttime periods. The INP recognised that in some rural situations the noise impacts would not be the same for daytime and night-time periods even though they may have the same criteria (because they have equivalent RBLs). Below highlights an excerpt from page 15 of the INP which illustrates this point:

In some rural situations, the rating background level may be the same for the day and night. In these cases, it is recognised that excursions of noise above the intrusiveness criterion during the day would not usually have the same impact as they would at night. This is due to the more sensitive nature of activities likely to be disturbed at night (for example, sleep and relaxation).

The current NSW Noise Policy for Industry (2017) (NPI) recognises this point further for rural locations and sets a minimum RBL and therefore minimum Intrusiveness criteria. The minimum levels are provided to recognise that rural locations which have low RBLs (< 30 dB) during all periods should not have the same intrusiveness criteria for all periods.

For this development the NPI supersedes the INP and allows a daytime noise limit of 40 dB LAeq,15min which recognises lower noise impacts during the daytime period. This assessment recommends changes to the consent levels to support the proposed s.4.55(2) modification as per Table 11 above.

4.11 NSW Road Noise Policy (RNP)

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the NSW Environment Protection Authority (EPA). The EPA oversees the Road Noise Policy (RNP, January 2011) which provides a framework and process for deriving traffic noise criteria.

Some industries such as mines and extractive industries are, by necessity, in locations that are often not served by arterial roads. Heavy vehicles must be able to access these often more remote sites and this may mean travelling on local public roads. Good planning practice acknowledges this type of road use and develops ways of managing any associated adverse noise impacts.

The local roads used as part of this development can be considered as a 'principal haulage route'. Therefore, as per the guidance in the NSW RNP the noise criteria for the route should match those for arterial / sub-arterial roads, recognising that they carry a different level and mix of traffic to local roads.

The RNP criteria applicable to this development are given in Table 12 below. All roads affected by the development (ie the 'principal haulage route') will be assessed using RNP criteria for arterial / sub-arterial roads.

Table 12. RNP Road Traffic Noise Criteria for Residential Land Uses.

Road Category	Type of Project / Land Use	External Assessment Criteria (dB re 20 µPa)	
		LAeq,15hr (Day)	LAeq,9hr (Night)
Freeway / arterial / sub-arterial roads	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	55 LAeq,15hr (Day)	50 LAeq,9hr (Night)

Where the existing noise levels due to traffic already exceed the assessment criteria given in Table 12 then the RNP requires that the total traffic noise level increase should be limited to 2 dB for situations where additional traffic is generated on existing roads by changes to land use developments.

4.12 Blasting Noise & Vibration Criteria

For blasting, the current Environmental Protection Licence (EPL) No. 20632 (licence condition L4) applicable to the quarry, requires the following:

Air-blast

- Air-blast overpressure level from blasting operations at the quarry must not exceed 120dB (Lin Peak) at any time when measured at any noise sensitive locations.
- Air-blast overpressure level from blasting operations at the quarry must not exceed 115dB (Lin Peak) at any noise sensitive locations for more than 5% of the total number of blasts over each reporting period.

Ground vibration:

- Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10 mm/sec at any noise sensitive locations.
- Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5 mm/sec at any noise sensitive locations for more than 5% of the total number of blasts over each reporting period.

Air-blast overpressure and ground vibration levels must be measured at the Glenavon residence and Lachoona residence for all blasts carried out in or on Glenella Quarry. Condition L4.6 of EPL No. 20632 limits blasting operations at Glenella Quarry to between 9:00am and 5:00pm Monday to Friday, unless otherwise approved prior by the EPA. Condition L4.7 of EPL No. 20632 limits blasting at the quarry to one blast per day. The above requirements will be used in this assessment.

5 Operational Noise Modelling

5.1 Model Inputs & Parameters

Noise modelling of the site was undertaken using SoundPLAN modelling software. The noise models were constructed from a combination of aerial photography, existing ground topography and design masterplans (following recent survey) for the development. The local terrain, design of the development, receiver buildings and structures have been digitised in the noise model to develop a three-dimensional representation of the operations of the development and surrounding environment. The parameters in Table 13 were defined in the noise model to calculate noise levels at sensitive receivers.

Table 13. Noise Model Parameters

Variable	Parameter
Calculation Standard	CONCAWE
Topography	Glenella Quarry Site – 1 m resolution Surrounding Area – 5 m resolution
Ground Absorption	0.75 (rural environment)
Receiver Height	1.5 m (mainly first storey receivers)

5.2 Noise Enhancing Meteorological Conditions

Noise model predictions were performed using noise enhancing meteorological conditions given in the NSW Noise Policy for Industry (NPI).

The noise enhancing meteorological conditions used in this assessment are given in Table 14 below. For all conditions the worst-case wind direction (source to receiver) for each receiver was assessed.

Table 14. Noise Enhancing Meteorological Conditions Used in the Noise Assessment

Period	Meteorological Parameters
Day / Evening	Stability categories A-D with light winds up to 3 m/s at 10 m AGL
Night	Stability category F with winds up to 2 m/s at 10 m AGL

Note 1. AGL = Above Ground Level.

Note 2. Stability categories are based on the Pasquill–Gifford stability classification scheme.

Note 3. Worst-case stability category D taken for Day / Evening periods.

This provides a conservative prediction of the potential noise impacts from the development at the surrounding sensitive receivers.

5.3 Operational Scenarios

With reference to Section 2, Table 3 the proposed operational scenarios can be summarised as per Table 15 below.

Table 15. Proposed Operational Scenarios

Time of Day	Description of Operational Noise Sources in Worst-Case 15-minute Period
Day (0700 to 1800 hrs)	External Processing – All crushers, screens, conveyors and washplant in constant operation at 100% load.
	Materials Handling / Stockpiling – 50% of the time handling materials, 50% of the time manoeuvring. All operations at 100% load.
	Deliveries / Truck Movements – Up to three (3) B-Doubles / Semi articulated trucks moving throughout the site. 50% of the time at full load, with reversing beepers operating for 50% of the time.
Evening (1800 to 2200 hrs)	Materials Handling / Stockpiling – 50% of the time handling materials, 50% of the time manoeuvring. All operations at 100% load.
	Deliveries / Truck Movements – Up to three (3) B-Doubles / Semi articulated trucks moving throughout the site. 50% of the time at full load, with reversing beepers operating for 50% of the time.
Night-time (2200 to 0700 hrs)	No operations – no assessment required.

5.4 Fixed Operational Noise Source Levels

The simulated worst-case fixed operational noise sources include:

- All fixed sources of noise were modelled operating simultaneously at full load for 100% of the time.
- All fixed sources were located as per the site plans shown in Figure 2 and Figure 3.
- Screening from stockpiles was included in the noise model.

5.5 Mobile Operational Noise Source Levels

Mobile operational noise sources include:

- Delivery vehicles were modelled entering the site from Battery Road and then moving around the site as per the site roads shown in Figure 3. For a worst-case noise assessment, the loudest vehicle has been assessed which is the B-Double truck with a typical Sound Power Level of 106 dB LWA. Delivery trucks were assumed to operate at full load (ie max engine revs) for 50% of the time while manoeuvring around the site.
- Permanent onsite vehicles can move anywhere around the site and have noise levels as given in Table 2. The vehicles were assumed to operate at full load (ie max engine revs) with 50% of the time handling materials and 50% of the time manoeuvring. The permanent onsite vehicles include:
 - a. Loader - Hyundai 770-G.
 - b. Excavator – Hyundai 480.
 - c. Dump truck - Terex TA400.

5.6 Corrections for Annoying Noise Characteristics

Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. On the other hand, some sources may cause less annoyance where only a single event occurs for a limited duration.

The NPI identifies correction factors for annoying noise characteristics which must be applied to the predicted noise levels before assessing against the PNTLS. In addition, noise sources with impulsive noise events should have noise corrections added as per the guidelines in AS 1055:2018.

The proposed operational noise sources have been assessed against the NPI and AS1055:2018 guidelines and the following correction factors included to account for potential annoying characteristics:

- +5 dB impulsiveness penalty added to all crusher/screens, loaders and excavators (AS1055:2018 estimated +5 dB penalty).
- +5 dB tonality penalty added to reversing alarms (NPI Fact sheet C).

6 Predicted Operational Noise Impacts

6.1 Predicted Operational Noise Impacts

Noise modelling of the fixed and mobile noise sources has been used to predict the noise emissions from the typical operation of the facility to the surrounding sensitive receivers.

A selection of the predicted worst-case operational noise levels due to onsite noise sources (with no mitigation measures) are summarised and compared against the NPI project noise trigger levels in Table 16 below.

In addition, a noise contour map for the daytime period is provided in Appendix B. The noise contours presented are taken at 1.5 m elevation to simulate first storey receivers (ie typical residential receivers in the area). The noise contours show how the noise emission from the proposed development propagates into the surrounding environment.

Table 16. Predicted Operational Noise Levels Compared to PNTLs

Location	Worst-Case LAeq,15m			PNTLs Exceedance LAeq,15m			LAeq,15m Sleep Disturbance
	Day	Eve	Night	Day	Eve	Night	
Residential				40	35	35	45
A (Glenella)	30	28	-	0	0	-	-
B (Badgery)	<20	<20	-	0	0	-	-
C (Lachoonna)	34	31	-	0	0	-	-
D (Glenavon)	39	35	-	0	0	-	-
E (Duallie)	21	<20	-	0	0	-	-
F (Golong)	22	20	-	0	0	-	-
G (Keronga)	<20	<20	-	0	0	-	-
H (Spring Creek)	<20	<20	-	0	0	-	-
Next nearest residential	32	27	-	0	0	-	-

The results from Table 16 and Appendix A demonstrate that the noise emissions from the site to the surrounding environment are low. The proposed development satisfies the PNTLs at all nearby residential receivers during all time periods.

6.2 Predicted Operational Noise Impacts – RNP

To calculate the traffic noise impacts generated by the operation of the development the existing road traffic volumes for Battery Road, Morongla / Reids Flat Road and Lachlan Valley Way are required. The traffic data used in this assessment was supplied via the traffic assessment report by Streetwise Road Safety and Traffic Services Pty Ltd (Streetwise).

Table 17 summarises the predicted existing and future traffic noise levels at the nearest affected residences. The predicted traffic noise levels are then compared against the RNP $L_{Aeq,15hr}$ criteria (daytime only due to the operational hours of the site) and the RNP +2 dB increase criteria as discussed in Section 4.11.

Table 17. Summary of Existing & Future Traffic Noise Levels on Surrounding Roads Compared to the RNP Criteria

Road	Nearest Residential Receiver (m)	Existing Traffic			Future Traffic			RNP $L_{Aeq,15hr}$ Exceedance	RNP +2dB Increase	Comment
		Vol	HV%	L_{Aeq}	Vol	HV%	L_{Aeq}			
Battery Road	35	138	51	47.8	176	57	49.2	0	-	RNP $L_{Aeq,15hr}$ criteria is not exceeded. RNP +2dB increase criteria is not applicable. Overall RNP satisfied.
Morongla / Reids Flat Road	18	175	33	48.7	217	40	50.3	0	-	RNP $L_{Aeq,15hr}$ criteria is not exceeded. RNP +2dB increase criteria is not applicable. Overall RNP satisfied.
Lachlan Valley Way	13.5	1351	33	61.1	1393	34	61.4	+6	+0.3	RNP $L_{Aeq,15hr}$ criteria exceeded by +6 dB. RNP +2dB increase criteria applies instead. +2dB increase is not exceeded. Overall RNP satisfied.

Both Battery Road and Morongla / Reids Flat Road demonstrate future noise emissions which satisfy the RNP criteria for arterial / sub arterial roads as per Section 4.10. No further measures are required as a result.

Lachlan Valley Way shows existing traffic noise levels which are above the RNP $L_{Aeq,15hr}$ criteria. Therefore, the traffic noise increase on Lachlan Valley Way should not exceed +2dB due to the additional traffic generated by the proposed site. Table 17 shows that the proposed development generates negligible additional traffic noise on Lachlan Valley Way. The RNP +2dB increase criteria are satisfied as a result.

Overall the RNP criteria are satisfied on all roads potentially affected by the development. No further measures are required as a result.

7 Blasting Noise and Vibration Impacts

7.1 Blasting Assessment Methodology

An estimation of the air-blast overpressure and ground-borne vibration levels can be calculated in general accordance with Appendix J7 of AS 2187.2-2006 Explosives - Storage and use. Part 2: Use of explosives.

7.1.1 Air-Blast Overpressure

Calculation of overpressure were performed using AS 2187.2-2006 Equation J7.2 which uses a cube root scaling formula as presented below.

$$P = K_a \left(\frac{R}{Q^{1/3}} \right)^a$$

Where:

P	=	pressure, in kilopascals
Q	=	explosives charge mass, in kilograms
R	=	distance from charge, in metres
K _a	=	site constant
a	=	site exponent

Air-blast is proportional to the cube root of the charge mass. This limits the effectiveness of charge mass reduction as a method of reducing air-blast levels; other factors are often more important, especially for confined blasthole charges.

7.1.2 Ground-borne Vibration

Calculation of ground-borne vibration were performed using AS 2187.2-2006 Equation J7.3 as presented below.

$$V = K_g \left(\frac{R}{Q^{1/2}} \right)^{-B}$$

Where:

V	=	ground vibration as vector peak particle velocity, in millimetres per second
Q	=	maximum instantaneous charge (effective charge mass per delay), in kilograms
R	=	distance between charge and point of measurement, in metres
K _g	=	site constant
B	=	site exponent

Ground vibration levels depend on the maximum instantaneous charge (effective charge weight per delay), and not the total charge weight, provided the effective delay interval is appropriate.

7.2 Blasting Impacts – Nearest Sensitive Receiver

The blasting records for the site over several years have been reviewed as part of this assessment. Each blast was measured at the closest residential receiver 'Glenavon' which is approximately 1,400 m due North of the free quarry face. All blasts were carried out on the quarry free face in accordance with the requirements of AS 2187.2-2006 Explosives - Storage and use. Part 2: Use of explosives.

Table 18 below summarises the historical blasting noise and vibration results.

Table 18. Historical Blast Event Measurements.

Date	Maximum Instantaneous Charge, MIC (Kg)	Measured Air-blast Overpressure (dB Lin Peak)	Measured Ground Vibration PPV (mm/s)	Exceedance Air-blast Overpressure Criteria	Exceedance Ground Vibration Criteria	Comment
12/03/2023	174	<105	<0.50	-	-	Blast event below the blast monitor trigger levels
11/07/2023	<290	112.9	0.43	-	-	
15/08/2023	<290	<105	<0.50	-	-	Blast event below the blast monitor trigger levels
09/10/2023	<290	<105	<0.50	-	-	Blast event below the blast monitor trigger levels
28/11/2023	<290	109.9	0.82	-	-	
09/05/2024	155	<105	<0.50	-	-	Blast event below the blast monitor trigger levels
09/07/2024	197	<105	<0.50	-	-	Blast event below the blast monitor trigger levels
11/09/2024	151	<105	<0.50	-	-	Blast event below the blast monitor trigger levels
11/02/2025	176	106.1	0.08	-	-	
07/04/2025	148	111.2	0.10	-	-	
09/05/2025	155	<105	<0.50	-	-	Blast event below the blast monitor trigger levels
20/05/2025	289	106.6	0.1	-	-	
31/07/2025	67	<105	<0.50	-	-	

Note: 1. Calculated in general accordance with Appendix J7 of AS 2187.2-2006 Explosives - Storage and use. Part 2: Use of explosives.

The results show good that no exceedances of the blast noise and vibration criteria have been recorded at the site during this period. The blast MICs varied in range from 67 kg to 289 kg. Typically the blast MIC is below 200 kg.

An air-blast overpressure and ground-borne vibration computer model were created and calibrated against the historical results. Based on the historical records and our calibrated computer models a Maximum Instantaneous Charge (MIC) of ~290 kg would not exceed the blasting criteria of 115 dB Linear Peak and 5 mm/s PPV. Therefore, an MIC 290 kg should be the upper limit for individual charge sizes at the site.

Every blasting event should be monitored at the nearest receiver 'Glenavon'. If blasts with an MIC of 290 kg are found to exceed the established air-blast overpressure and ground vibration limits, then the MIC of future charges should be reduced in 20 kg steps until the limits are satisfied.

7.3 Blast Monitoring Requirements

We note that the previous consent requires monitoring at receivers 'Glenavon' (closest) and 'Lachoonna'. Dual monitoring is not considered necessary in future consent conditions.

'Glenavon' and 'Lachoonna' are both located due North of the quarry free face at the site. The 'Glenavon' residence is located 400 m closer to the site than the 'Lachoonna' residence as per Table 1 of this report. Blasting noise and vibration compliance at 'Glenavon' ensures compliance at 'Lachoonna' because it is 400 m further away from blast events. Any blast noise and vibration measured at 'Lachoonna' will always be lower when compared to the 'Glenavon' residence.

Therefore, blast compliance monitoring at 'Lachoonna' is redundant and not considered necessary. We recommend that a single blast monitoring station is located at the 'Glenavon' residence to determine compliance.

7.4 Blasting Impacts – Infrastructure

Structural damage vibration targets are defined by DIN 4150-3:2016-12 Vibration in Buildings – Part 3: Effects on Structures.

The DIN standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. Sources of vibration that are considered in the standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (eg compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended target values for short-term vibration to ensure minimal risk of structural damage to residential and industrial buildings are presented numerically in Table 19 and Figure 5 below.

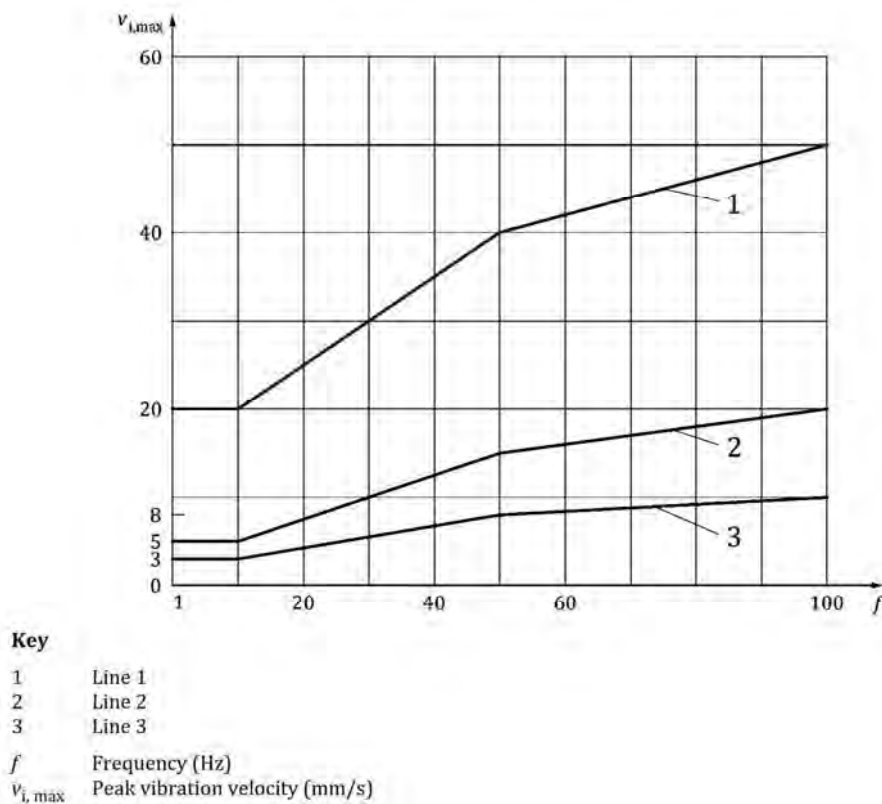
Table 19. Short-term Vibration Targets - Minimal Risk of Structural Damage

Line No.	Type of Structure	Guideline Values for $v_{i,max}$ in mm/s				
		Foundation All Directions $i = x, y, z$			Topmost Floor Horizontal Direction $i = x, y$	Floor Slabs Vertical Direction $i = z$
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All Frequencies	All Frequencies
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (eg listed buildings)	3	3 to 8	8 to 10	8	20 ³

Notes:

1. Even if guidelines values are complied with, minor damage cannot be excluded.
2. At frequencies above 100 Hz, the guideline values for 100 Hz can be applied as minimum values.
3. In the case of sensitive structures (3) it may be necessary to lower the relevant guideline values markedly to prevent minor damage.

Figure 5. Graph of Short-term Vibration Target Values for Structural Damage



The nearest residences are all considered to be Type 2 (Line No. 2) structures and typically develop structural damage at vibration levels above 5 mm/s.

Table 18 shows blasting vibration levels of less than 1 mm/s for the historical blasts. Therefore, worst-case blast events have vibration levels 5 x lower than structural damage levels even at the closest residential receiver 'Glenavon'. The risk of structural damage from blasting is therefore nil. No further remedial measures are required as a result.

7.5 Blasting Impacts – Animals and Livestock

Naturally occurring overpressure events from thunder and lightning storms can easily exceed 120 dB Linear Peak. Table 18 shows historical blasting overpressure events of less than 113 dB Linear Peak at the nearest residences. Therefore, naturally occurring overpressure events are considerably higher than the blasting events from the development. The effects on livestock are predicted to be negligible and no further remedial measures are required as a result.

8 Conclusion

Waves Consulting has conducted a noise and vibration impact assessment of the proposed increase in the rate of extraction and truck volumes at Glenella Quarry located at 483 Battery Road, Cowra, NSW. This assessment has investigated the worst-case noise emissions associated with the operation of the proposed development, as modified.

Importantly, no changes are proposed to the currently approved quarry operation in terms of the operational extraction area, quarrying methods, method of processing quarry materials or operating hours.

This assessment has demonstrated that the predicted operational noise emissions from the site to the surrounding environment are low. The proposed development satisfies the Project Noise Trigger Levels (PNTLs) of the NSW Noise Policy for Industry (NPI) during all applicable time periods.

The operational traffic noise levels on the nearby affected roads have been assessed. Table 17 of this assessment shows that the proposed development, as modified, generates acceptable operational traffic noise. The NSW Road Noise Policy (RNP) criteria are satisfied as a result.

The offset distances (in all directions) between the vibrationally intensive equipment and any sensitive receivers is large (> 500 m). The potential for vibration impacts due to the normal operation of the development are effectively nil. All vibration criteria with respect to cosmetic damage to buildings and human comfort impacts will be satisfied as a result.

Blasting overpressure and ground vibration assessment shows compliance of the blasting criteria with an MIC $\leq$ 290 kg as per Table 18 of this report. Structural and cosmetic damage vibration limits will also be satisfied with an MIC $\leq$ 290 kg at all the nearest residential receivers.

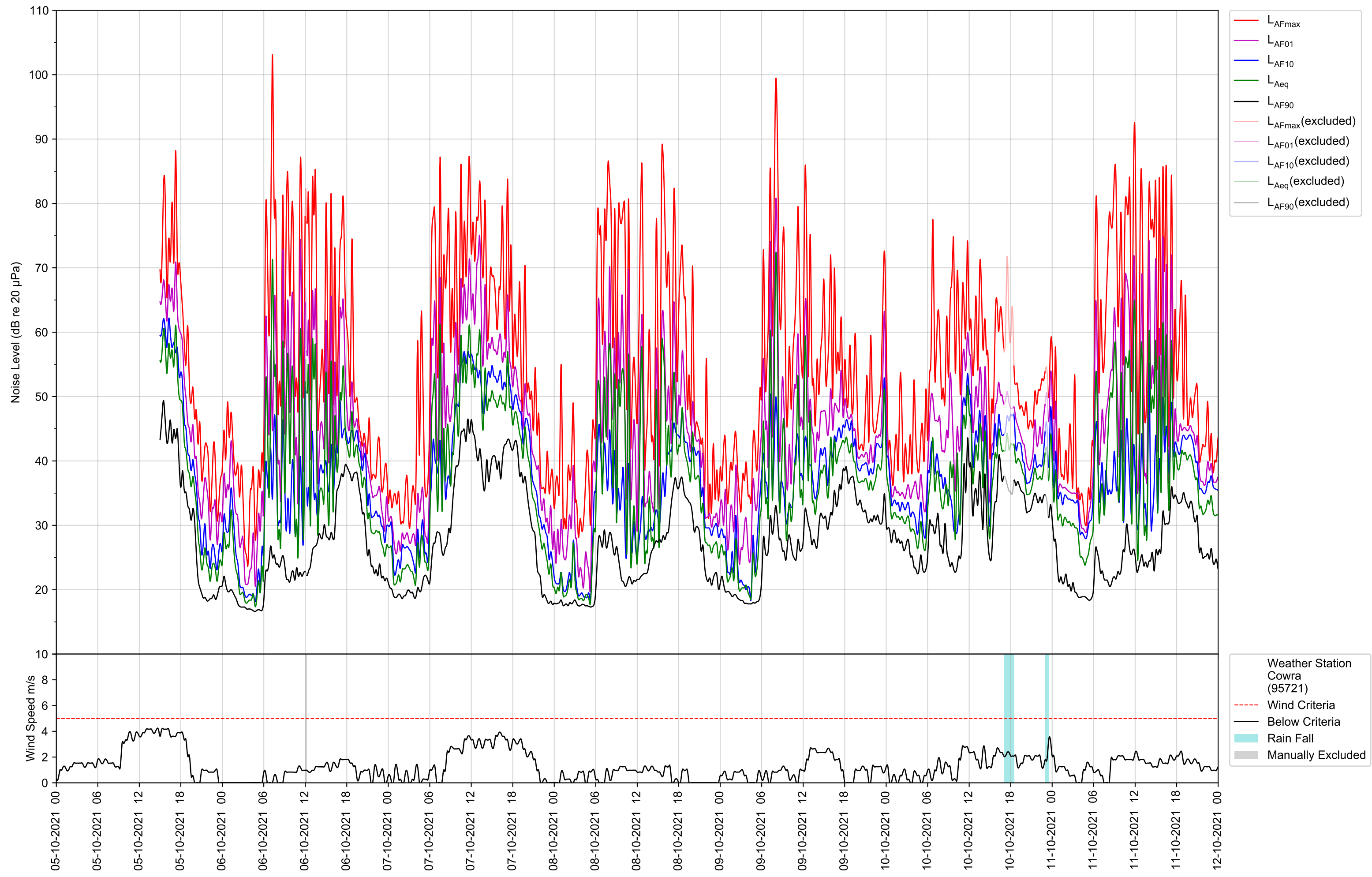
It is concluded that the proposed development, as modified, is compliant with respect to noise and vibration impacts and is therefore suitable for operation.



APPENDIX A: GRAPHICAL NOISE LOGGER DATA

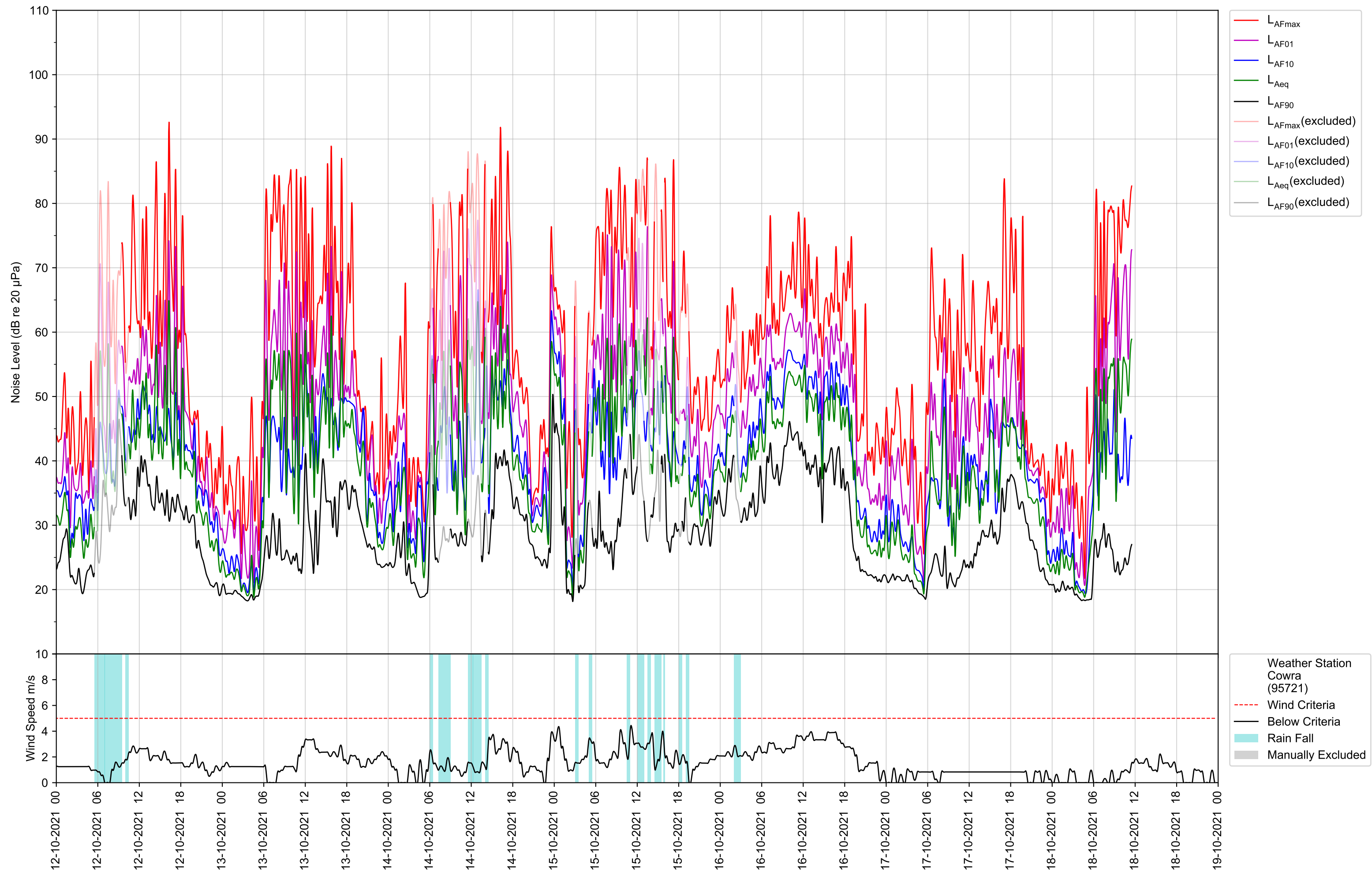
Graphical Noise Logger Data
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Project: Glenella Quarry
Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45741
Pre Calibration: 0.50 dB
Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW



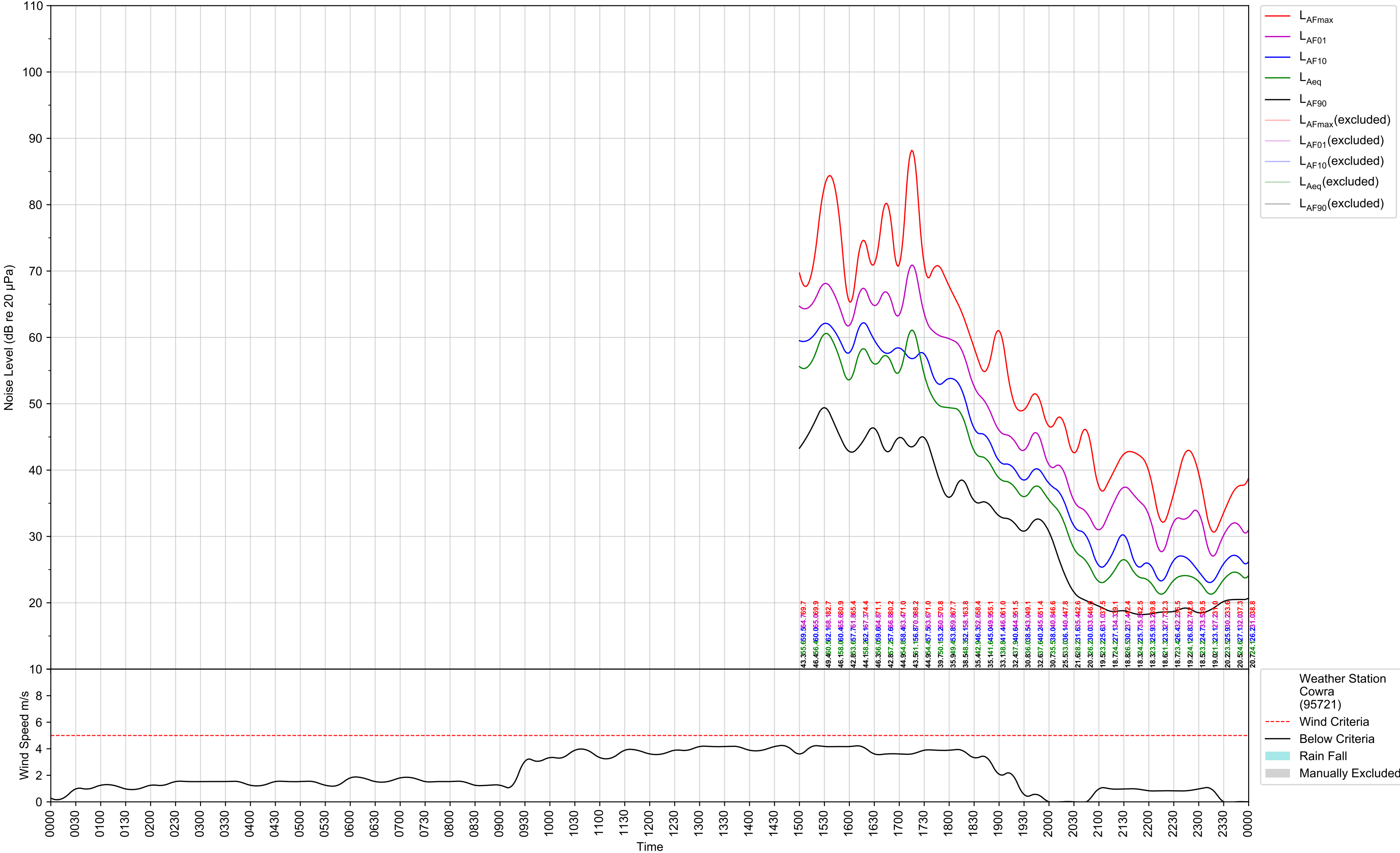
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Equipment: Svan 977
Serial Number: 45741
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW



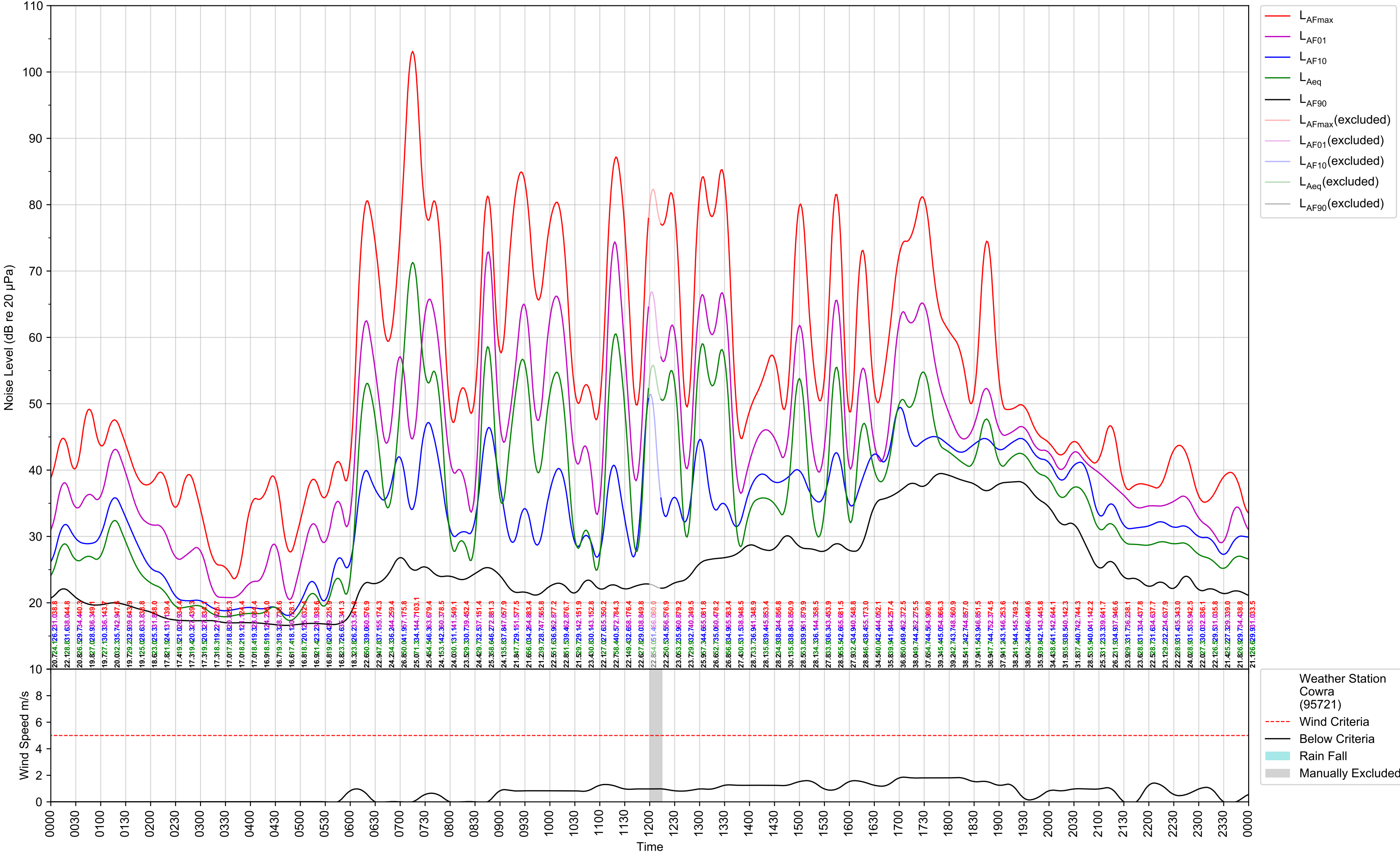
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Equipment: Svan 977
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW



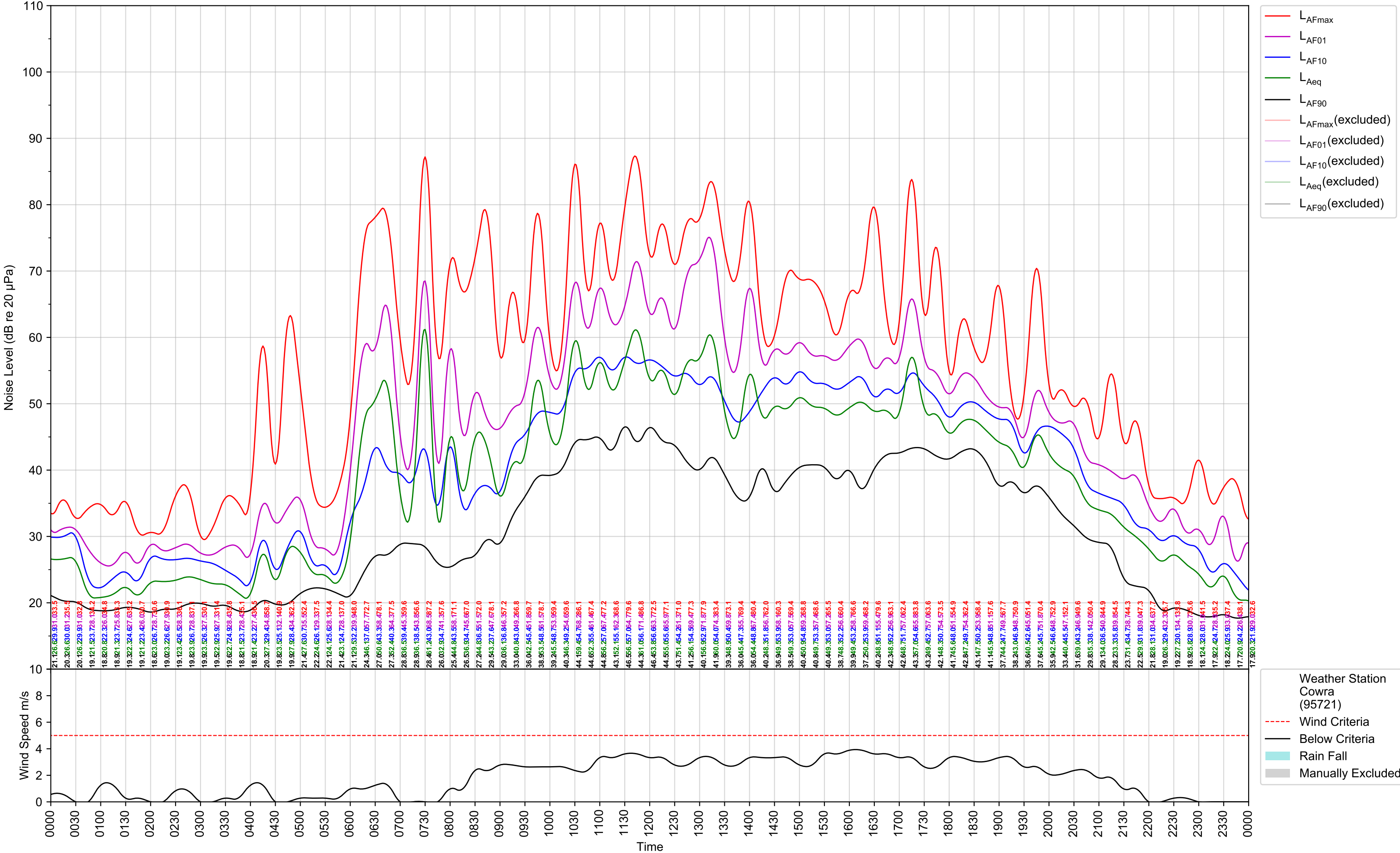
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45741
Pre Calibration: 0.50 dB
Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW

Graphical Noise Logger Data
Date: Wednesday 06 October 2021



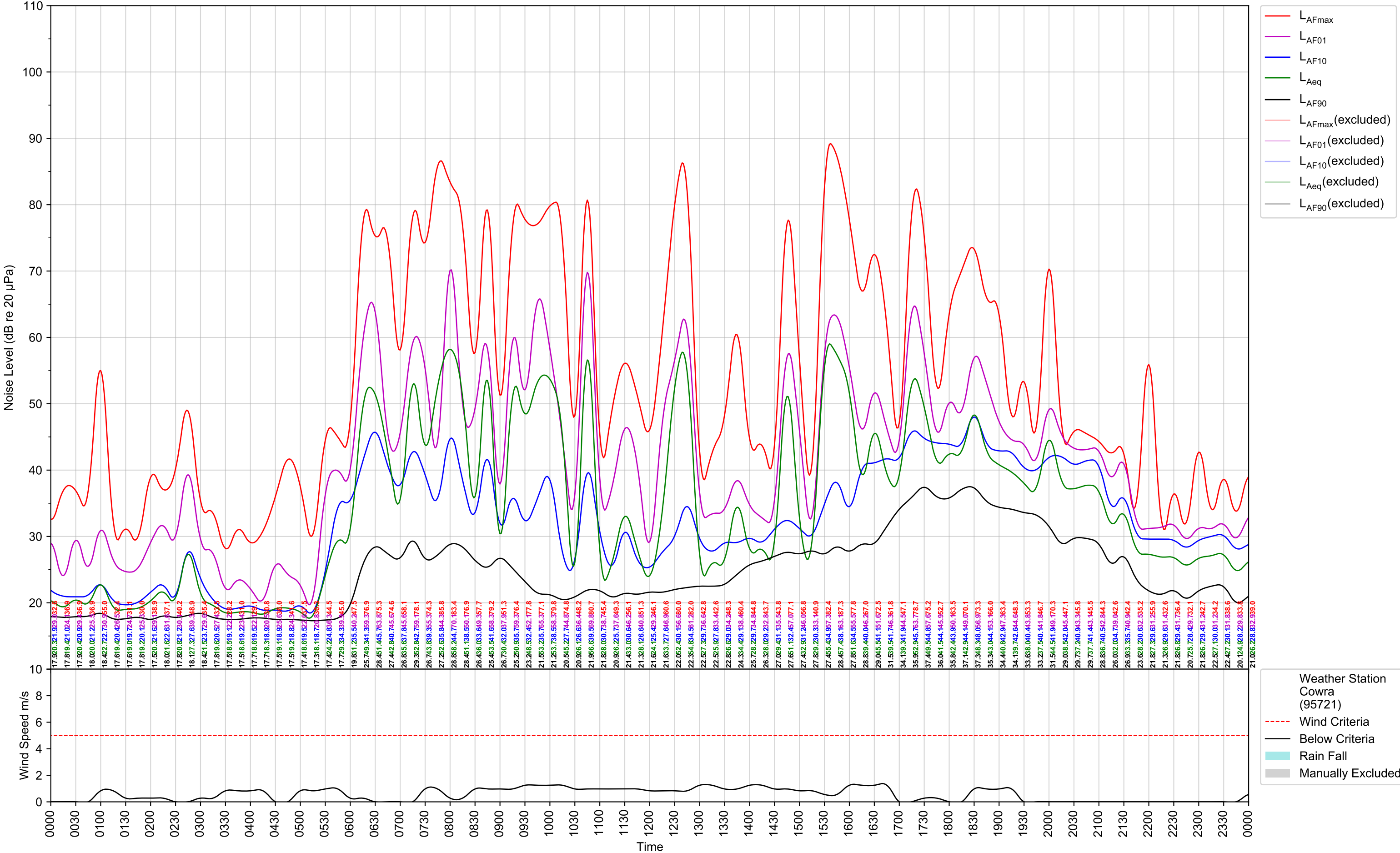
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Project: Glenella Quarry
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Equipment: Svan 977
Serial Number: 45741
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW



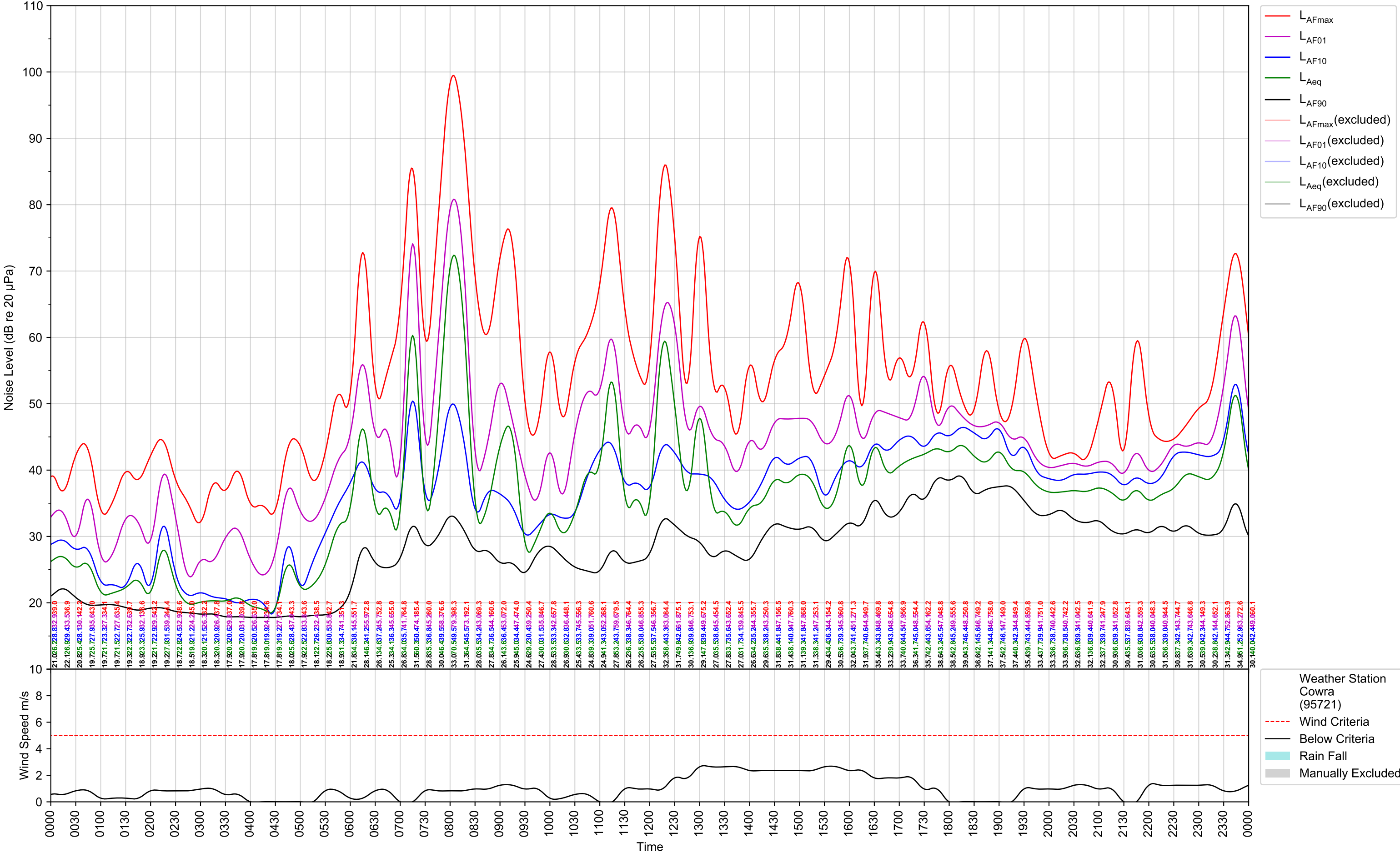
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45741
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW

Graphical Noise Logger Data
Date: Friday 08 October 2021



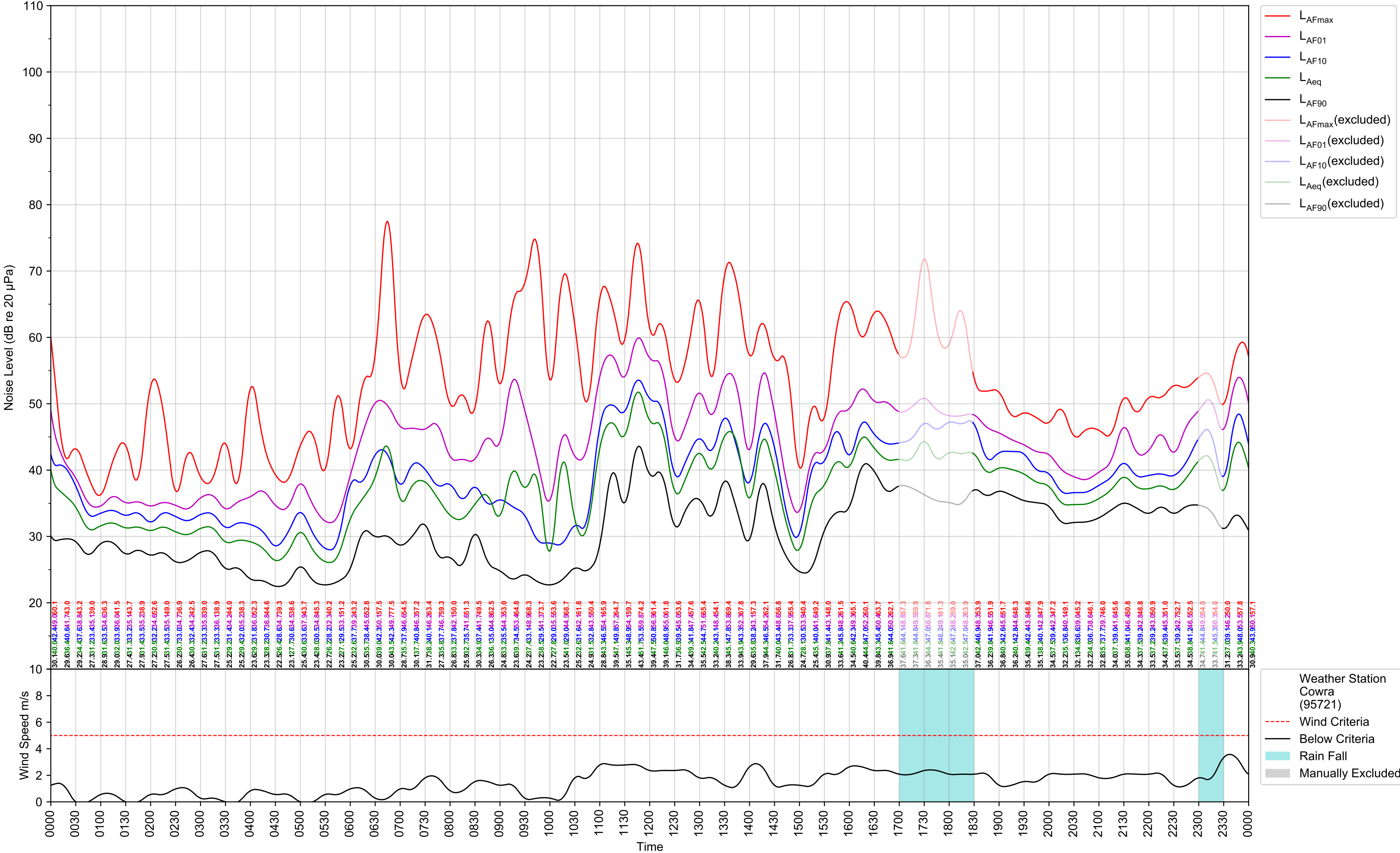
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Equipment: Svan 977
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW

Graphical Noise Logger Data
Date: Saturday 09 October 2021



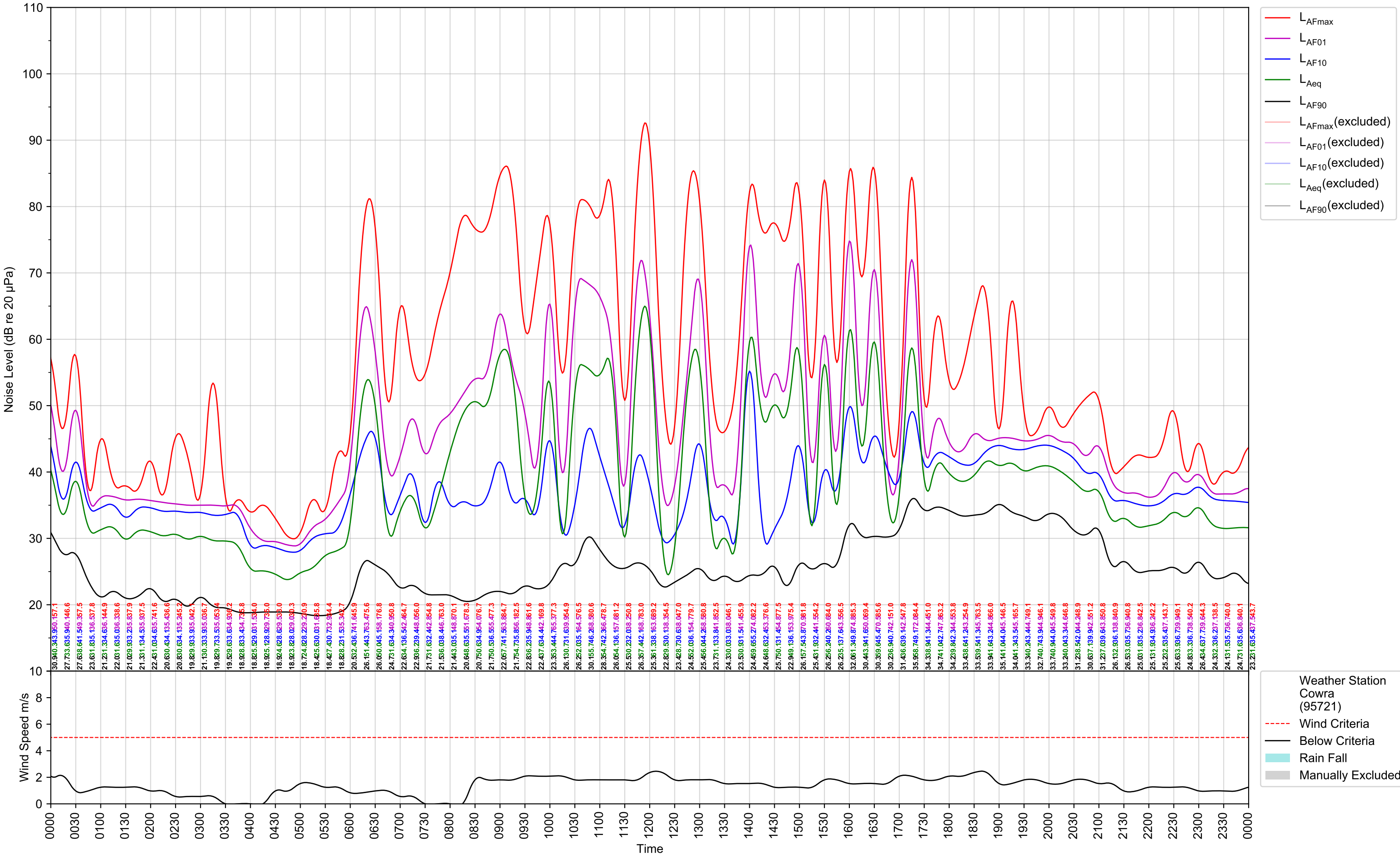
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW

Graphical Noise Logger Data
Date: Sunday 10 October 2021



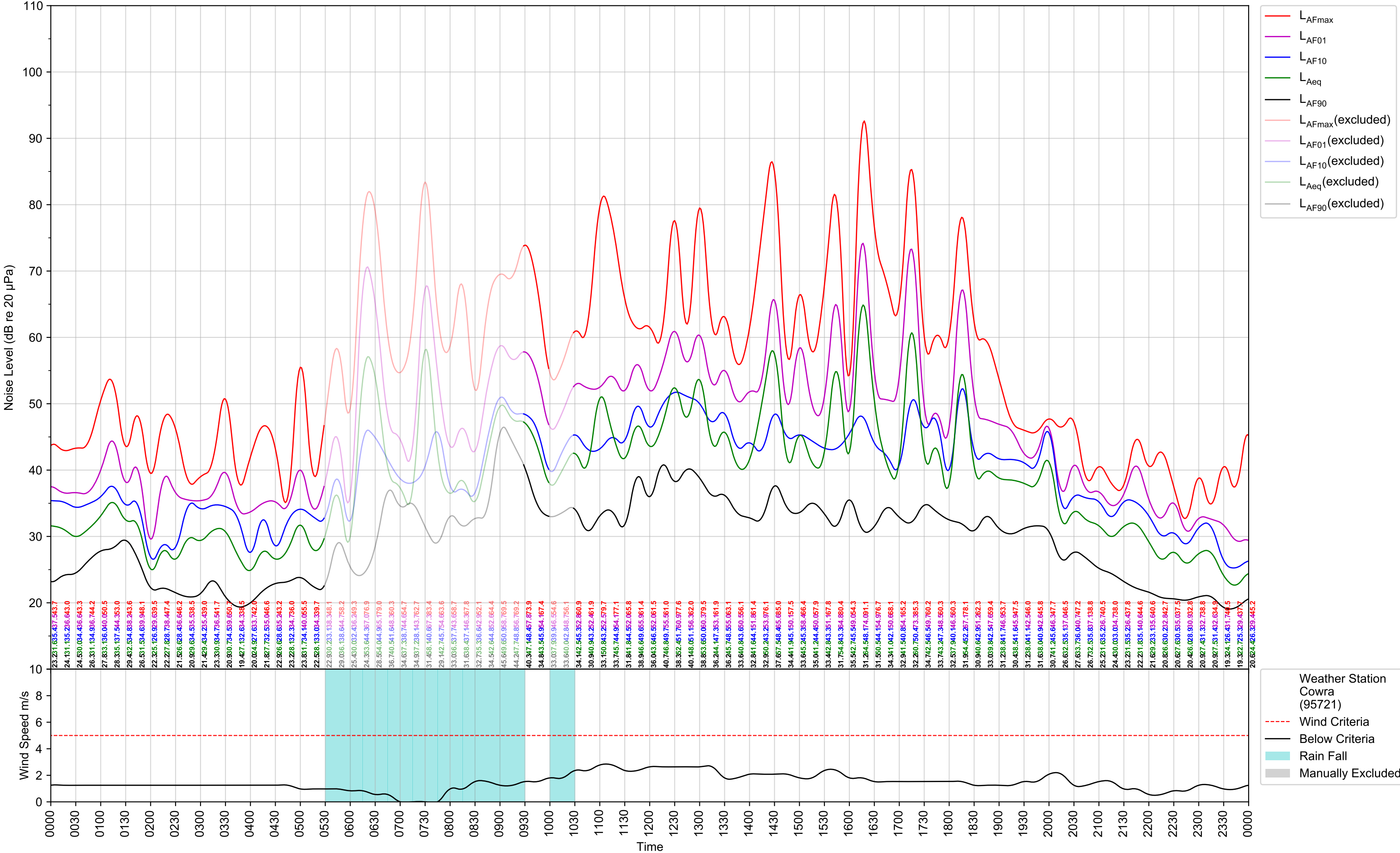
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Equipment: Svan 977
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW



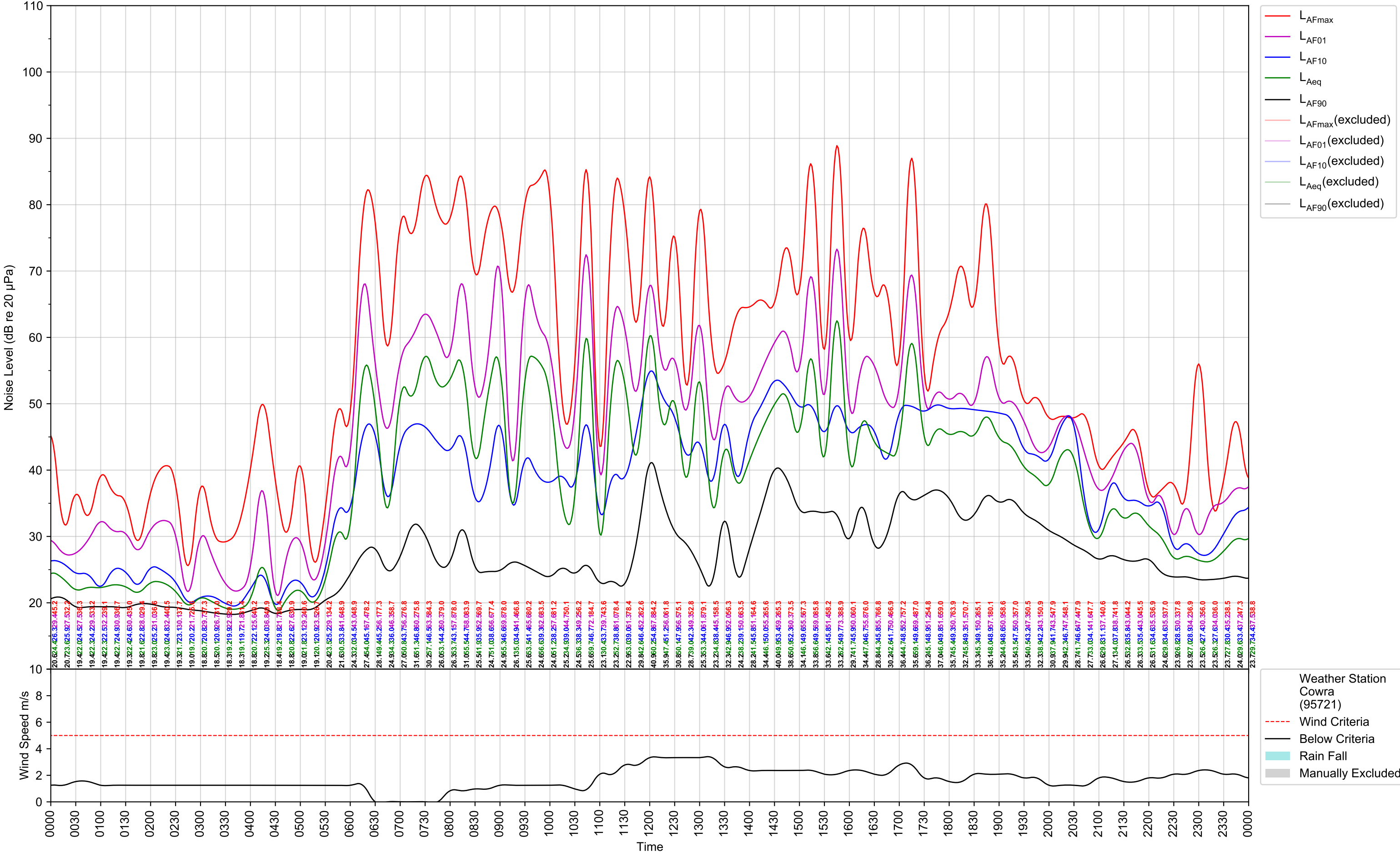
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Equipment: Svan 977
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW

Graphical Noise Logger Data
Date: Tuesday 12 October 2021



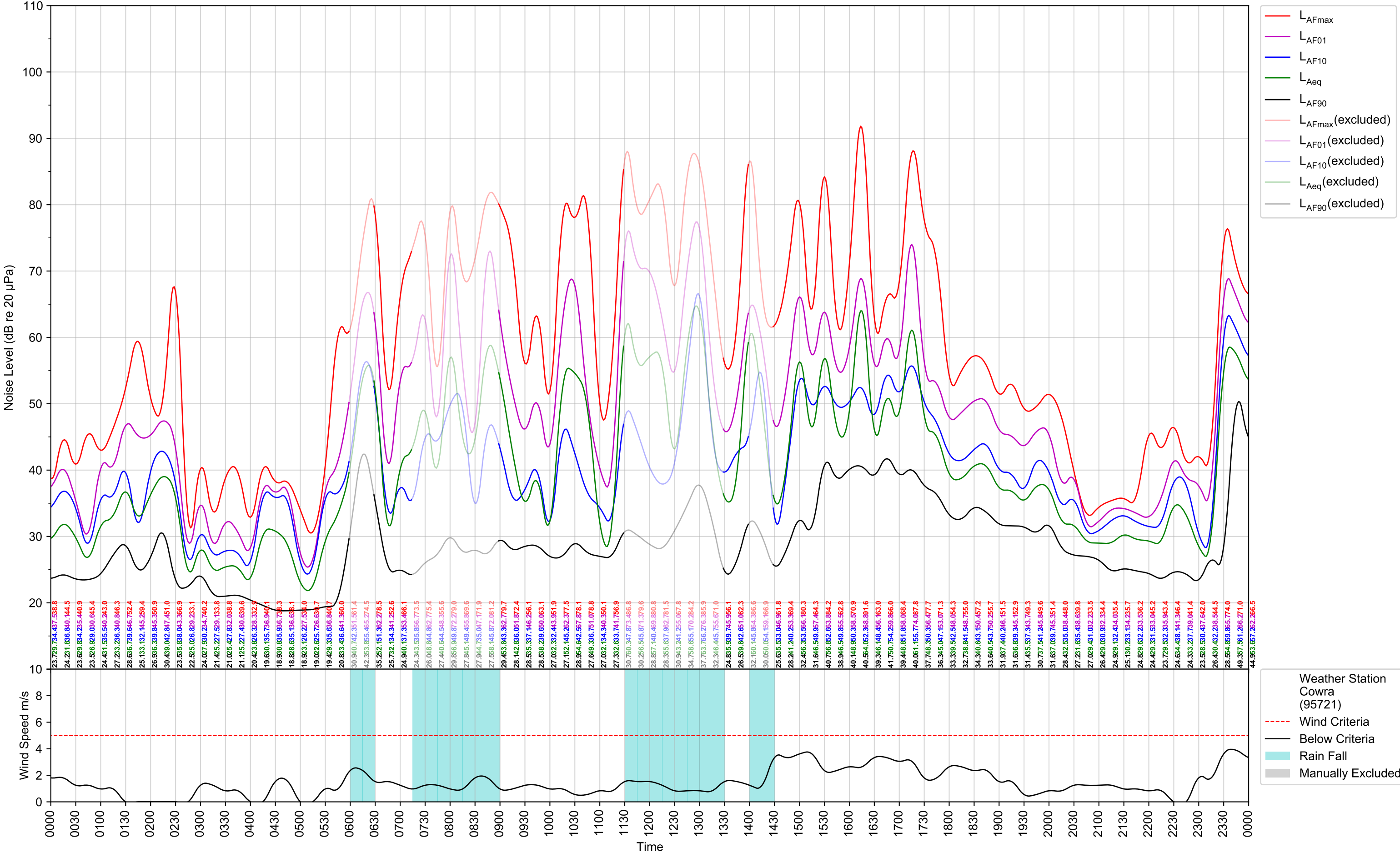
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW



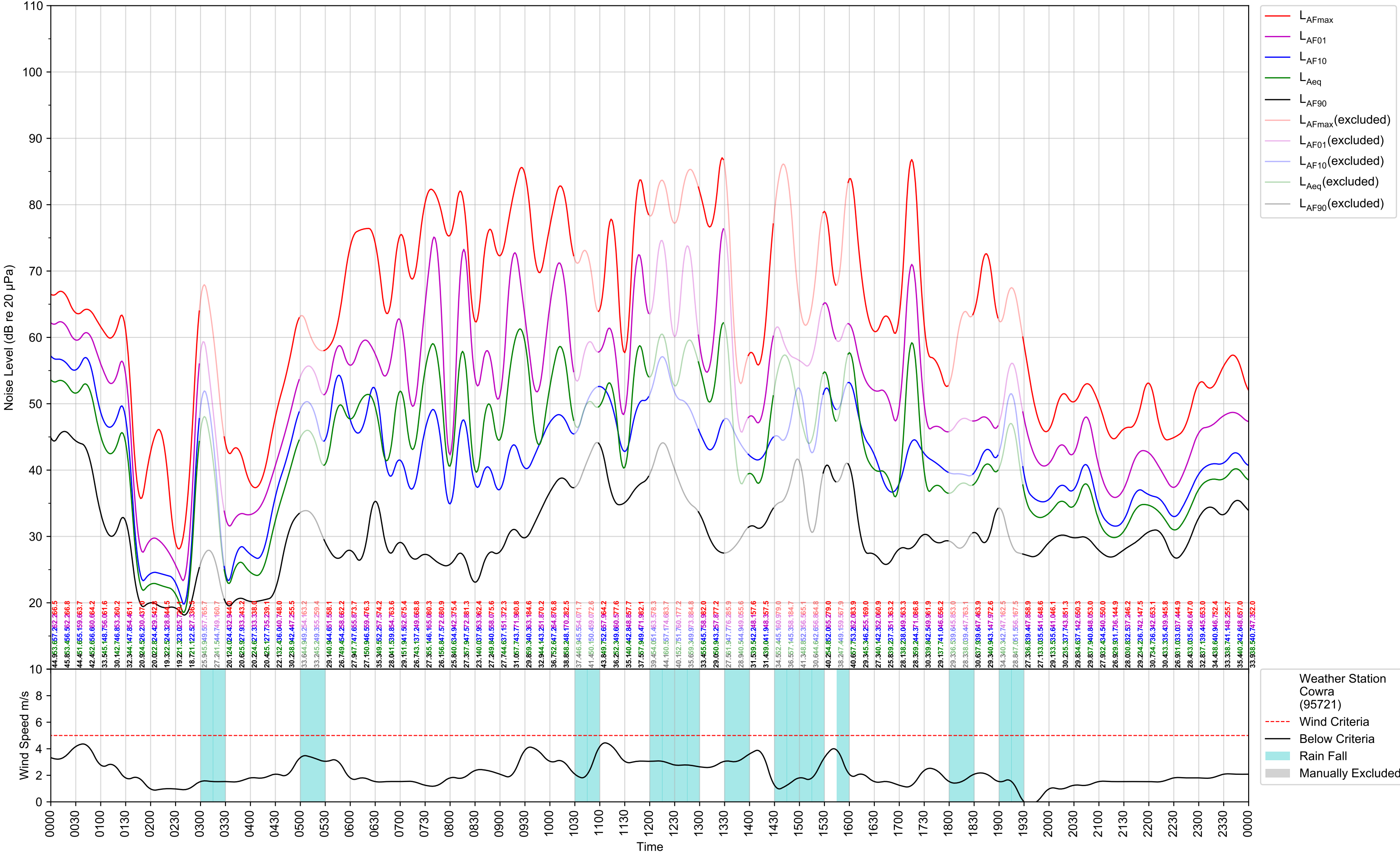
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Location: 483 Battery Road, Cowra, NSW

Graphical Noise Logger Data
Date: Thursday 14 October 2021



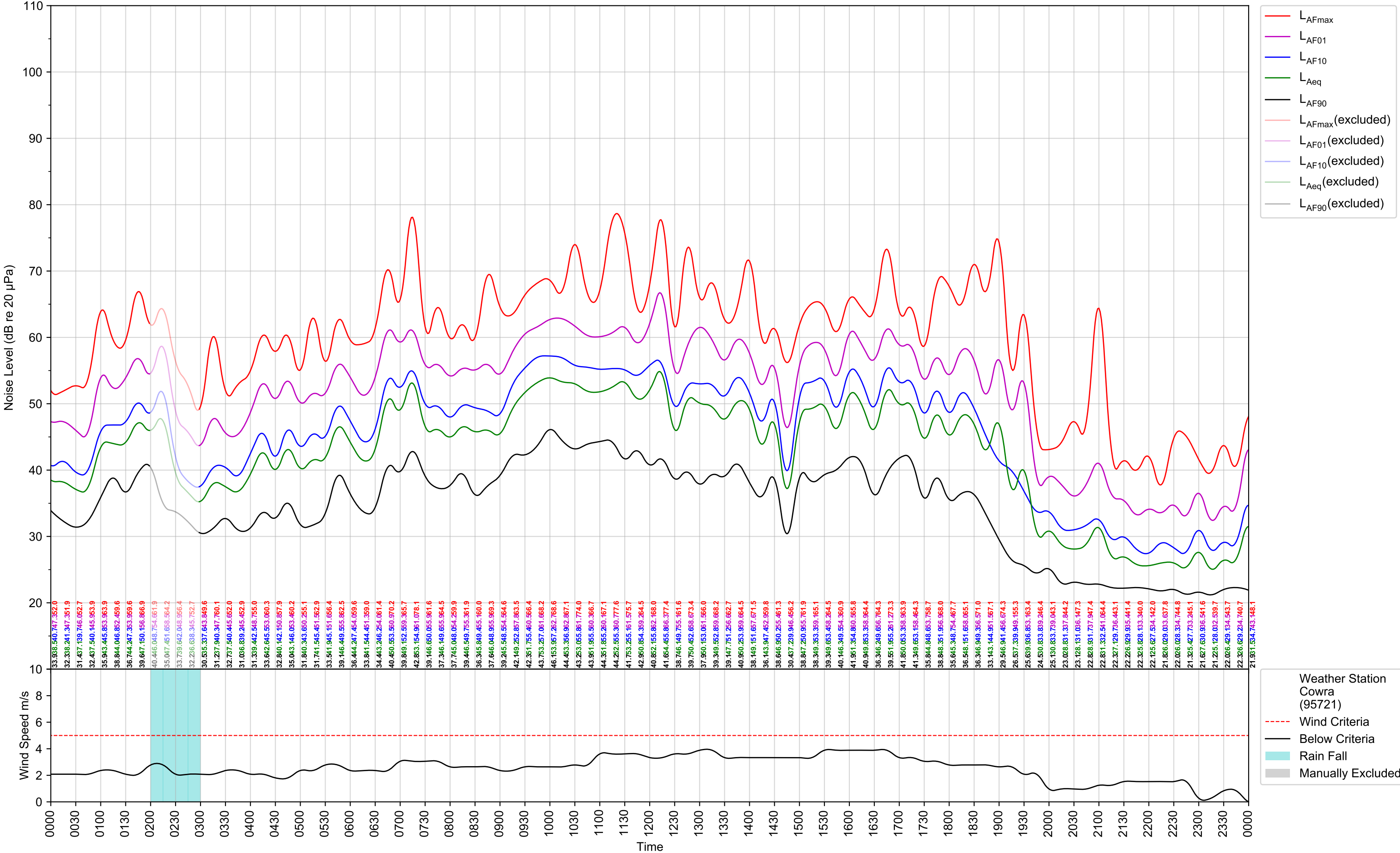
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Serial Number: 45741
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Location: 483 Battery Road, Cowra, NSW

Graphical Noise Logger Data
Date: Friday 15 October 2021



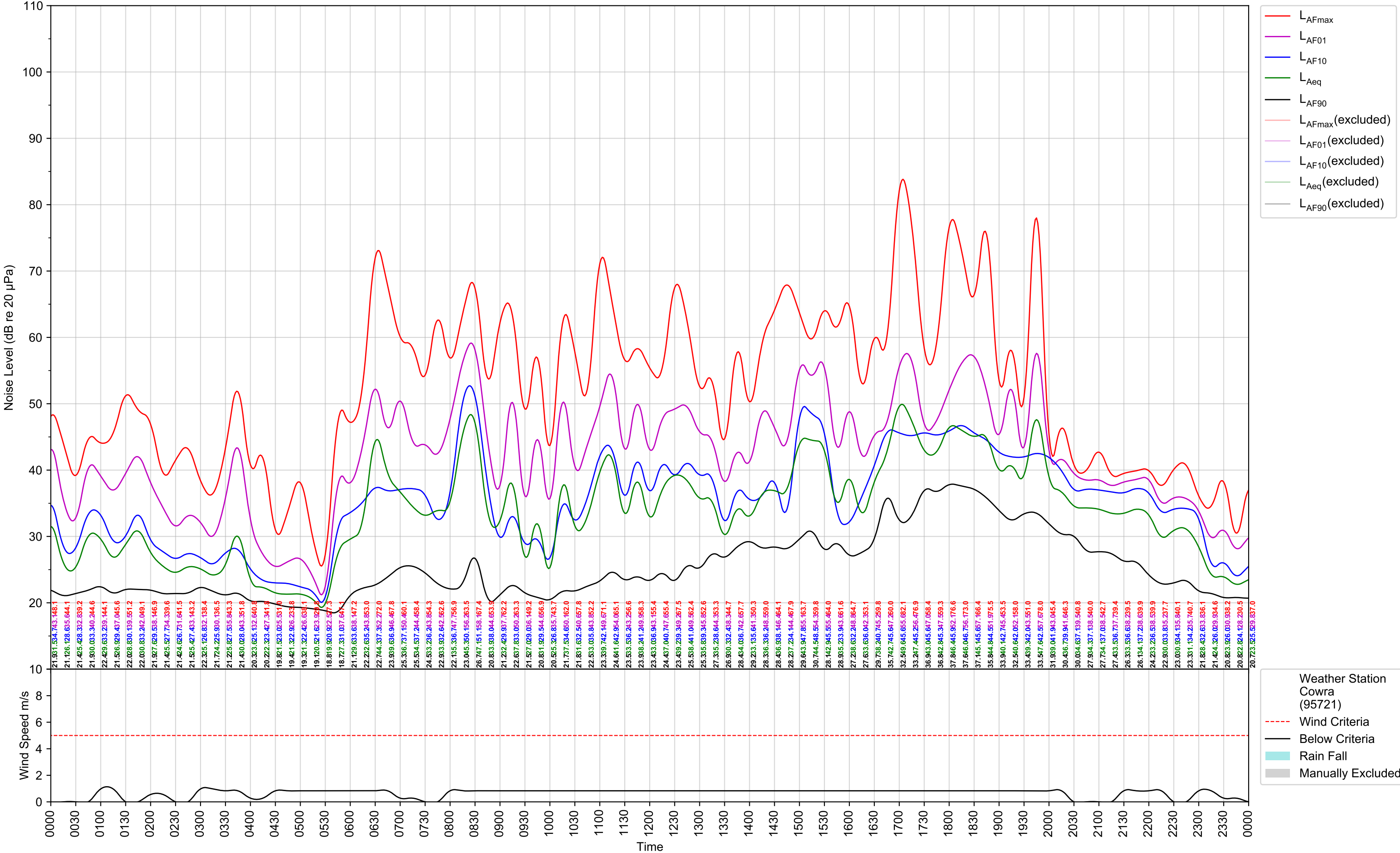
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Equipment: Svan 977
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Location: 483 Battery Road, Cowra, NSW

Graphical Noise Logger Data
Date: Saturday 16 October 2021



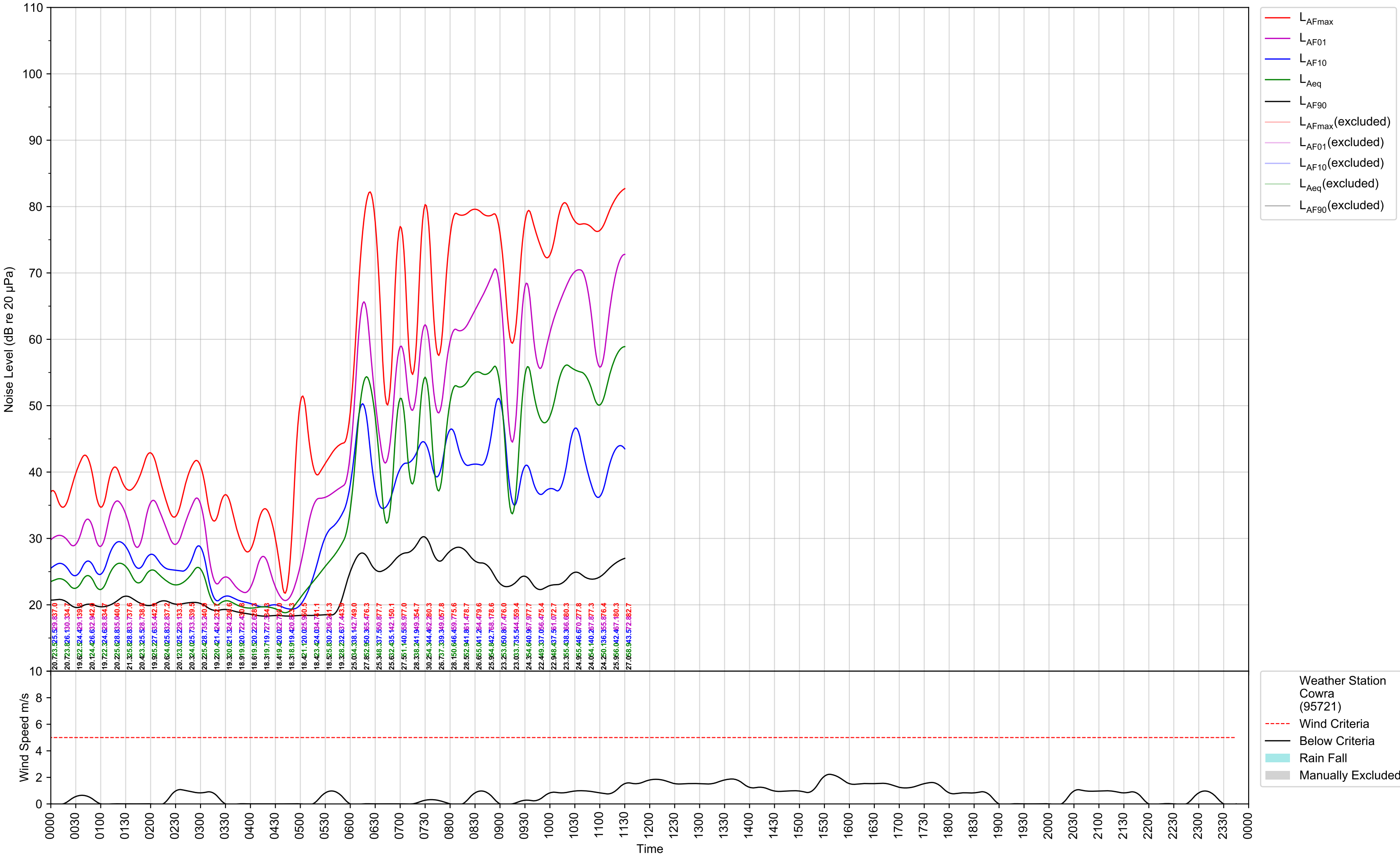
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Equipment: Svan 977
Serial Number: 45741
Pre Calibration: 0.50 dB
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Location: 483 Battery Road, Cowra, NSW

Graphical Noise Logger Data
Date: Sunday 17 October 2021



Graphical Noise Logger Data
Date: Monday 18 October 2021

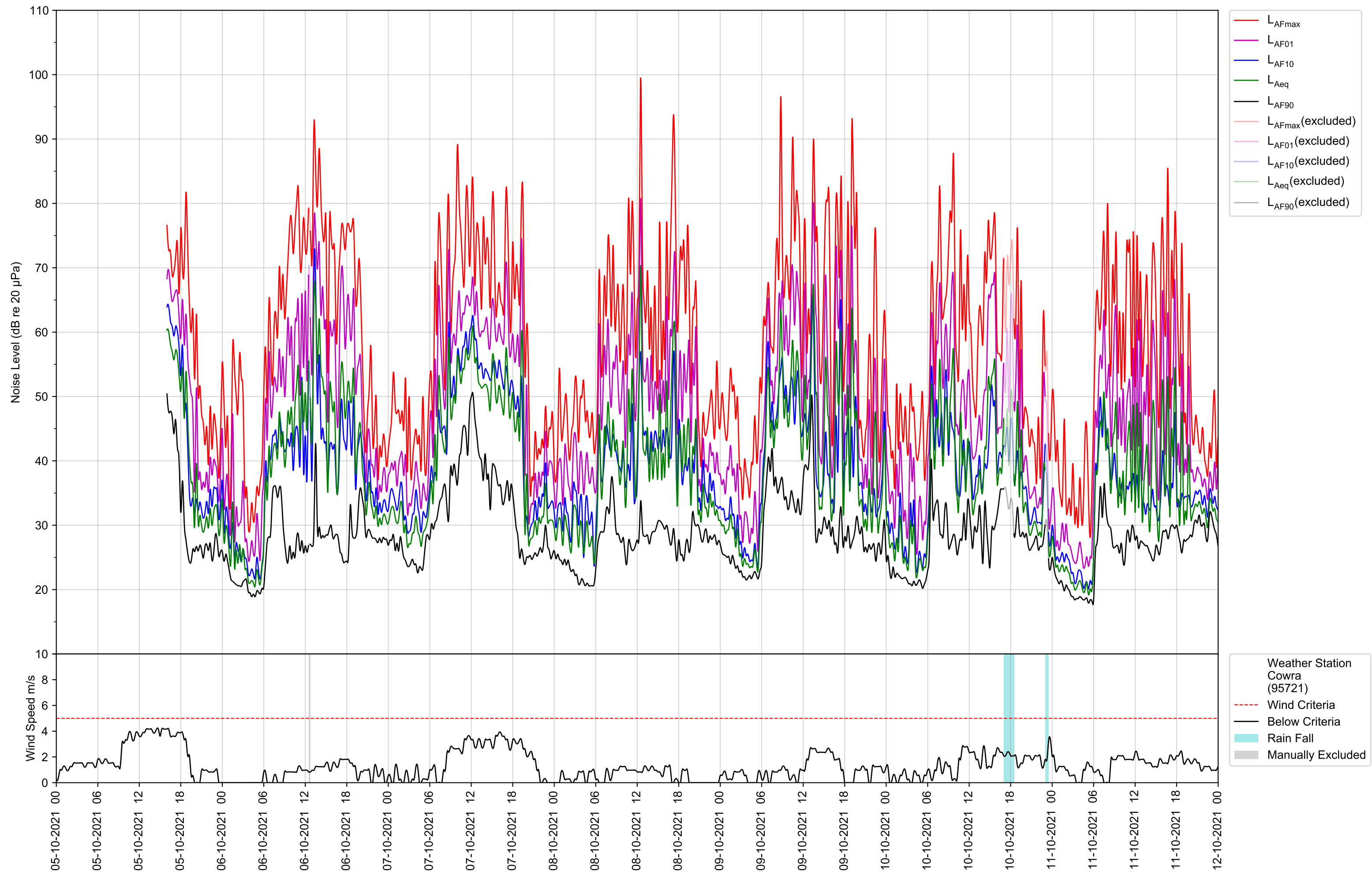
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Equipment: Svan 977
Serial Number: 45741
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Post Calibration: 0.52 dB
Location: 483 Battery Road, Cowra, NSW



Graphical Noise Logger Data
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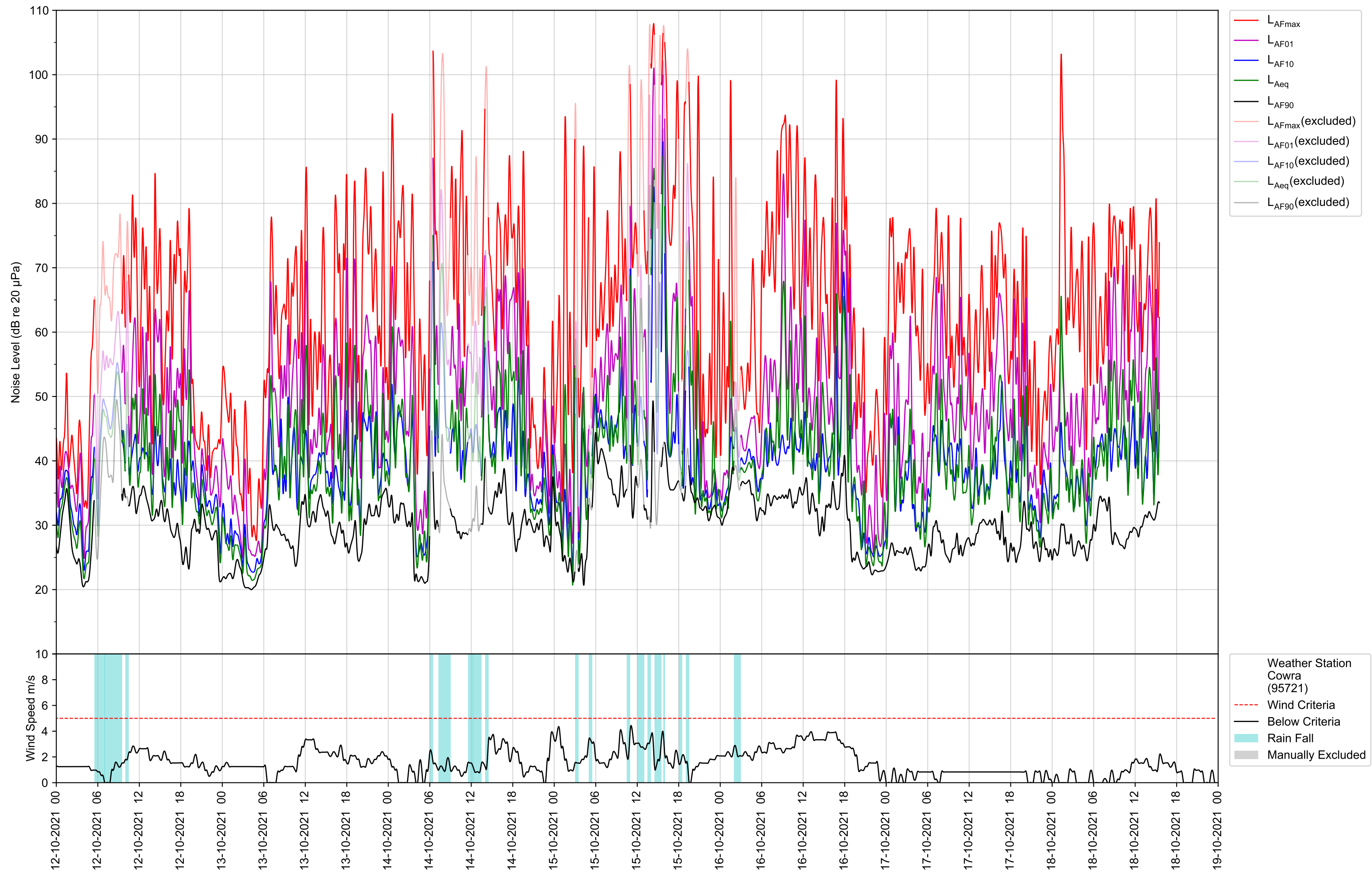
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
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Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW



Graphical Noise Logger Data
Week 2: 12-10-2021 to 19-10-2021



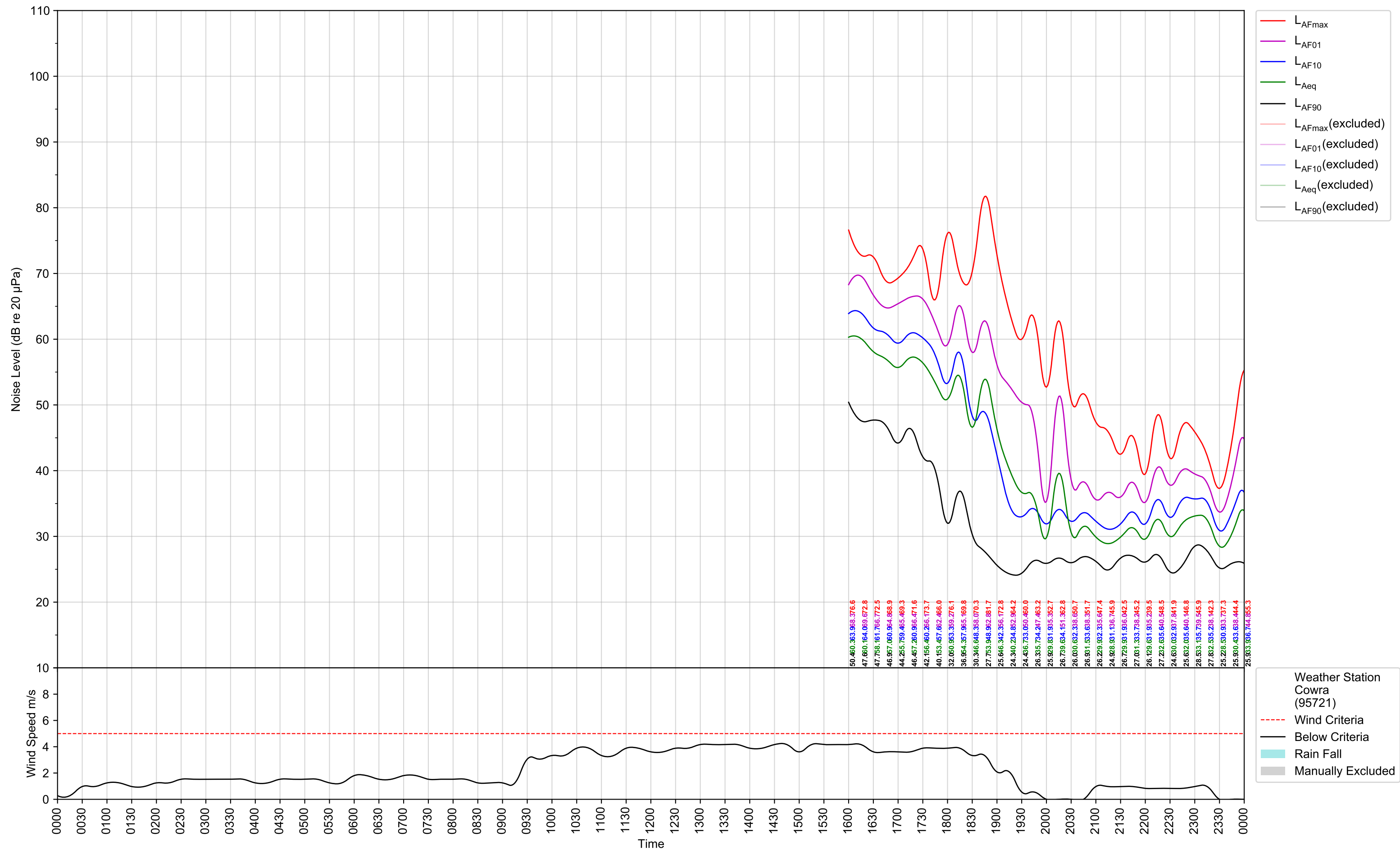
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
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Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW



Graphical Noise Logger Data
Date: Tuesday 05 October 2021

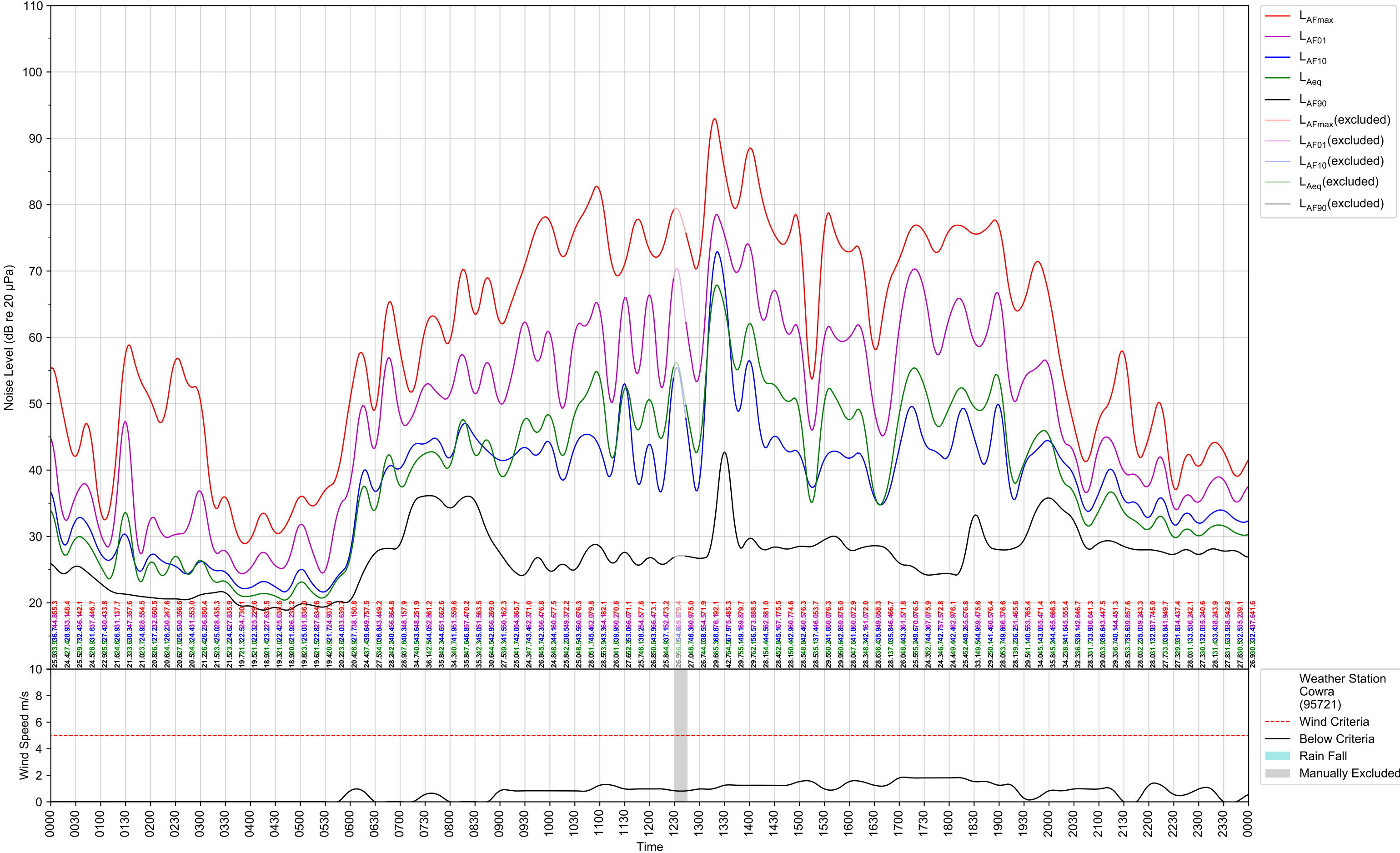


Project: Glenella Quarry
Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW



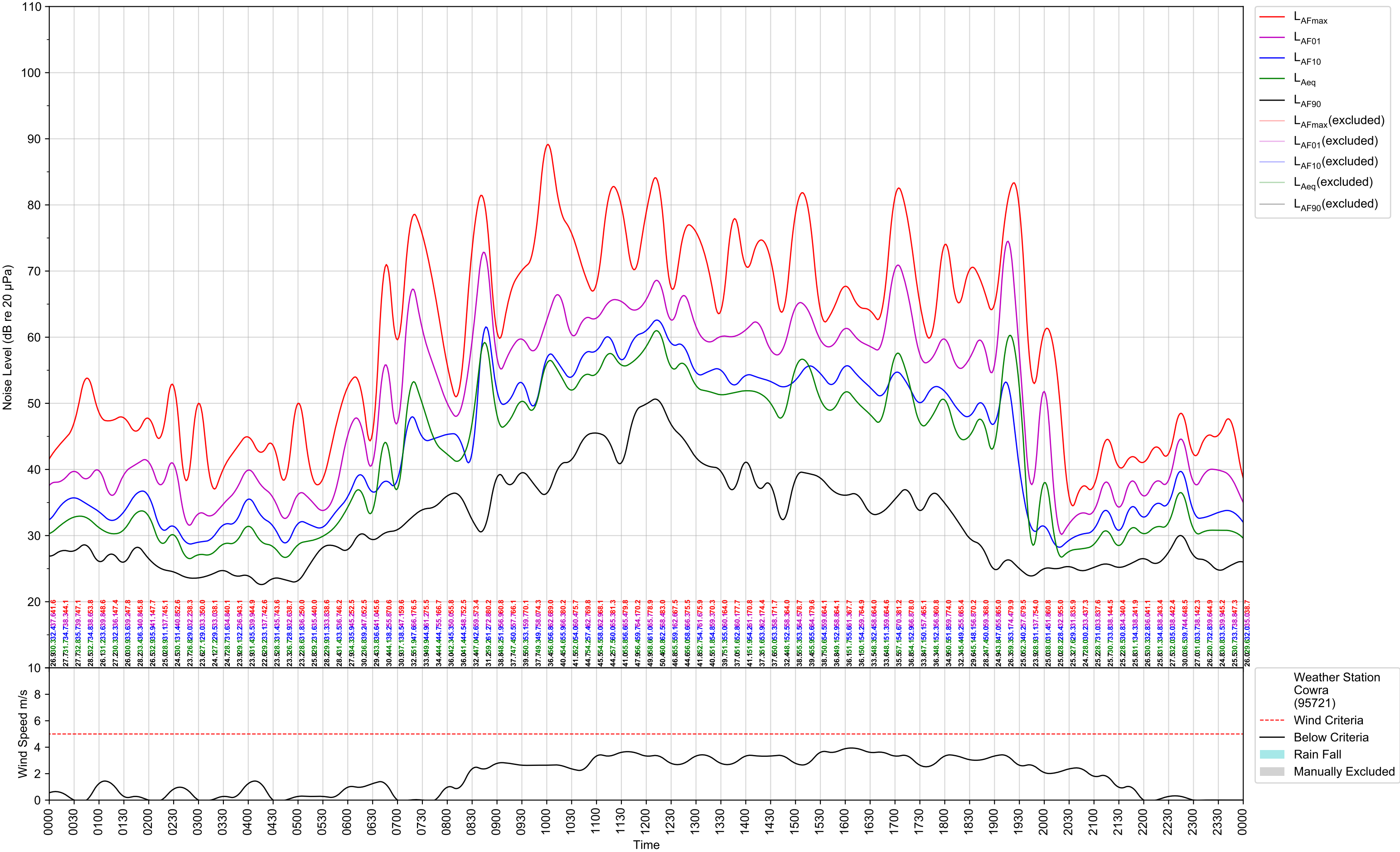
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Project Number: 60.00893.01
Equipment: Svan 977
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Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Wednesday 06 October 2021



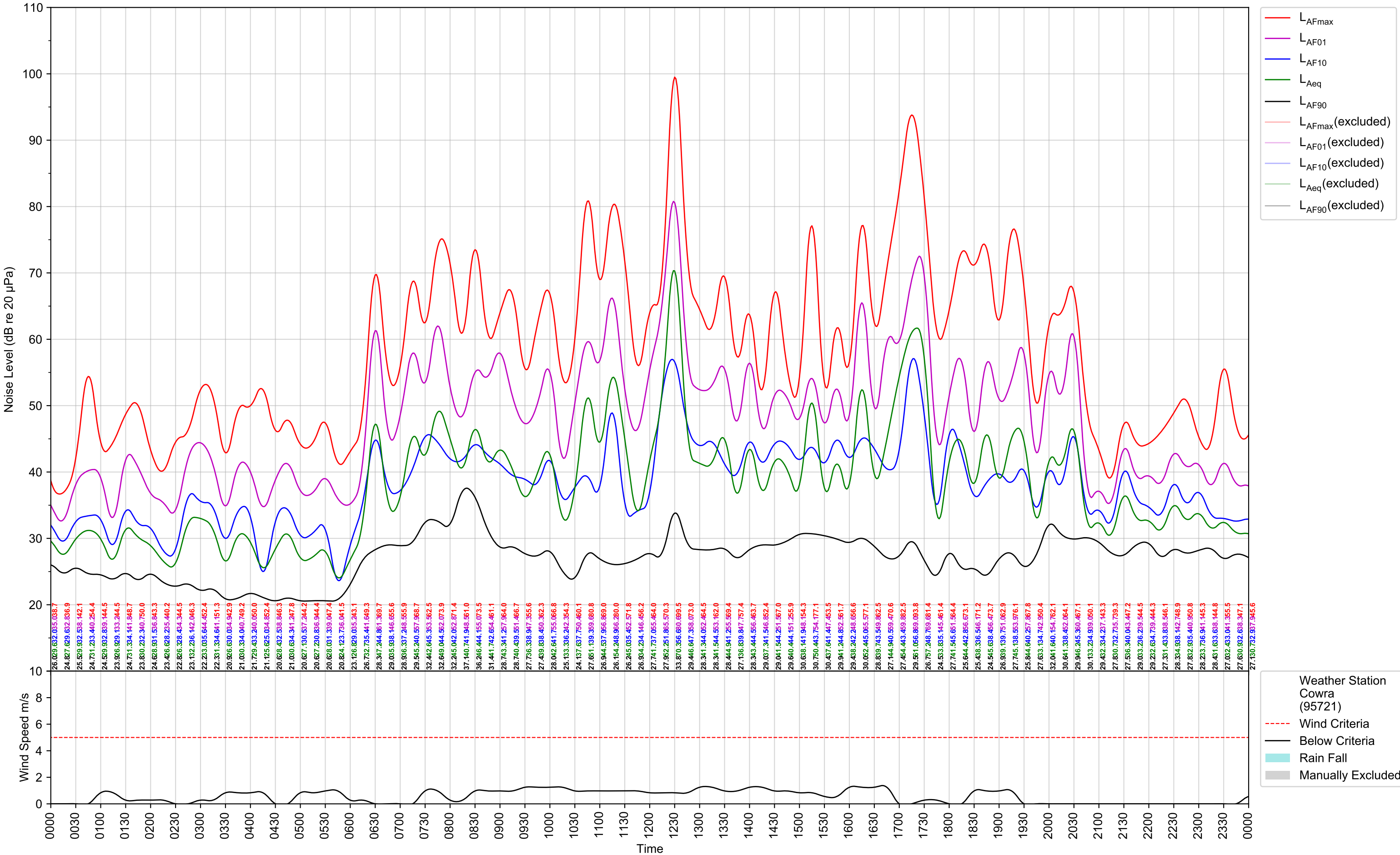
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Thursday 07 October 2021



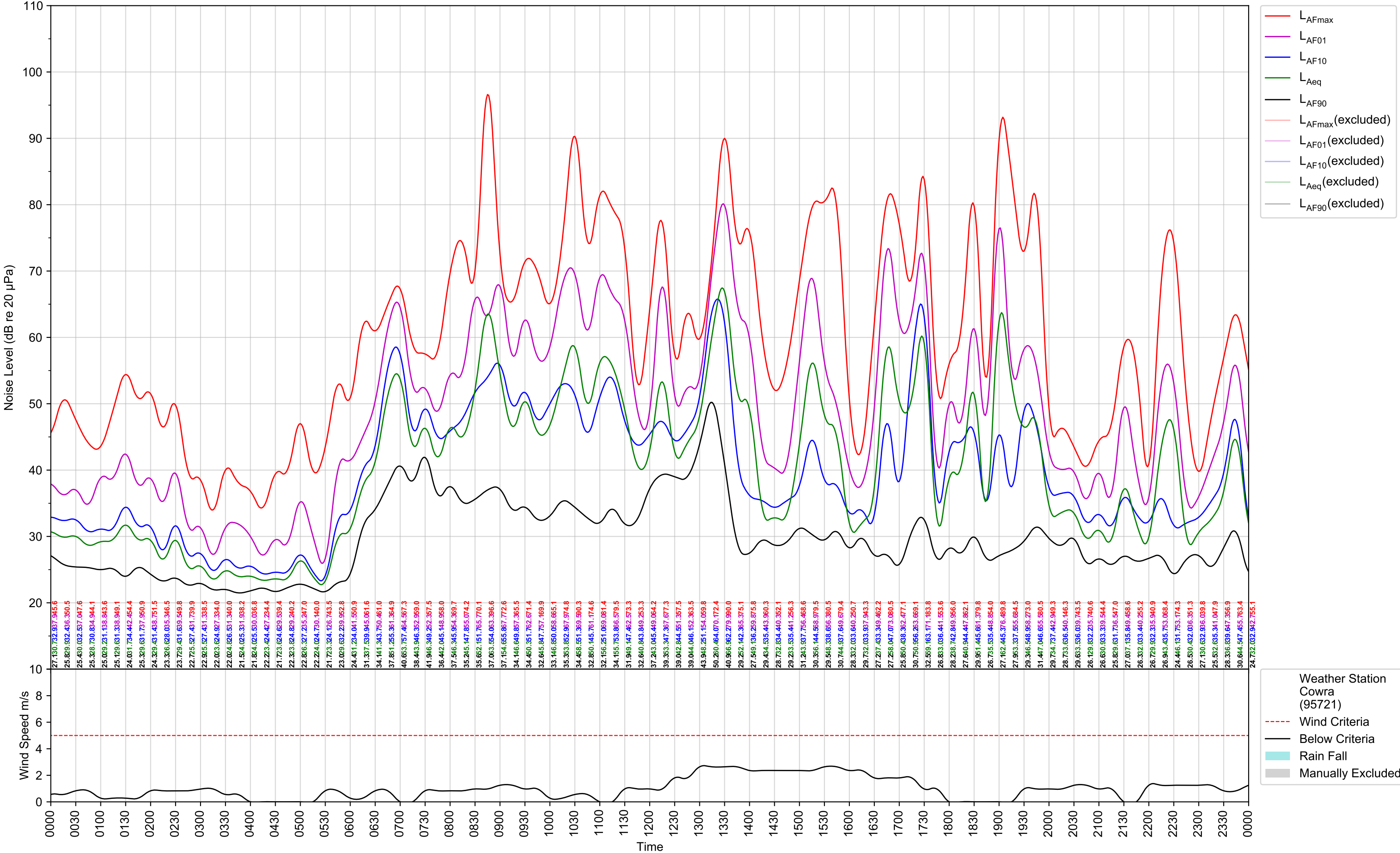
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
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Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Friday 08 October 2021



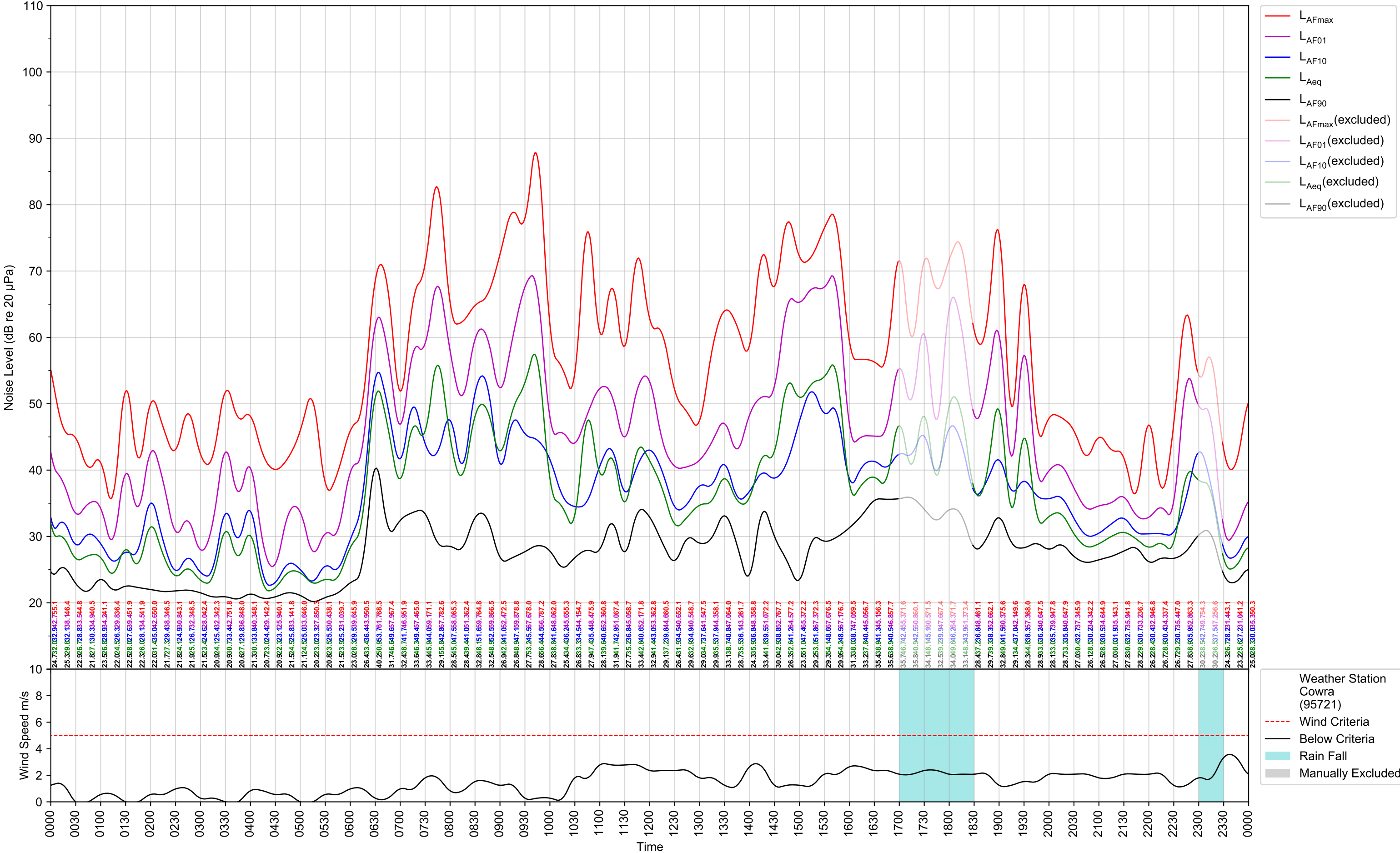
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Saturday 09 October 2021



Project: Glenella Quarry
Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

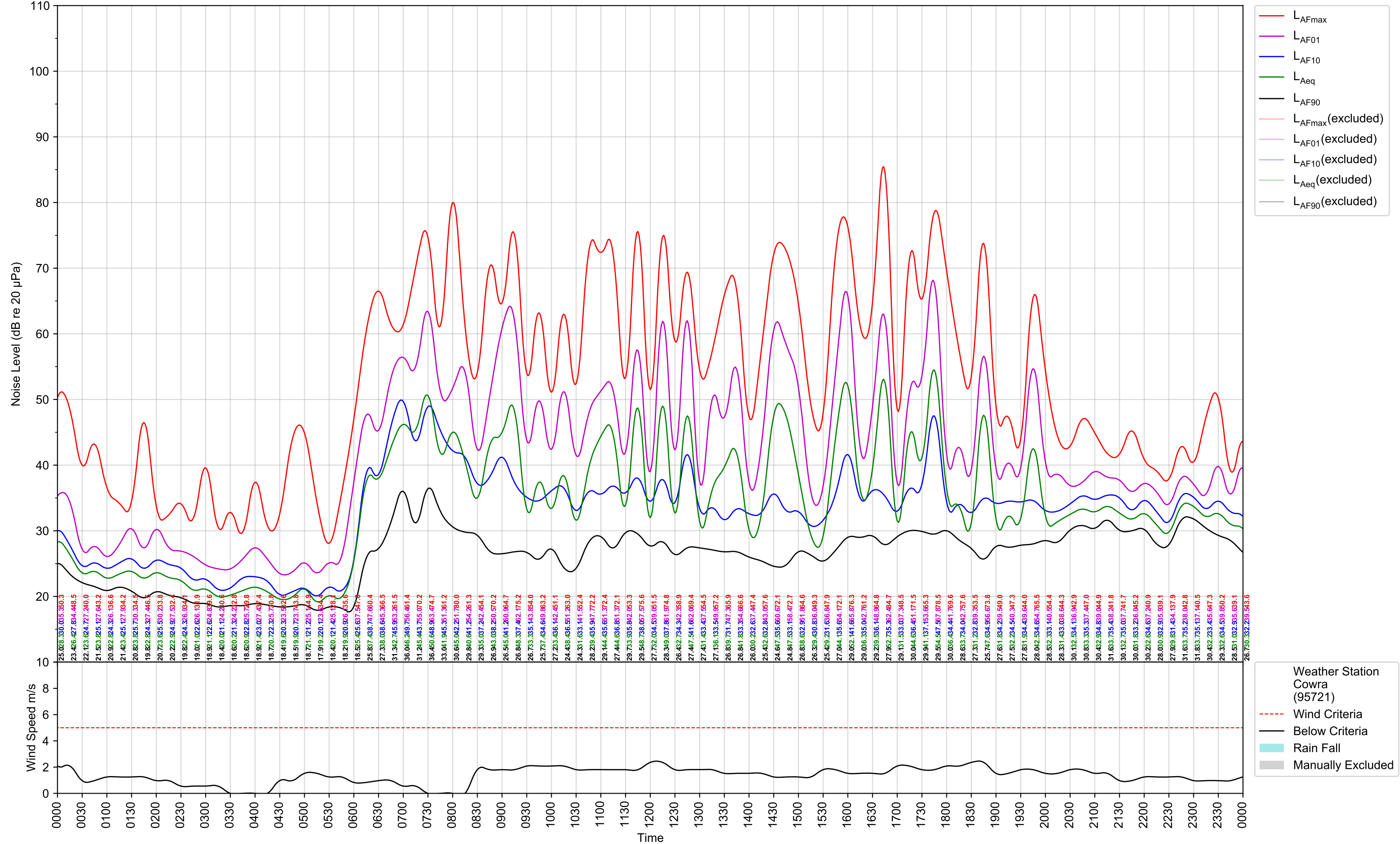
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Graphical Noise Logger Data
Date: Monday 11 October 2021

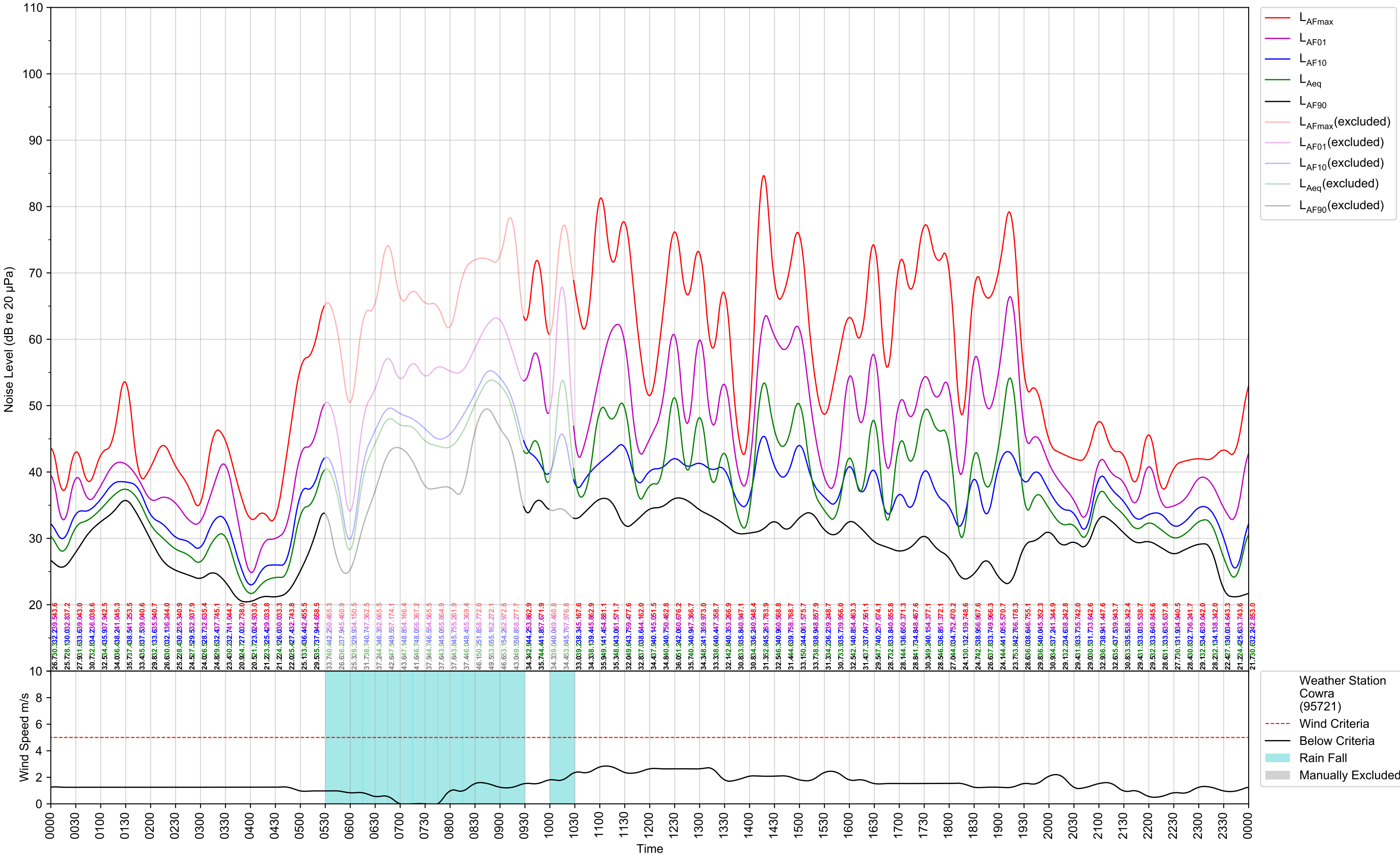


Project: Glenella Quarry
Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW



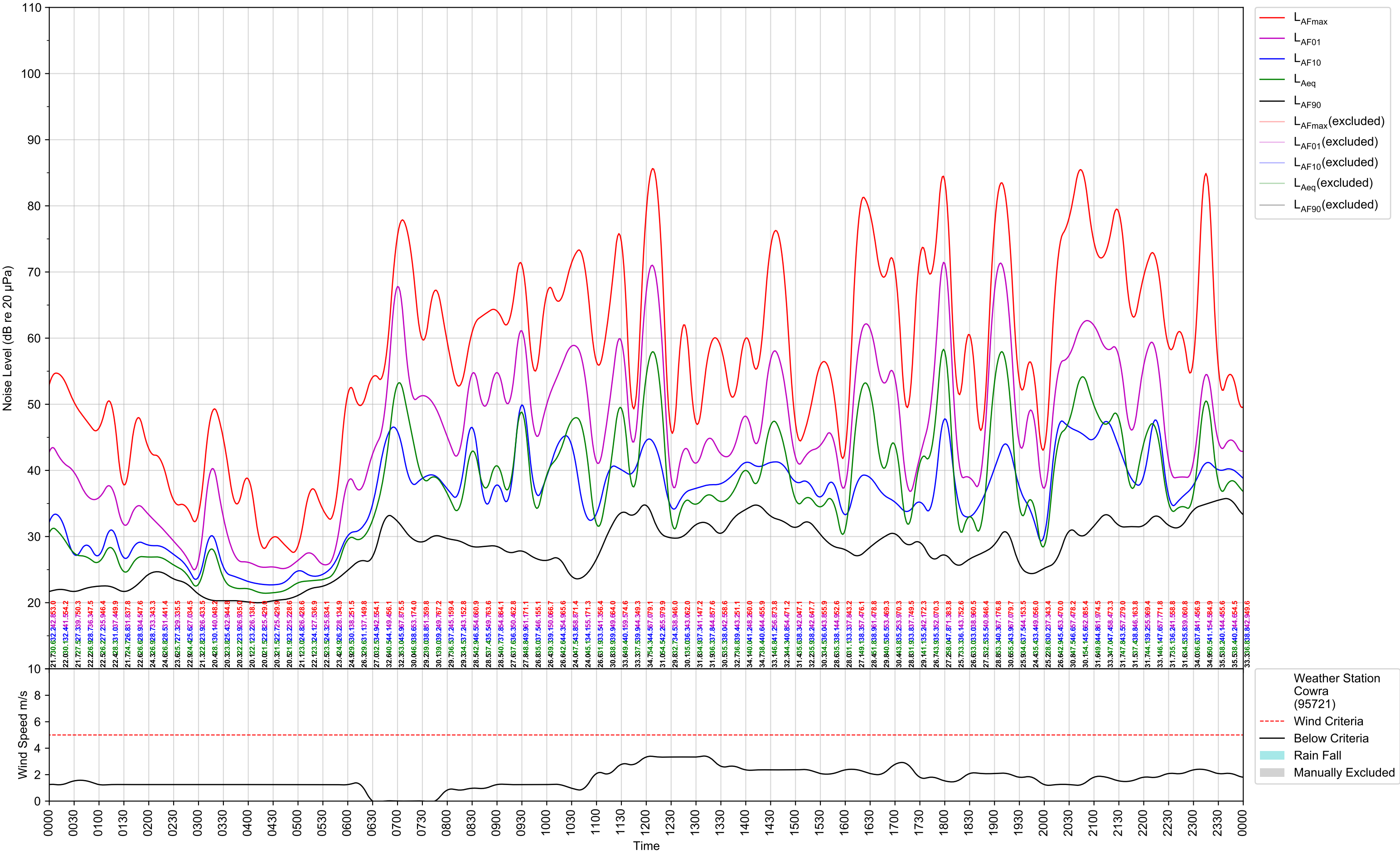
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Tuesday 12 October 2021



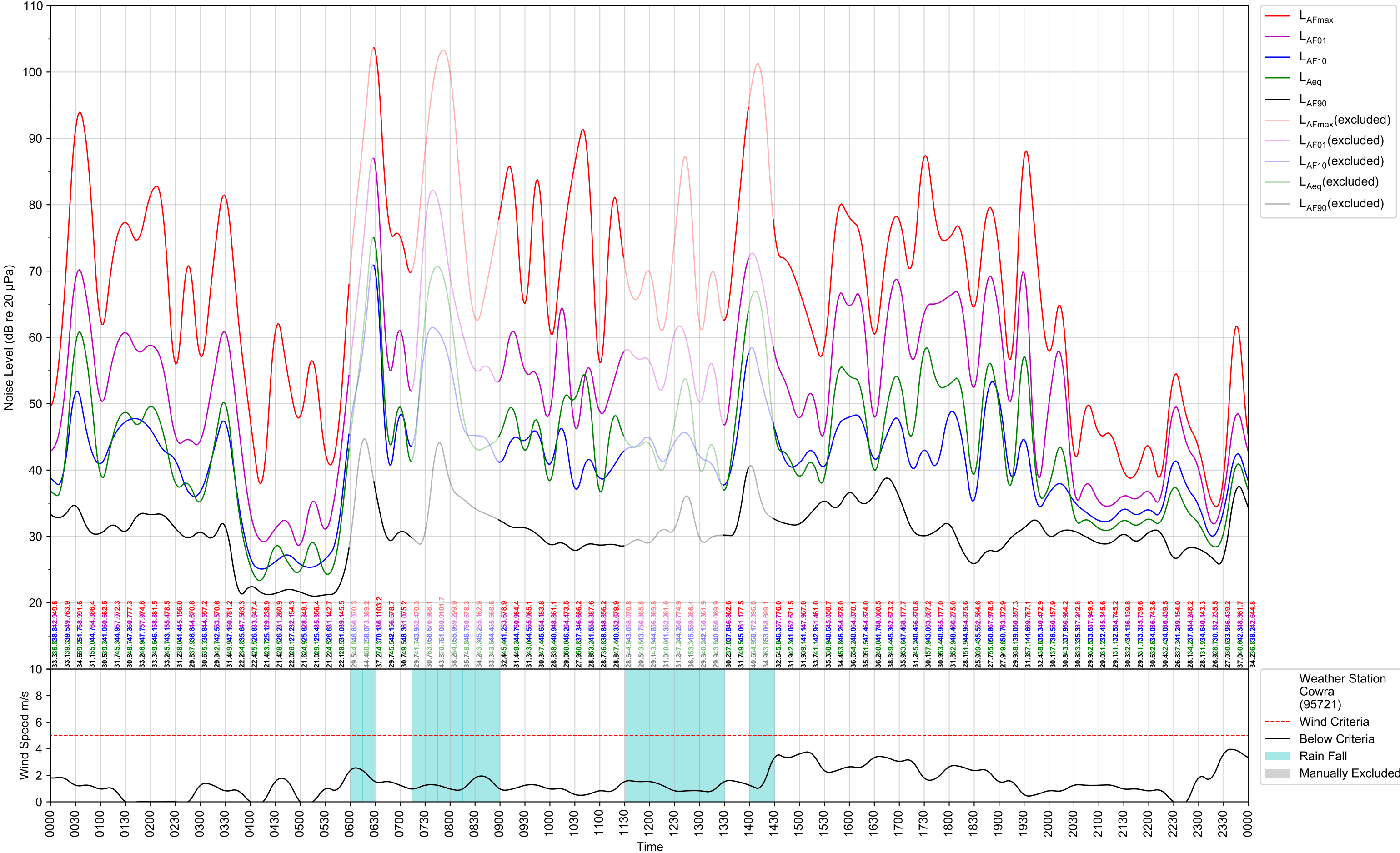
Project: Glenella Quarry
Project Number: 60.00893.01
Equipment: Svan 977
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Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Wednesday 13 October 2021



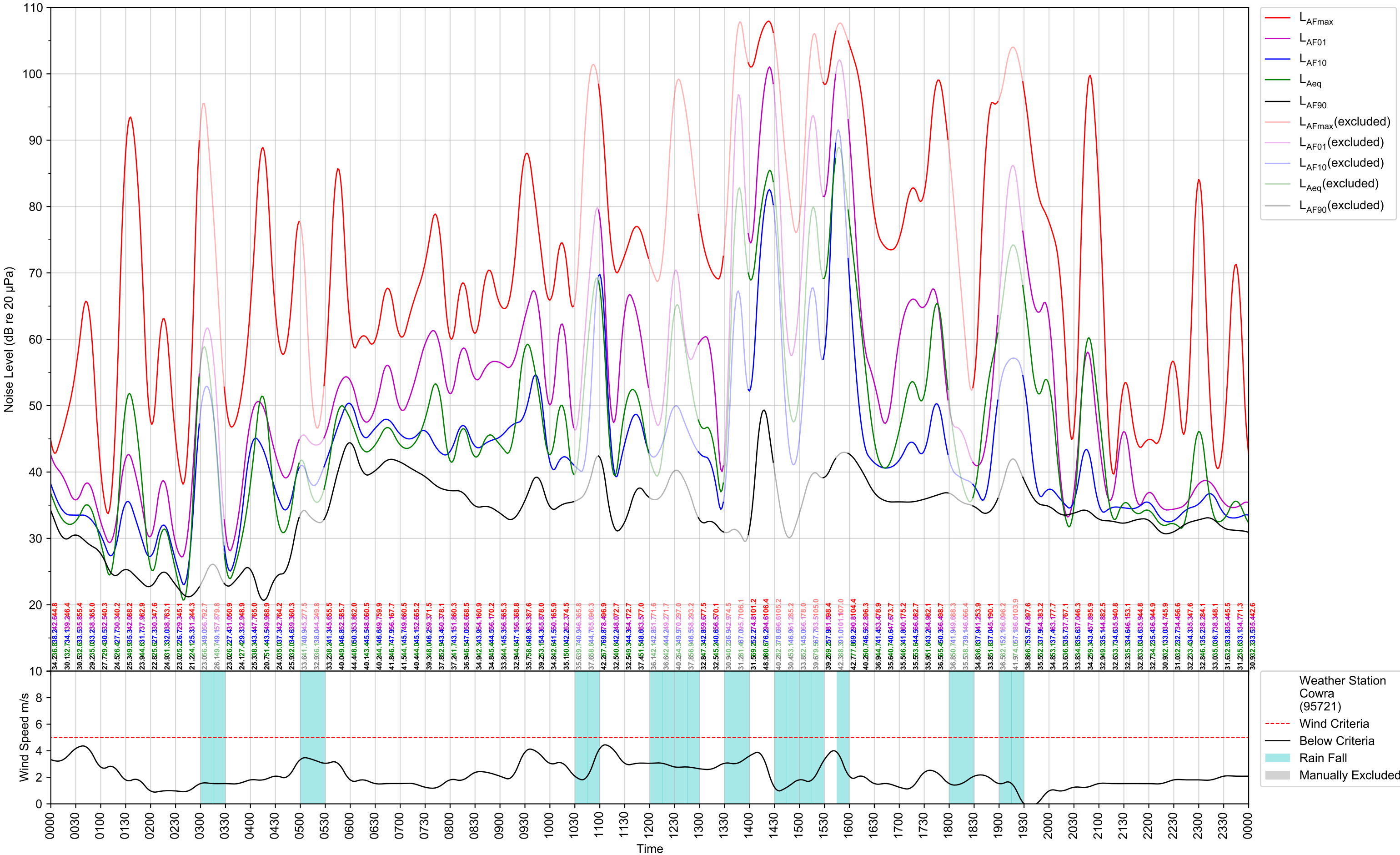
Project: Glenella Quarry
Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Thursday 14 October 2021



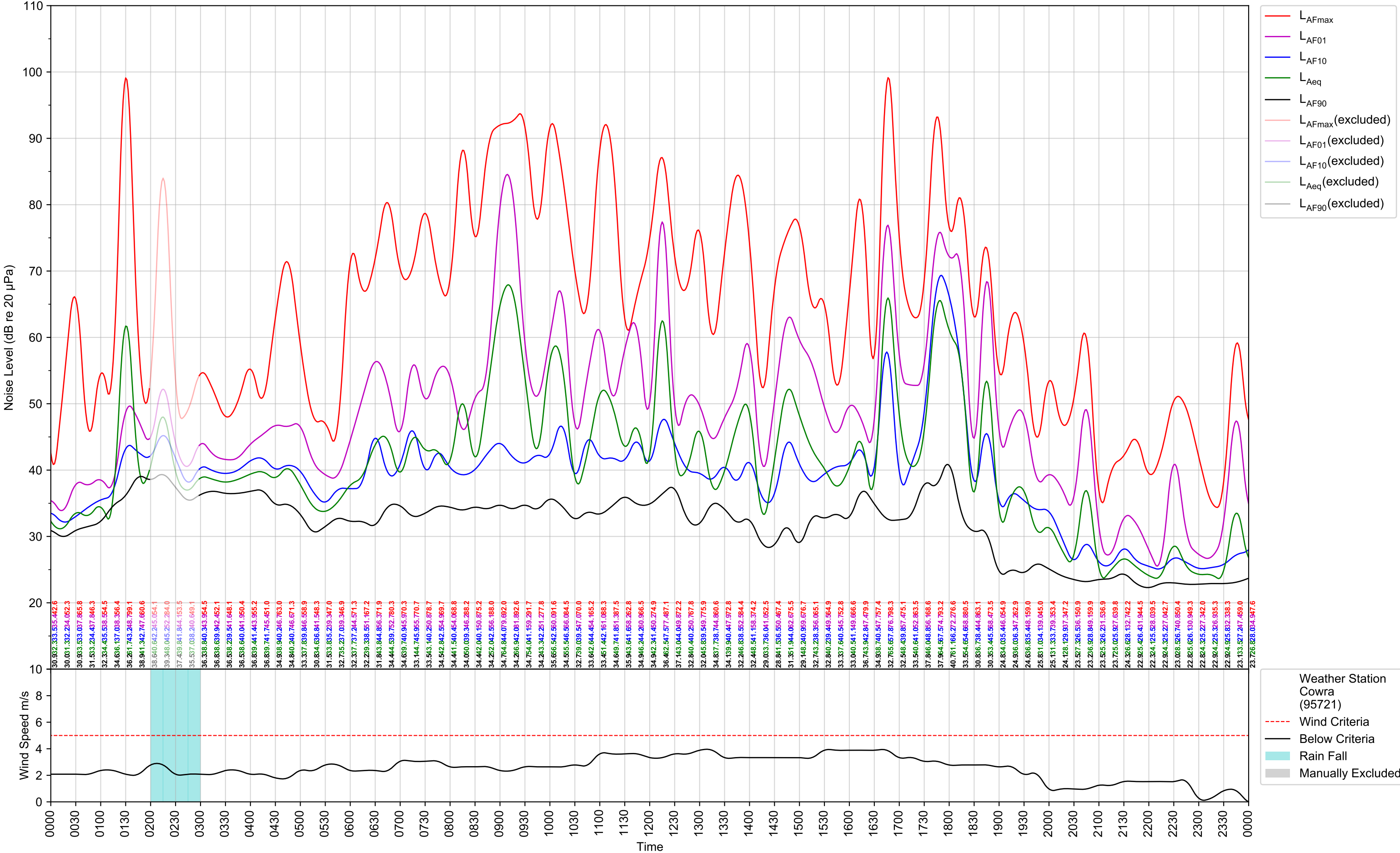
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Friday 15 October 2021



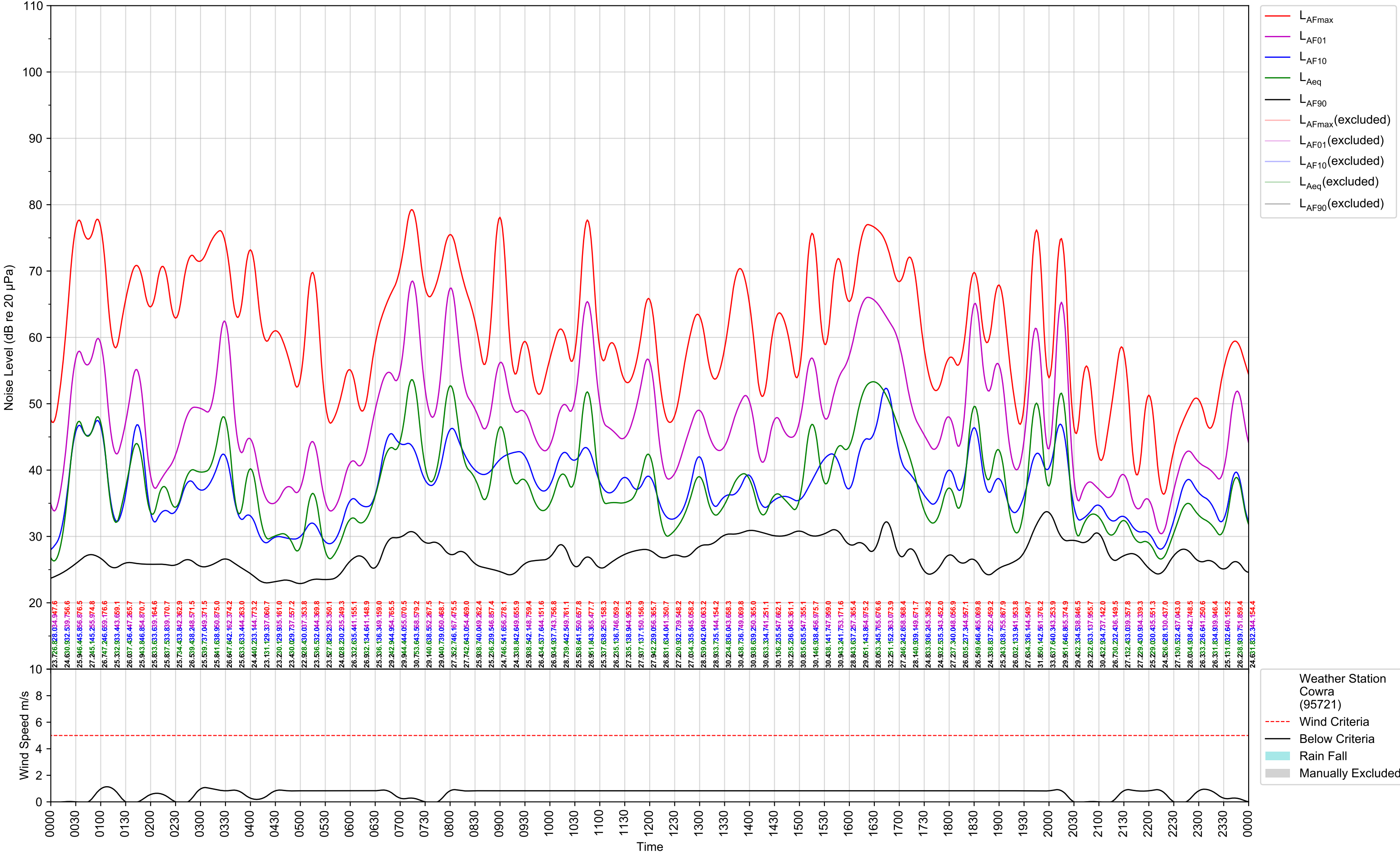
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Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Saturday 16 October 2021



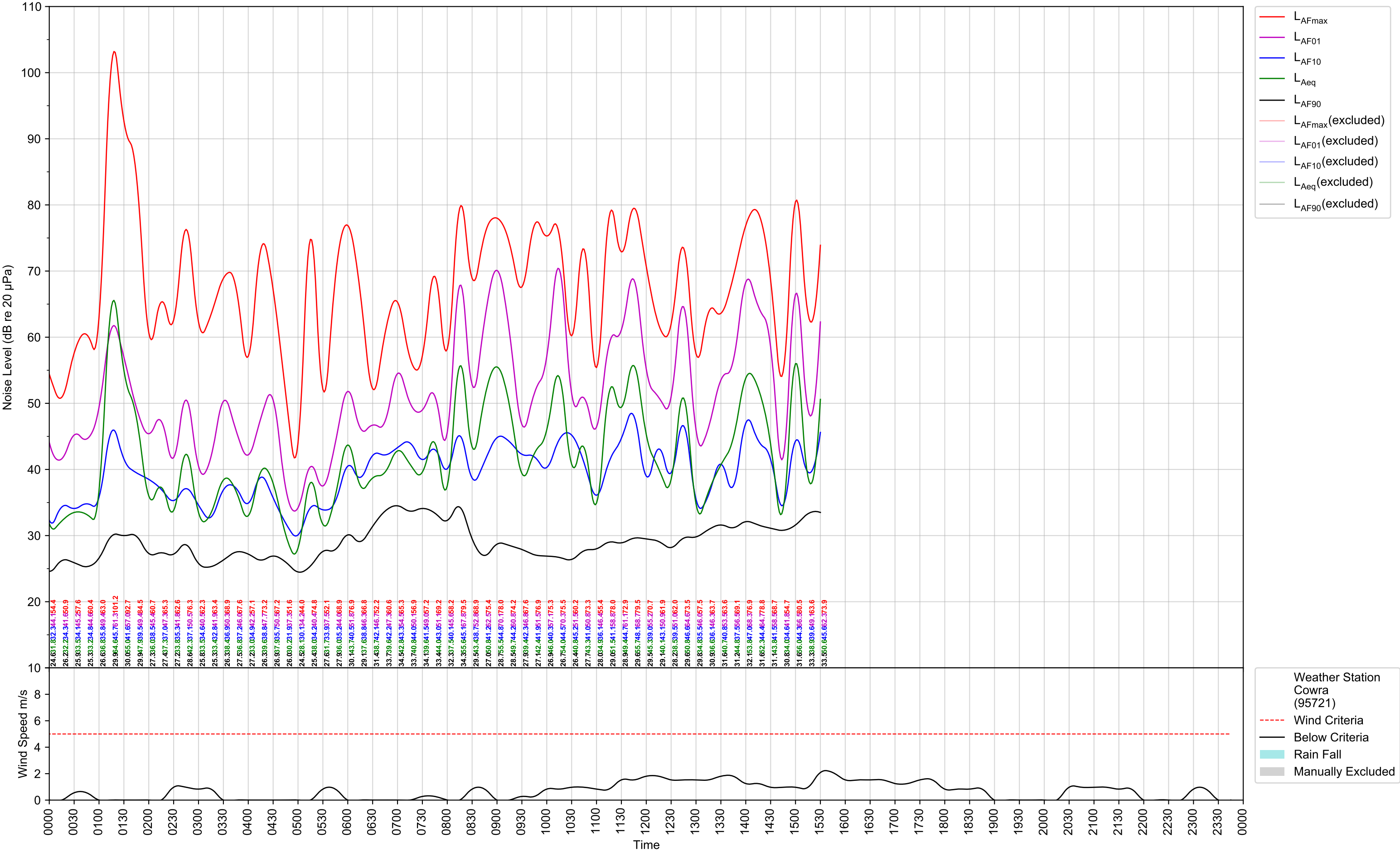
Project: Glenella Quarry
Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Sunday 17 October 2021



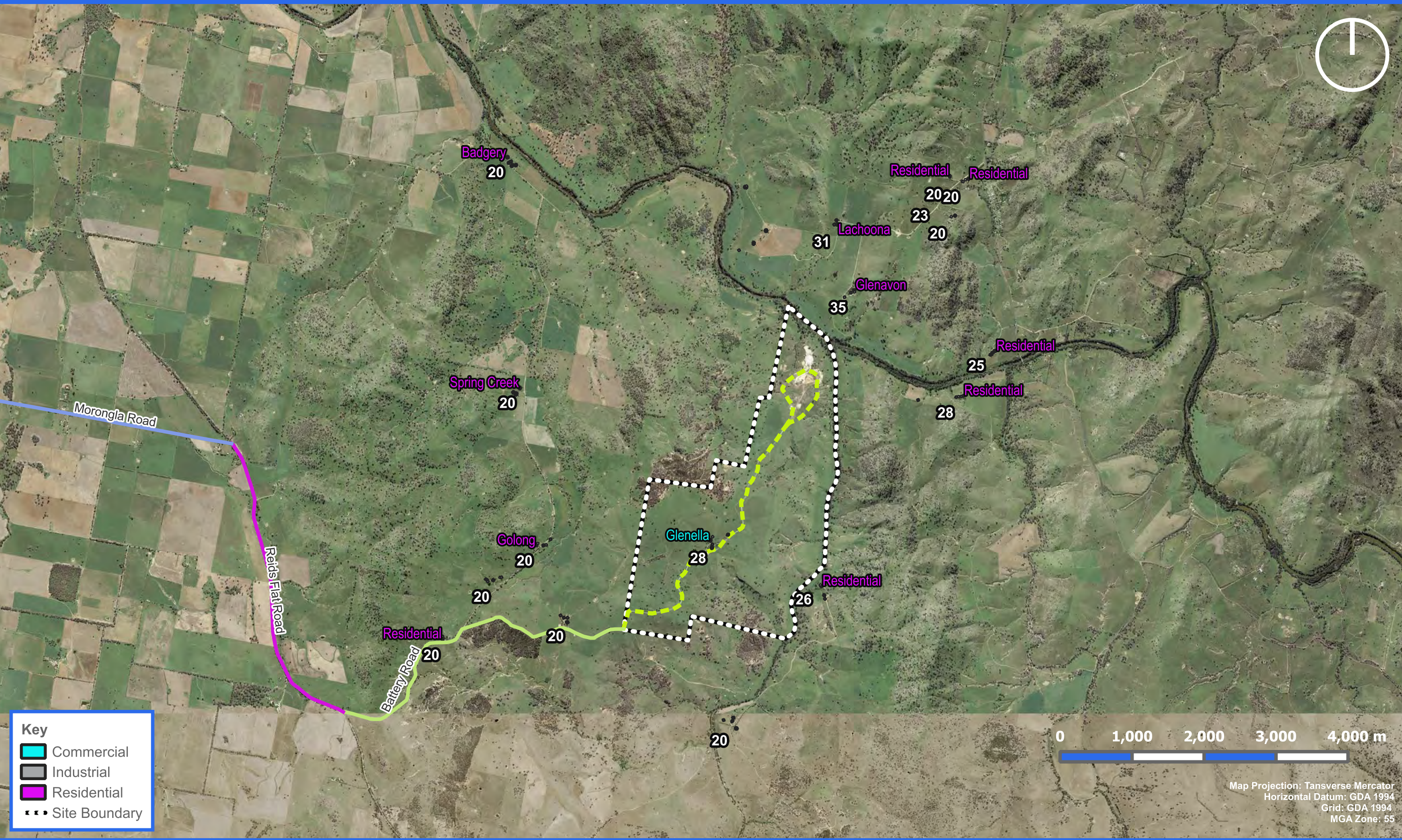
Project: Glenella Quarry
Project Number: 60.00893.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: 0.50 dB
Post Calibration: 0.16 dB
Location: Glen Avon Road, Darby Falls, NSW

Graphical Noise Logger Data
Date: Monday 18 October 2021





APPENDIX B: NOISE LEVEL MAP



Key

- Commercial
- Industrial
- Residential
- Site Boundary



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994
MGA Zone: 55

Imagery courtesy of NSW Imagery

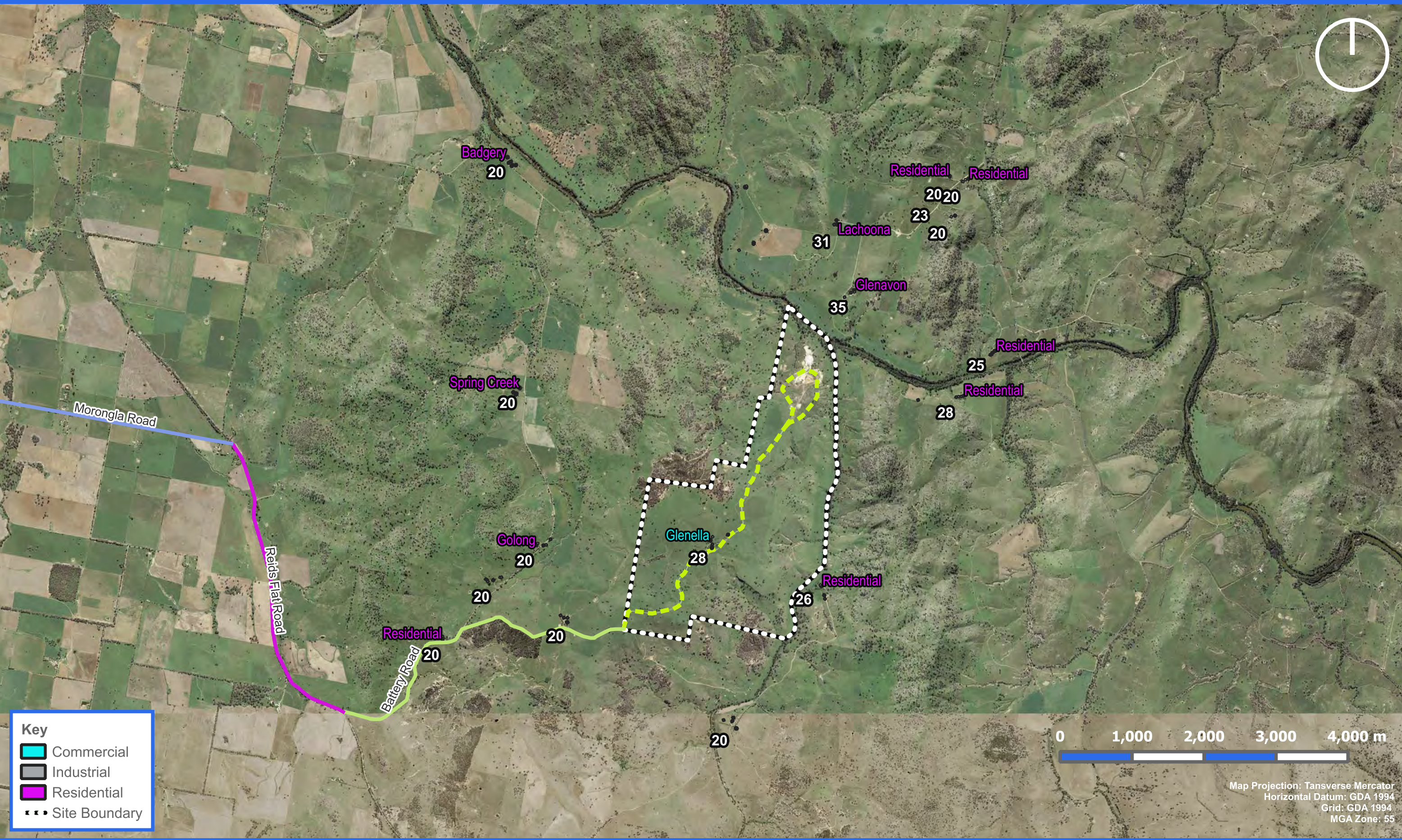
Glenella Quarry - Proposed Production Increase 483 Battery Road, Cowra, NSW

Operational Noise Levels - $L_{Aeq,15min}$ Daytime (during site operations)



Waves
CONSULTING

Project Number: 60.00893.03
Date: 24 November 2025
Revision: 01
Prepared by: TC



Key

- Commercial
- Industrial
- Residential
- Site Boundary



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994
MGA Zone: 55

Imagery courtesy of NSW Imagery

Glenella Quarry - Proposed Production Increase 483 Battery Road, Cowra, NSW

Operational Noise Levels - LAeq,15min Evening (during site operations)

Waves
CONSULTING

Project Number: 60.00893.03
Date: 24 November 2025
Revision: 01
Prepared by: TC

13 January 2026

General Manager

- Cowra Council
- Hilltops Council

Dear Sir,

PROPOSED SECTION 4.55(2) MODIFICATION : GLENELLA QUARRY, COWRA

Outline Planning Consultants Pty Ltd act for Glenella Quarry Pty Ltd, the quarry operator/owner, to prepare the accompanying Statement of Environmental Effects (SEE) report to both Cowra and Hilltops councils pursuant to the provisions of Section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). It seeks modifications to Development Application No. 73/2007 (Cowra) and Development Application No. 117/06 (Hilltops) covering to 54 hectares (ha), 29 ha of which is located within the Hilltops local government area (LGA) with the remaining 35 ha located within the Cowra LGA as set out below:

Part of Approved Quarry in Cowra LGA	Part of Approved Quarry in Hilltops LGA
Lots 35 & 44 DP 752935 (approx. 35ha)	Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 (approx. 29ha)

The proposed s.4.55(2) modification seeks approval to the following:

- An increase in the maximum allowable rate of extraction at Glenella Quarry, from the current 200,000 tonnes per annum to 499,000 tonnes per annum.
- The existing development consents (above) allow for a maximum of 35 loaded trucks per day leaving the quarry/mine site. This s.4.55(2) modification application seeks an increase to 50 loaded trucks per day, an increase of 15 loaded trucks per day or an average increase of 1.5 loaded trucks per day.
- Changes to permitted daytime noise levels and monitoring. The changes to noise limits also has the benefit of bringing the quarry/mine operation in line with the current NSW *Noise Policy for Industry* (2017), which came into force some 10 years after the above consents were issued.

Importantly, no changes are proposed to the currently approved quarry operation generally, and in particular in terms of the approved quarry extraction area, size of the resource to be won, or operating hours, other than to allow the winning of heavy minerals- a by product of the already approved sand processing operations, and deletion of dust monitoring.

The SEE report and accompanying specialist reports provides the information required by Clause 100 of the *Environmental Planning & Assessment Regulation 2021* (EP&A Regulation 2021).

Yours sincerely



GARY PEACOCK

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Proposed Modification of
Glenella Quarry

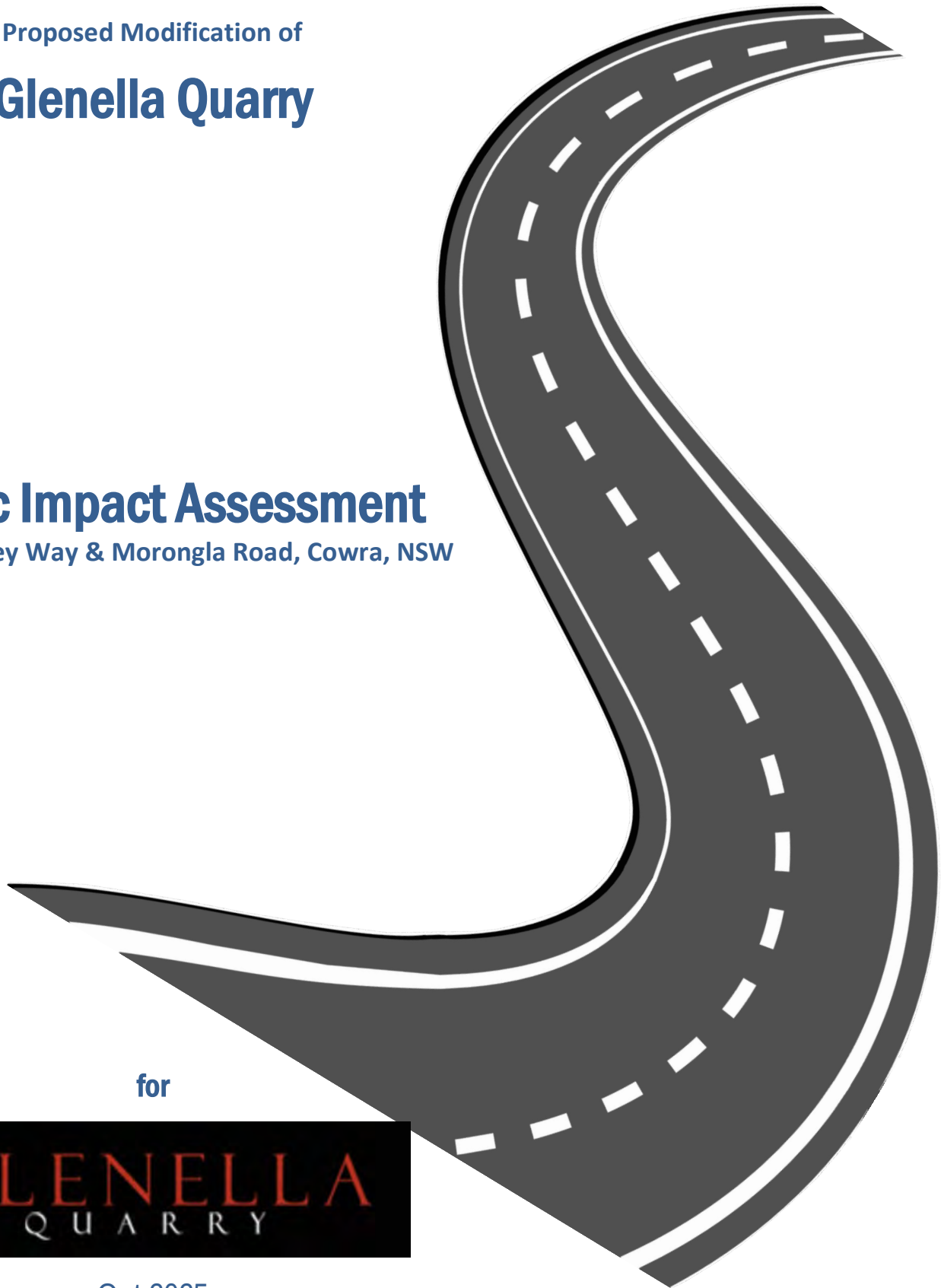
Traffic Impact Assessment

Lachlan Valley Way & Morongla Road, Cowra, NSW

for



Oct 2025



Traffic Impact Assessment Details

Generic Document No.			
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CONTENTS

1.	INTRODUCTION.....	4
2.	PROPOSED DEVELOPMENT	4
3.	SITE LOCATION.....	4
4.	REFERENCES.....	5
5.	COUNCIL BOUNDARIES.....	5
6.	EXISTING ROAD NETWORK.....	6
6.1	Local Roads.....	6
6.2	Intersections	8
7.	TRAFFIC VOLUMES	10
7.1	Manual Traffic Count (May, 2023).....	10
7.2	Council Traffic Volumes (2022).....	11
7.3	Adopted Traffic Volumes (2025).....	12
7.4	Future Traffic Volumes (2035)	12
7.5	Quarry Generated Traffic Volumes.....	13
7.6	Distribution of Quarry Generated Traffic Movements.....	14
8.	INTERSECTION ASSESSMENT	15
9.	HAULAGE ROAD.....	15
9.1	Current Approvals and Voluntary Planning Agreements	16
9.2	Site Inspection.....	16
9.3	Existing Haul Route Traffic Volumes	19
9.4	Road Condition.....	20
9.5	E.S.A Impacts.....	21
9.6	Speedzone Assessment	22
9.7	Crash History.....	22
10.	PUBLIC TRANSPORT	23
11.	ASSESSMENT SUMMARY	23
12.	RECOMMENDATIONS.....	25
	Appendix A: Proposed Layout of Future Glenella Quarry.....	28
	Appendix B: Proposed Upgrade of Lachlan Valley Way at Intersection with Morongla Road	30
	Appendix C: Except from Glenella Quarry 'Driver Code of Conduct'.....	32
	Appendix D: Except from m Existing Voluntary Planning Agreement.....	34



1. INTRODUCTION

StreetWise Road Safety & Traffic Services Pty Ltd (StreetWise) have been engaged by Glenella Quarry to prepare a Traffic Impact Assessment for an existing quarry at Battery Road, Cowra. The traffic impact assessment is required to support a proposed s.4.55 modification of Glenella Quarry, which will result in increased daily truck numbers from a current approved maximum of 35 loads per day to 50 loaded trucks per day.

This report presents the findings of the traffic assessment and includes the following;

- Site Inspection including inspection of local road network.
- Liaise with Council Traffic / Development Engineers, Client or Client's representative.
- Determine peak operation traffic generation for the nominated / recognised design vehicles.
- Assess traffic impacts on the Lachlan Valley Way & Morongla Road intersection.
- Complete Intersection Assessment for the intersection of Lachlan Valley Way & Morongla Road to determine future Level of Service and Capacity for its existing operation and into the future based on the predicted future quarry modification.
- Determine the impacts that the quarry- generated traffic may have on the local road network (i.e. Lachlan Valley Way, Morongla Road, Reid Flat Road and Battery Road)
- Complete a visual assessment of the haul route (i.e. the quarry site to the Lachlan Valley Way via Morongla Road and Battery Road) to observe any existing or potential road safety issues as a result of the development.

2. PROPOSED DEVELOPMENT

This traffic assessment is to support a proposed s.4.55 modification of the existing Glenella Quarry at Cowra. The proposal includes:

- the continuation of an existing quarry for up to 30 years
- an increase in the rate of extraction from 200,000 tonnes per annum (tpa) to 499,000 tpa;
- transporting products via public roads at a maximum rate of 50 laden heavy vehicles per day; and
- progressively rehabilitating the site.

The existing quarry currently generates haulage truck movements between the quarry site and Lachlan Valley Way, via Morongla Road, Reids Flat Road and Battery Road. This report will assess the existing haulage route, and its suitability for the proposed increase in haulage movements. Glenella Quarry is not proposing to change the hours of operation for product loading and transport activities.

3. SITE LOCATION

The subject site is an existing quarry at 483 Battery Road, Cowra 2794 (Lot 35 & 44 DP 752935 - Cowra LGA; and Lots 1-3 DP795553, Lot 106 DP 752935 and Lots 27, 28, 63 & 123 DP 754584 - Hilltops LGA).

The property on which the existing quarry is located is approximately 700ha in area and located approximately 25kms south-east of the Cowra CBD.





Figure 3.1 – Locality Plan

4. REFERENCES

The following references have been used as part of this Traffic Impact Assessment

- Cowra Council DCP 2021,
- Hilltops Council DCP 2025,
- TfNSW Guide to Traffic Generating Developments,
- TfNSW Guide to Transport Impact Assessment (GTIA 2024)

5. COUNCIL BOUNDARIES

The existing Glenella quarry straddles the boundary between the Cowra local government area (LGA) and that of the Hilltops LGA, while the majority of the roads that make up the approved haul route, including Lachlan Valley Way, are located within the Cowra Council boundaries.

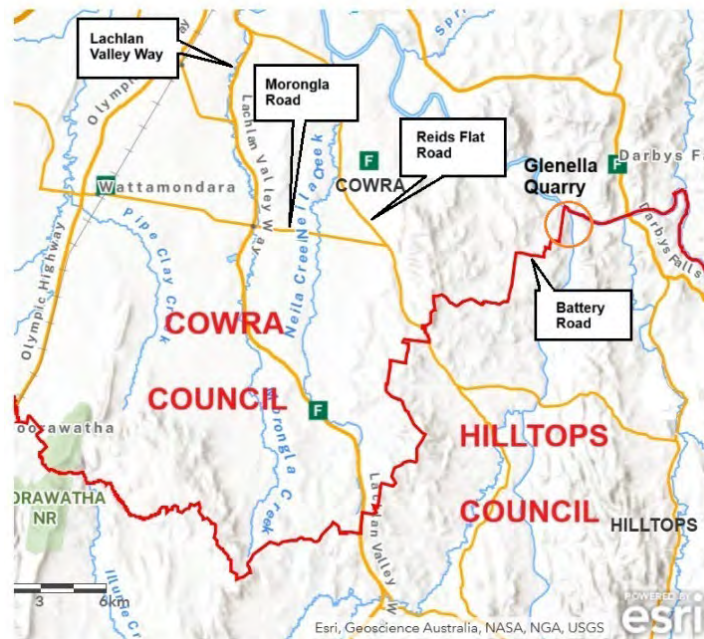


Figure 5.1: Plan showing council boundaries near the existing Glenella Quarry

6. EXISTING ROAD NETWORK

The existing quarry is located within a rural precinct, approximately 20 minute drive from the Cowra township. The roads in the immediate vicinity of the quarry are low volume, rural roads owned and maintained by the local council. The local roads which make up the existing haul route connect with Lachlan Valley Way approximately 12 kms to the west of the quarry.

6.1 Local Roads

6.1.1 Lachlan Valley Way

Lachlan Valley Way (B81) is a major rural road in New South Wales, Australia, running through the Lachlan Valley, an agricultural region known for grain, livestock, and irrigation farming. The total length of Lachlan Valley Way is 320kms, running generally east-west between Cowra and Booligal (and Cobb Hwy).

Lachlan Valley Way passes through or near a series of rural towns and farming communities, including:

- Cowra – a regional centre known for vineyards, agriculture, and the Japanese Garden.
- Gooloogong – a small rural village with strong community ties.
- Forbes – a historic gold rush town on the Lachlan River.
- Condobolin – the geographic centre of NSW, serving a large farming district.
- Hillston – an agricultural hub on the Lachlan River, known for cotton and citrus farming.
- Booligal – a village on the Lachlan River (north of Hay in the Riverina area) which is located on the Cobb Highway.

To the south of the quarry, Lachlan Valley Way runs through Boorowa and intersects with the Hume Highway, which connects to projects further afield including Yass, Canberra and Sydney. Lachlan Valley Way is also the main southern access to the Hilltops Shire, which is a major customer of Glenella Quarry's products.

Lachlan Valley Way is owned and maintained by the NSW state government (TfNSW) is predominantly a two-lane sealed rural highway, with generally light to moderate, mostly agricultural and local transport.



Figure 6.1: Lachlan Valley Way, looking south from the intersection with Morongla Road

Lachlan Valley Way is a TfNSW-designated B-double route. Although variable over its length, Lachlan Valley Way generally comprises a 7m to 8m wide sealed pavement, with a 1m to 2m shoulder, and centreline marking. Guideposts are also provided, as well as tabledrains where required.

Inspection of the road between Morongla and Cowra found that conditions are generally good, with some minor pavement edge break-off observed. The speed limit is generally 100kmh but reduced to 80km/hr for a distance of approximately 800m through the subject intersection with Morongla Road.

6.1.2 Morongla Road

Morongla Road (east) is approximately 6.1km in length and extends from Reids Flat Road in the south to Lachlan Valley Way in the north. A further section of Morongla Road also extends on the western side of Lachlan Valley Way. The carriageway is generally 5.3m to 6.2m (predominantly 5.5m) wide sealed pavement, providing 1 lane in either direction, with variable width sealed shoulders and roadside tabledrains. The speedzone of Morongla Road is 100km/hr.



Figure 6.2: Morongla Road, looking east across intersection with Lachlan Valley Way

Morongla Road serves as an important local connector between the regional centre of Cowra and the rural locality of Morongla Creek (south-east of Cowra). Morongla Road is a regional road (RR237) which is owned by Cowra Shire Council, with some funding for maintenance provided by the NSW state government (TfNSW).

6.1.3 Reids Flat Road

Reids Flat Road is a rural road that runs through farming and grazing country, linking the towns of Crookwell and Wyangala (near the Wyangala Dam) via Bigga and Reids Flat. The road is generally

two-lane, undivided rural road without line marking in some parts. The subject section of Reids Flat Road is sealed (bitumen). The speed zone is currently marked as 100km/h to the Battery Rd intersection. The previous intersection upgrade approval states it should be 80km/h between Morongla Rd and Battery Rd.

Traffic volumes are low, mainly consisting of local residents, farm vehicles and tourists (Wyangala Dam for fishing and camping etc). The road is owned and maintained by Cowra Council.



Figure 6.3: Reids Flat Road, looking south near Morongla Road

6.1.4 Battery Road

Battery Road is a rural road in the Cowra Shire, NSW. The area along Battery Road is mostly agricultural / rural land (farms, grazing, mixed farming) with large land lots. The roadway is sealed and varies in width between 5.5 – 6.5m, with minimal width sealed shoulders. The roadway is signposted at 60kmh and generally includes centreline marking. Battery Road is generally undulating, and the horizontal alignment includes numerous curves, many of which are sign posted with reduced speeds. The majority of Battery Road is in Hilltops Shire, who have recently undertaken roadworks to upgrade Battery Road, and will provide ongoing maintenance of the road.



Figure 6.4: Battery Road, looking south near entry to Glenella quarry

6.2 Intersections

6.2.1 Lachlan Valley Way & Morongla Road

The intersection of Lachlan Valley Way and Morongla Road is a 4-way intersection with 1 lane in either direction on all 4 legs. The layout does not include any auxiliary lanes, or other widening to assist turn movements. Give Way signs on the side roads give priority to the major road (Lachlan Valley Way). Centrelines and edge lines are painted on Lachlan Valley Way, but no delineation on Morongla Road. The intersection

does not currently include streetlighting. The posted speed limit on Lachlan Valley Way reduces from 100kmh to 80kmh for approximately 400m at both approaches to the intersection.



Figure 6.5: Intersection of Lachlan Valley Way & Morongla Road looking south (L) and north (R)

The existing intersection of Lachlan Valley Way and Morongla Road has been reviewed recently in relation to a separate Development Application, and the layout is to be upgraded in the near future. Discussion in regard to the intersection upgrade have included Transport for New South Wales and Cowra Council. A concept layout for the intersection upgrade is included at the rear of this report.

6.2.2 Morongla Road & Reids Flat Road

The intersection of Morongla Road and Reids Flat Road is a 3-way intersection with 1 lane in either direction on all 3 legs. The layout has recently been upgraded, with a large radius curve now connecting Morongla Road to Reids Flat Road (south), with Reids Flat Road (north) being the minor leg (see Figure 6.6 below).

The intersection did not include any linemarked centrelines or edge lines at the time of inspection. The intersection does not currently include streetlighting. The posted speed limit on Morongla Road is 100kmh.

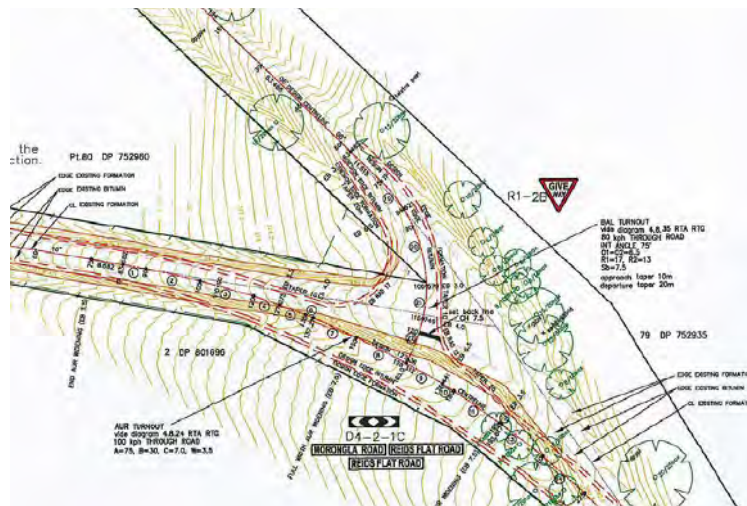


Figure 6.6: Design plans showing upgrade of the intersection of Reids Flat Rd & Morongla Rd



Figure 6.7: Intersection of Morongla Road & Reids Flat Road – previous (L) & upgraded (R)

6.2.3 Reids Flat Road & Battery Road

The intersection of Reids Flat Road and Battery Road is a 3-way intersection with 1 lane in either direction on all 3 legs. The third leg of the layout is Bennetts Spring Road (see Figure 6.6 below). As can be seen in Figure 6.9 below, a centreline is provided through the intersection, while a STOP sign is located on the minor road (Battery Road). Chevron barrier boards are located opposite Battery Road, while destination signage is also provided.

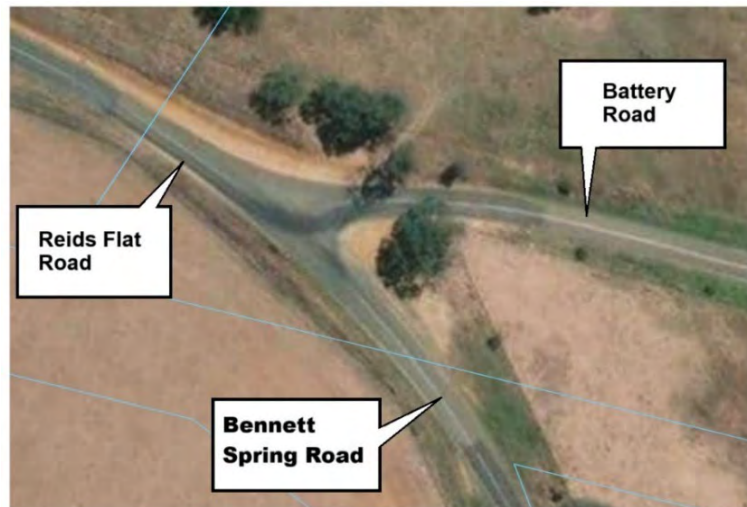


Figure 6.8: Aerial photo showing intersection of Reids Flat Rd & Battery Rd



Figure 6.9: Intersection of Reids Flat Rd & Battery Rd looking south (L) and west (R)

The key intersection potentially impacted upon by the project is the intersection of Lachlan Valley Way and Morongla Road and the assessment by traffic consultants (SECA Solution) demonstrates that the existing controls at this intersection, which allow for BAR / BAL control can continue to allow for the current and projected traffic movements at this location. A Works Authorisation Deed (WAD) entered into by Glenella Quarry Pty Limited and Transport for NSW (TfNSW) for the upgrading of the intersection of Morongla Road and Lachlan Valley Way includes the widening of Lachlan Valley Way, the provision of regulatory signposting, provision of sealed pavements and line marking to accommodate the swept paths of heavy vehicles.

7. TRAFFIC VOLUMES

7.1 Manual Traffic Count (May, 2023)

A manual traffic count was undertaken at the intersection of Lachlan Valley Way and Morongla Road on 31 May 2023. The counts indicated traffic volumes are low in this area, with a total of 96 vehicles per hour, with a heavy vehicle percentage of 18 – 19%. The peak hours are:

Morning	8:00 – 9:00am
Afternoon	5:00 – 6:00pm

	1	2	3	4	5	6	7	8	9	10	11	12	
	Lachlan Valley Way (Northbound)			Morongla Rd (westbound)			Lachlan Valley Way (Southbound)			Morongla Rd (eastbound)			
	Light	Hwy		Light	Hwy		Light	Hwy		Light	Hwy		
9:00 to 9:15	1	0	0	0	0	0	0	0	0	0	0	0	23
9:15 to 9:30	0	0	0	0	0	0	0	0	0	0	0	0	19
9:30 to 9:45	1	0	0	0	0	0	0	0	0	0	0	0	28
9:45 to 10:00	1	0	0	0	0	0	0	0	0	0	0	0	25
	3	0	0	0	0	0	0	0	0	0	0	0	95

	1	2	3	4	5	6	7	8	9	10	11	12	
	Lachlan Valley Way (Northbound)			Morongla Rd (westbound)			Lachlan Valley Way (Southbound)			Morongla Rd (eastbound)			
	Light	Hwy		Light	Hwy		Light	Hwy		Light	Hwy		
9:00 to 9:15	0	0	0	0	0	0	0	0	0	0	0	0	23
9:15 to 9:30	1	1	0	0	0	0	0	0	0	0	0	0	11
9:30 to 9:45	0	1	0	0	0	0	0	0	0	0	0	0	24
9:45 to 10:00	0	0	0	0	0	0	0	0	0	0	0	0	16
	1	1	0	0	0	0	0	0	0	0	0	0	

Figure 7.1: Summary of traffic count at intersection of Lachlan Valley Way & Morongla Rd

Given that the manual traffic count was undertaken in 2023, the above volumes should be adjusted using an annual growth factor. Council's website indicates population growth rates have varied over the past few years between -0.5% and 1.6 %. Based on this data, StreetWise have adopted an annual growth rate of 1.0% p.a, with the following diagrams showing adjusted volumes for 2025.

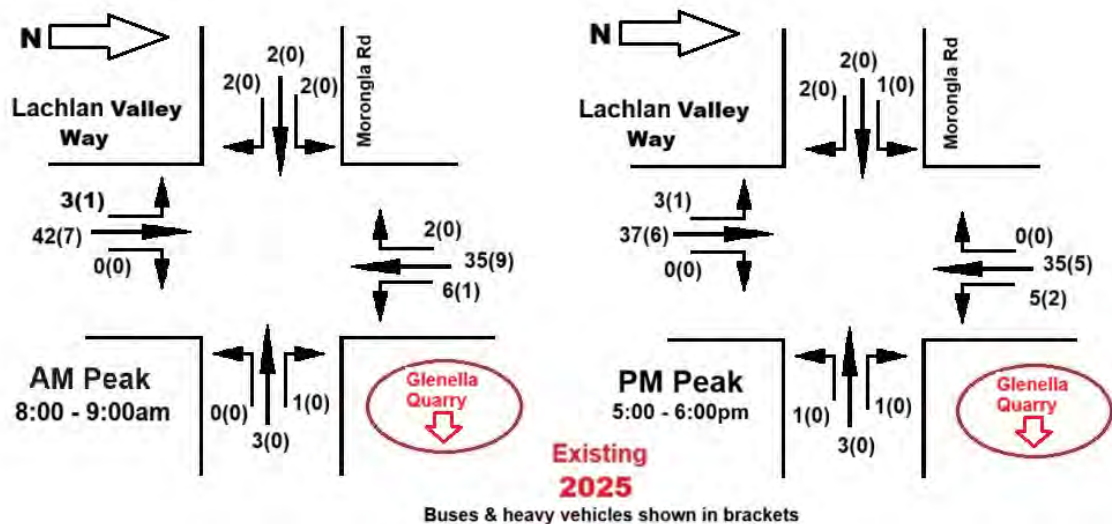


Figure 7.2: Existing volumes through intersection of Lachlan Valley Way & Morongla Rd

7.2 Council Traffic Volumes (2022)

Cowra Council provided the following daily traffic volumes for the intersection of Lachlan Valley Way and Morongla Road. The information shows total daily traffic volumes (AADT) on all 4 legs of the intersection (i.e. a total of both directions). The information was collected via tube counters over a number of weeks (October – November 2022). A guide to peak hour volumes can be obtained by dividing the AADT by 10.

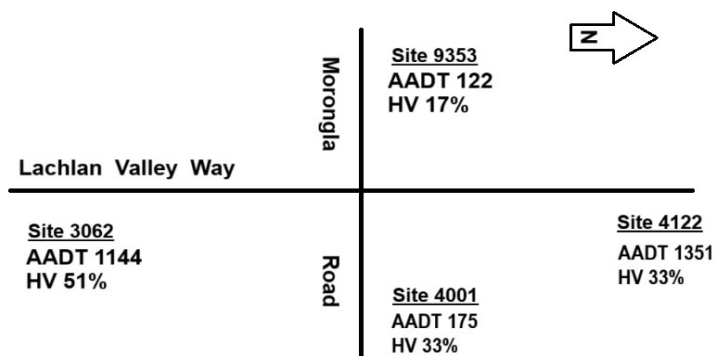


Figure 7.3: Daily volumes through intersection of Lachlan Valley Way & Morongla Rd (2022)



7.3 Adopted Traffic Volumes (2025)

As can be seen from the traffic volumes above, the peak hour volumes (2023) from the manual traffic counts are generally less than the estimated peak hour volumes from Cowra Council's AADT counts (2023). This may be due to the manual count not being undertaken on the peak day of the week or missing the actual peak hour. Therefore, for the purposes of this assessment, StreetWise have adopted the AADT volumes provided by Cowra Council, and adjusted the numbers using the following method:

- Add 1% annual growth to the AADT volumes x 3 years (i.e. adjust 2022 to 2025)
- Divide the AADT volumes by 10 to obtain approximate peak hour volumes
- Apply the ratio of existing movements obtained at the manual count

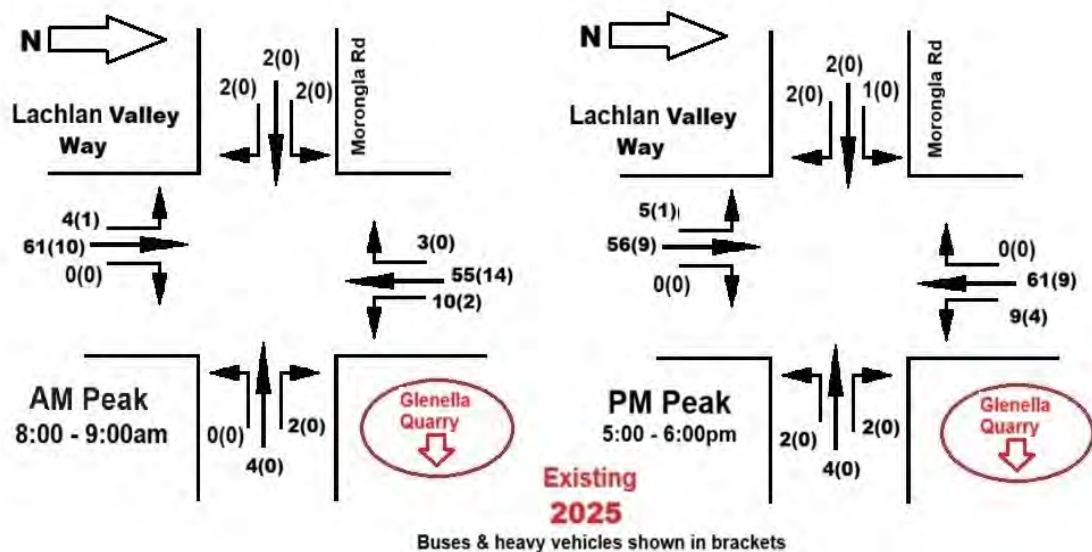


Figure 7.4: Adjusted peak hour volumes through intersection of Lachlan Valley Way & Morongla Rd (2025)

7.4 Future Traffic Volumes (2035)

Figure 7.5 below shows the estimated future (2035) traffic volumes through the intersection of Lachlan Valley Way and Morongla Road. The volumes are calculated using existing volumes and applying 1% annual growth for 10 years into the future. The estimated volumes do not include traffic increases due to the proposed modification of the Glenella Quarry.

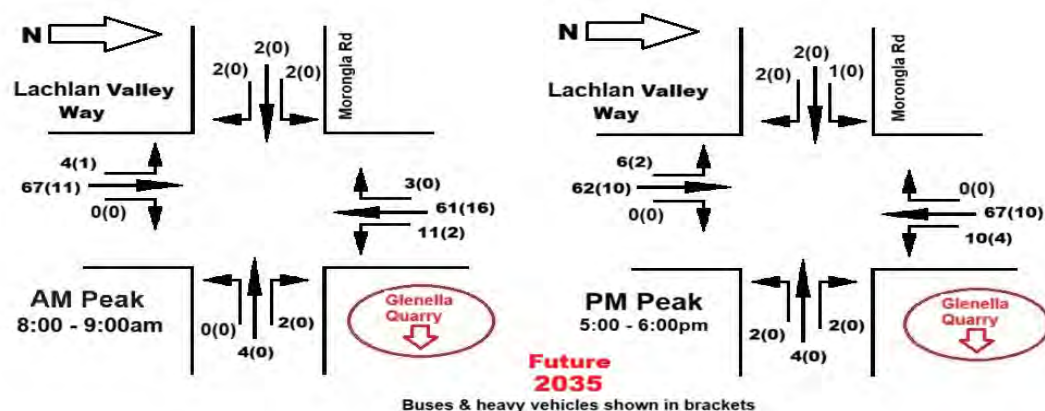


Figure 7.4: Estimated future peak hour volumes through intersection of Lachlan Valley Way & Morongla Rd (2035)

7.5 Quarry Generated Traffic Volumes

The majority of quarry material won from the existing Glenella Quarry is used for a range of purposes, primarily as a roadbase or select fill servicing local and regional infrastructure projects. The existing operation generates a mix of truck and dog combinations (32 & 37.50 tonnes) to haul the quarry material, with occasional use of larger (42 tonne truck and dog) and smaller trucks used where road weight limits allow. The table below (Figure 7.5) shows the average number of laden quarry truck movements generated by the existing quarry operation (max. of 200,00 tonnes per year) compared with the proposed future operation (499,00 tonnes per year), for both 32 and 42 tonne capacity haulage trucks.

Glenella Hard Rock Quarry	Average Output - Existing		Average Output - Proposed	
Annual Output (Tonnes)	200,000		499,000	
Vehicle capacity (Truck & dog (tonnes))	32	42	32	42
Average no. of laden trucks per year	6250	4762	15594	11881
Available working weeks per year	48	48	48	48
Maximum working hours per week	59	59	59	59
Average no. of laden trucks per week	130	99	325	248
Average no. of laden trucks per weekday	26.0	19.8	65.0	49.5
Average no. of laden trucks per hour	2.6	2.0	6.5	5.0

Figure 7.5: Average number of haulage movements generated by quarry

The above table showing average haulage vehicle movements is based on the currently approved hours of haulage operation i.e.

- 7.00am to 5.00pm (Monday to Friday)
- 7.00am to 4.00pm (Saturdays)
- No Work Sundays

Figure 7.6 below shows the currently approved hours of operation for a range of activities at Glenella Quarry. Note that loading is permitted 7.00am - 10.00pm Mon-Fri and 7.00am - 4.00pm on any Saturday.

Activity	Monday to Friday	Saturday	Sunday/public holidays
Extraction of the resource	7.00am- 5.00pm	7.00am- 3.00pm	Not permitted
Blasting	9.00am- 5.00pm	Not permitted	Not permitted
Crushing of the resource	7.00am- 6.00pm	7.00am- 3.00pm	Not permitted
Loading	7.00am- 10.00pm	7.00am- 4.00pm	Not permitted

Figure 7.6: Currently approved hours of operation at Glenella quarry

The following should be considered:

- The haulage trip numbers shown in Figure 7.5 above are a maximum trips per year only, and the actual number of haulage trips per year is likely to be less than shown in the table.
- The current maximum number of laden haulage trips is 35 per day
- It is proposed to cap the maximum number of future laden haulage trips per day to 50
- In recent years, quarry haulage vehicles have steadily been increasing in size. However, the trend appears to be more axles for increased payloads, but less weight per axle i.e. while haulage trucks are increasing in size, the impacts on road pavements are decreasing, due to spreading the load over more axles.

7.6 Distribution of Quarry Generated Traffic Movements

7.6.1 Haulage Vehicles

As discussed above, the maximum number of laden truck movements generated by the proposed modifications to the quarry operations is 50 per day, or 100 trips (laden out and empty return) per day. This averages out to 5 per hour (or 10 return) per hour for a 10 hour working day. Given that there are likely to be more haulage trips in the morning than the afternoon when servicing roadworks or other civil projects, StreetWise have rounded up the maximum number of morning trips generated by the quarry to 8 laden (or 16 return) per hour. Note that the quarry currently generates an average of 2 – 3 laden truck movements per hour i.e. the estimated increase in laden truck movements at peak times will be around 5 per hour.

The existing Glenella Quarry currently provides quarry material to a number of clients in the Cowra area for a range of civil projects, as well as locations in the Central West and South West Slopes & Plains. The location of these projects has varied over the years, but according to the quarry operator, the destinations are generally split evenly between north and south of Morongla Road i.e. over any reasonable length of time, 50% of the haulage trucks turn left towards Boorowa and 50% towards Cowra.

7.6.2 Staff Movements

The existing quarry employs between 5 to 8 staff, depending on client demands. The majority of the staff generally arrive at 6am and the remaining between 6.30-7.00am, with the majority of the staff leaving around 5pm. The proposed quarry modification may require up to 4 additional staff during peak operation. Based on the early start times, it is unlikely that staff commuter movements will have much impact on the local road network during the morning peak hour. However, the proposal may add 4 outward trips to the afternoon peak hour. Quarry staff generally live in Cowra, or within a short drive of the quarry, and most commute via Reids Flat Road (i.e. not Morongla Road). However, for the purposes of this assessment, the distribution of movements through the intersection of Lachlan Valley Way and Morongla Road has been adopted as 50% from the north and 50% from the south.

7.6.3 Other Vehicle Movements

The existing quarry also generates a number of light to medium sized vehicle movements per day, including fuel trucks, water trucks, service vehicles, couriers etc. These movements are included in existing traffic counts, and there is unlikely to be any significant increases in the future.

As can be seen in Figure 7.6 below, the proposed quarry modification will generate an estimated maximum of 16 turn movements through the existing intersection of Lachlan Valley Way and Morongla Road during the morning peak hour, and around 10 movements during the afternoon peak hour. Given the current low volumes through the intersection during peak hours (145 total vehicles), StreetWise consider the layout has adequate capacity to cater for the additional haulage movements with minimal impact on efficiency or safety.

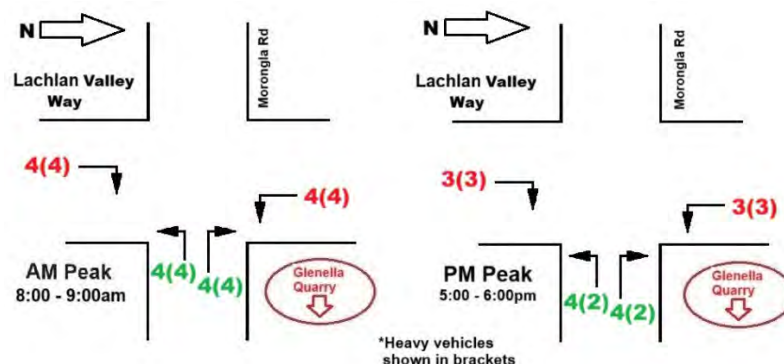


Figure 7.6: Estimated peak hour haulage movements to be generated by quarry

8. INTERSECTION ASSESSMENT

Figure 7.4 above indicates that less than 160 vehicles will pass through the existing intersection of Lachlan Valley Way and Morongla Road in the future (2035), based on current volumes and 1% per annum growth. The estimated increase in vehicle movements due to the proposed modification of the Glenella Quarry is a maximum of 16 (Figure 7.6), which means that the total number of peak hour movements through the intersection will be less than 180.

Given that previous versions of Austroads stated that computer modelling was not required for intersections with total volumes of 400 per hour, StreetWise consider that computer modelling (SIDRA) is not required for the intersection of Lachlan Valley Way and Morongla Road.

StreetWise have utilised the Austroads Intersection Warrant (Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings) for an 80kmh speedzone. As shown in Figure 8.1 below, the future peak hour traffic volumes, including the estimated additional quarry generated movements, only require a BAR / BAL intersection. In simple terms, this would require widening of the intersection to allow vehicles on Lachlan Valley Way adequate width to safely pass any vehicles slowing, queuing or turning into Morongla Road.

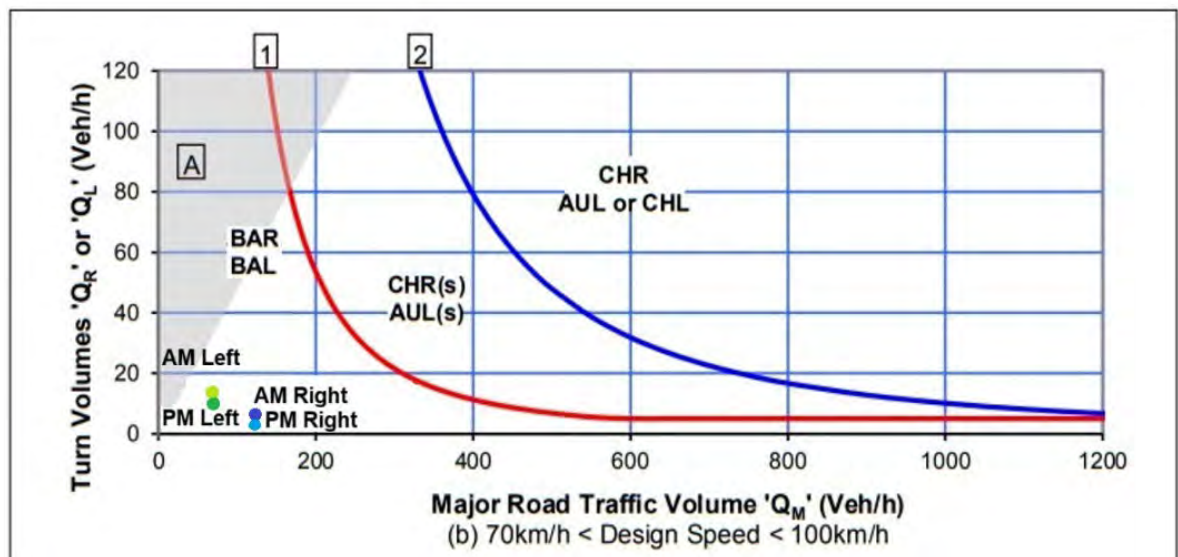


Figure 8.1: Austroads Intersection Warrant for 80kmh speedzone

9. HAULAGE ROAD

The approved quarry haul route runs from the quarry back along the local road system, administered by Cowra Shire Council, with a small section within the Hilltops LGA, to Lachlan Valley Way and thence to markets beyond. In accordance with the consents issued the following road upgrades have been carried out:

- The intersection of Battery, Reids Flat and Bennett Springs Roads constructed to maintain the priority of through traffic along Reids Flat and Bennet Springs Roads, with Battery Road forming the terminating leg of the intersection. Included the installation of regulatory signposting and appropriate warning signs to warn drivers of the intersection as well as the 'STOP' control in Battery Road, painted median with rumble bar inserts on the Battery Road approach to the intersection, line marking, and provision of sealed pavement at the intersection to accommodate the swept paths of heavy vehicles.
- The intersection of Reids Flat and Morongla Roads constructed to maintain the priority of through-traffic along Reids Flat Road with Morongla Road forming the terminating leg of the intersection. Included the installation of regulatory signposting, line marking, and provision of sealed pavement at the intersection to accommodate the swept paths of heavy vehicles.

- Two (2) box culverts located on Morongla Road have been widened, with a compacted road base and overlay.
- Thirteen (13) box culverts located on Reids Flat Road have been widened, with a compacted road base and overlay.
- Glenella Quarry Pty Limited has entered into a planning agreement with Cowra Shire Council to contribute to the upgrading of Morongla and Reids Flat Roads accordance with the Planning Agreement signed by Glenella Quarry Pty Limited and Cowra Shire Council.
- A Works Authorisation Deed (WAD) entered into by Glenella Quarry Pty Limited and Transport for NSW (TfNSW) for the upgrading of the intersection of Morongla Road and Lachlan Valley Way.

9.1 Current Approvals and Voluntary Planning Agreements

As part of a development consent granted by Cowra Shire Council on 6 July 2007, the quarry operator (developer) agreed to make developer contributions towards agreed roadworks. A Voluntary Planning Agreement, which outlines the works to be undertaken, the cash contributions to be paid and/or the works in kind to be undertaken, was agreed and signed by both parties.

The list of agreed roadworks (as shown in Appendix D), includes:

- Extend culverts on Reids Flat Road
- Widen and overlay Morongla Road (6.1km in 6 stages)
- Widen box culvert on Morongla Road
- Widen and overlay Reids Flat Road (3.25 km in 3 stages)

StreetWise have inspected the above sections of road as part of the overall haul road assessment, and it appears the roadworks agreed to in the VPA have not yet been completed.

9.2 Site Inspection

As discussed previously, the existing approved haulage route from the Glenella Quarry utilises:

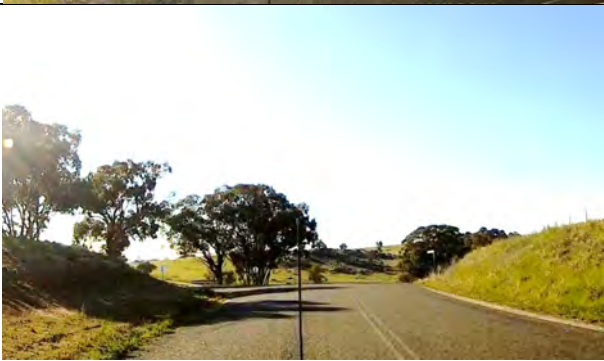
- Morongla Road – 6.20km (Lachlan Valley Way to Reids Flat Road)
- Reids Flat Road – 4.30km (Morongla Road to Battery Road)
- Battery Road – 4.9km (Reids Flat Road to Glenella Quarry Gate)

The above haulage route is 15.4kms in length and connects the existing quarry with Lachlan Valley Way. As can be seen from Figure 9.1 below, Lachlan Valley Way is an approved heavy vehicle route for trucks up to 26m B-doubles.



Figure 9.1: TfNSW Map showing Approved Heavy Vehicle Routes near Cowra

StreetWise recently undertook a visual assessment of the existing approved haulage route. The inspection was recorded via dashcam, as well as a number of photographs. The following table includes comments and photographs at various locations between the quarry and Lachlan Valley Way.

Intersection of Lachlan Valley Way & Morongla Road		- Typical BAL / BAR Rural Cross Junction Intersection layout. - There <u>is</u> adequate Safe Intersection Stopping Distance for the posted speed limit.
Intersection of Morongla Road & Reids Flat Road		- Typical BAL / BAR Rural Cross Junction Intersection layout. - There is <u>not</u> adequate Safe Intersection Stopping Distance for the posted speed limit. Advanced warning signage is installed on approach to the intersection.
Intersection of Reids Flat Road & Battery Road		- Typical BAL / BAR Rural Cross Junction Intersection layout. - There is <u>not</u> adequate Safe Intersection Stopping Distance for the posted speed limit. Advanced warning signage is installed on approach to the intersection.
Morongla Road		- AADT 400. - Morongla Road Posted Speed Limit is 100km/h. - Sealed formation varies between 6.0 to 7.0m wide. - No linemarking. - 3 major culvert /drainage structures located along the route. - <i>TfNSW Delineation Manual states the following where roads are to be linemarked.</i> a) 300 Vehicles per Day (Rural Road) b) Sealed Pavement 5.50m wide or greater. - Flat Vertical Grade (0 to 5%) - Substandard horizontal curve at Reids Flat Road intersection. (Advanced Warning & Speed Advisory Signage provided on approach)

		
Reids Flat Road	 	- Reids Flat Road Posted Speed Limit is 100km/h. Changes to 80km/h on approach to Reids Flat Road & Battery Road intersection (see photo left). - Sealed formation varies between 5.50 to 6.0m wide. - No linemarking. - 12 culvert /drainage structures located along the route. - <i>TfNSW Delineation Manual states the following where roads are to be linemarked.</i> c) 300 Vehicles per Day (Rural Road) d) Sealed Pavement 5.50m wide or greater. - Flat Vertical Grade (0 to 5%) generally increasing to a rolling grade (5 to 10%) vertical alignment in places.
Battery Road	 	- Battery Road Posted Speed Limit is 60km/h. - Sealed formation varies between 6.50 to 8.0m wide. - As a minimum Battery Road has centreline marking between Reids Flat Road and the Glenella Quarry gate. Edgeline marking is installed for a distance of 0.80km starting at the Reids Flat Road intersection. - 12 culvert /drainage structures located along the route. - <i>TfNSW Delineation Manual states the following where roads are to be linemarked.</i> e) 300 Vehicles per Day (Rural Road) f) Sealed Pavement 5.50m wide or greater. - Rolling Vertical Grade (5 to 10%) generally. The horizontal alignment includes numerous small radius curves (50 – 100m radius), some of which include crests.

		Many of the curves include signage to indicate alignment of road, with some including recommended reduced speeds (see bottom photo).
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9.3 Existing Haul Route Traffic Volumes

Current traffic volumes on the haulage route toads (Morongla Road, Reids Flat Road and Battery Road) are low, with less than 20 vehicles an hour at peak times at the Lachlan Valley Way intersection, and significantly less in the vicinity of the existing quarry – say 10 per hour (5 in each direction), which equates to an average of 6 minutes gap between vehicles. Given that the quarry will generate a maximum of 8 laden truck & dog trips per hour at peak times (or an average increase of 5 laden vehicles), the likelihood of conflict on the haul route between local vehicles and quarry-generated movements is relatively low.

StreetWise understand that the quarry operators ensure all drivers are educated in regard to the quarry's Drivers Code of Conduct, and all haulage truck drivers will be in communication via 2-way radio.

Sealed Road Width

The following table is from Austroads 'Guide to Road Design Part 3: Geometric Design' and indicates the recommended sealed width for rural roads catering for various daily traffic volumes.

Table 4.5: Single carriageway rural road widths (m)

Element	Design AADT				
	1–150	150–500	500–1000	1000–3000	> 3000
Traffic lanes ⁽¹⁾	3.7 (1 x 3.7)	6.2 (2 x 3.1)	6.2–7.0 (2 x 3.1/3.5)	7.0 (2 x 3.5)	7.0 (2 x 3.5)
Total shoulder	2.5	1.5	1.5	2.0	2.5
Minimum shoulder seal (2),(3),(4),(5),(6)	0	0.5	0.5	1.0	1.5
Total carriageway	8.7	9.2	9.2–10.0	11.0	12.0

- 1 Traffic lane widths include centrelines but are exclusive of edge-lines.
- 2 Where significant numbers of cyclists use the roadway, consideration should be given to fully sealing the shoulders. Suggest use of a maximum size 10 mm seal within a 20 km radius of towns.
- 3 Wider shoulder seals may be appropriate depending on requirements for maintenance costs, soil and climatic conditions or to accommodate the tracked width requirements for Large Combination Vehicles.
- 4 Short lengths of wider shoulder seal or lay-bys to be provided at suitable locations to provide for discretionary stops.
- 5 Full width shoulder seals may be appropriate adjacent to safety barriers and on the high side of superelevation.
- 6 A minimum 7.0 m seal should be provided on designated heavy vehicle routes (or where the AADT contains more than 15% heavy vehicles).

FIGURE 9.2 Single carriageway rural road widths (Austroads)

Traffic volume data at the intersection with Lachlan Valley Way indicates that 175 vehicles per day utilise Morongla Road, at the western end of the existing haul route. According to the Austroads table above, a rural road catering for between 150 – 500 vehicles per day should have a sealed width of 6.2m, with 1.5m shoulders both sides. Inspections by StreetWise indicates that Morongla Road's sealed width is generally 7m wide, with minimal width sealed or gravelled shoulders.

It should be noted that existing traffic volumes on Morongla Road are low. Based on the peak hour volumes (less than 20), the average gap between vehicles in either direction is a minimum of 3 minutes, which means the potential for conflict between passing vehicles is also low.

The sealed road width on Reids Flat Road and Battery Road is approximately 5.5 – 6.5m, with some narrow gravelled shoulders. Current daily traffic volumes on Reids Flat Road and Battery Road are likely to be less than 150 vehicles.

All 3 of the local roads that make up the existing approved haulage route exceed Austroads minimum lane width requirements for the current low traffic volumes, but do not include the minimum required sealed shoulders. However, unsealed shoulders are available in most locations.

Linemarking & Delineation

TfNSW Delineation Manual recommend any rural roads that have:

- a sealed width of over 5.5m
- an AADT of 300 vehicles or more

should include a painted centreline to separate opposing traffic lanes, create no-overtaking zones where there is restricted sight distance, or where potentially hazardous conditions exist.

9.4 Road Condition

The existing quarry haulage route crosses a council boundary approximately midway along the Reids Flat section of road, with Morongla Road within the Cowra Council area and Battery Road within the Hilltops Council area.

StreetWise conducted a site inspection, which included a visual assessment of Morongla Road, Reids Flat Road and Battery Road on 1 October 2025. StreetWise observed the surface of all 3 roads are generally in reasonable condition, although some existing defects were noted over the 15.4km haul route between Lachlan Valley Way and the existing quarry site. StreetWise noted a number of sections where the roads have been upgraded, including the intersection of Reids Flat Road and Morongla Road.

It should be noted that the subject roads are part of an approved quarry haulage route and have been used by quarry trucks for around 20 years. As can be seen in Figure 9.3 below, the existing roads have adequate width to safely pass laden truck & dog movements generated by the quarry. The road surface is also in good condition.





FIGURE 9.3 Looking south on Reids Flat Road, showing northbound haulage truck

9.5 E.S.A Impacts

The existing quarry haulage route crosses a council boundary approximately midway along the Reids Flat section of road, with Morongla Road within the Cowra Council area and Battery Road within the Hilltops Council area. The impact of the approved quarry on traffic and roads was considered at the time of the assessment of the 2007 EIS, approved by both Cowra and Boorowa councils. Since then, the quarry operator has upgraded access within the quarry site and along the haul route over the local road system back to Lachlan Valley Way in accordance with the VPA currently in place between the quarry operator and Cowra Council. These road improvements are of benefit to all road users, not just the quarry, and are capable of safely accommodating the small daily increase in quarry truck traffic proposed. Refer to Appendix B for details.

Reliance on larger trucks means that over the life of the quarry there is likely to be much less pavement damage than if smaller truck loads were employed. Wear and tear on a road pavement is measured by the impact of the Equivalent Standard Axles (ESAs) on that road from heavy truck traffic. This is then considered in terms of the volume of material to be won from a quarry and type of truck used to transport that load. Research shows that larger haulage vehicles carrying larger loads cause significantly less road pavement damage than smaller haulage vehicles carrying smaller payloads, measured in terms of ESAs per tonne of load. For example, a 43 tonne B-double produces 224 ESAs per 1,000 tonnes of load, and:

- Up to 58% less ESAs per 1,000 tonnes than a 2 axle rigid truck (payload up to 7.6 tonnes).
- Up to 35% less ESAs than a 3 axle rigid truck (payload up to 13.69 tonnes).
- Up to 74% less ESAs than a semi-trailer carrying between 24 to 27 tonne payloads.

(Source: Australian Trucking Association "Truck Impact Chart Technical Advisory Procedure" Developed by the ATA Industry Technical Council 2.2 edition – March 2018.)

Larger quarry trucks carrying larger loads (like that proposed), will result in demonstrably less impacts on the road pavement than that of smaller truck loads. The mere fact that there have been improvements in the carrying capacity of quarry trucks since the grant of consent for the quarry does not mean that the character of the approved use has changed. These improvements have resulted in quieter trucks, with improved braking and safety systems. Such improvements do not result in any change to the character of the use, confirmed by the NSW Court of Appeal in *Archibald v Byron Shire Council* [2003] NSWCA 292 (5 November 2003). In addition to the above, the following matters are of relevance:

9.6 Speedzone Assessment

Section 9.4.19 of the Transport for New South Wales 'Speed Zoning Standard' (TS 03631:1.0) states the following:

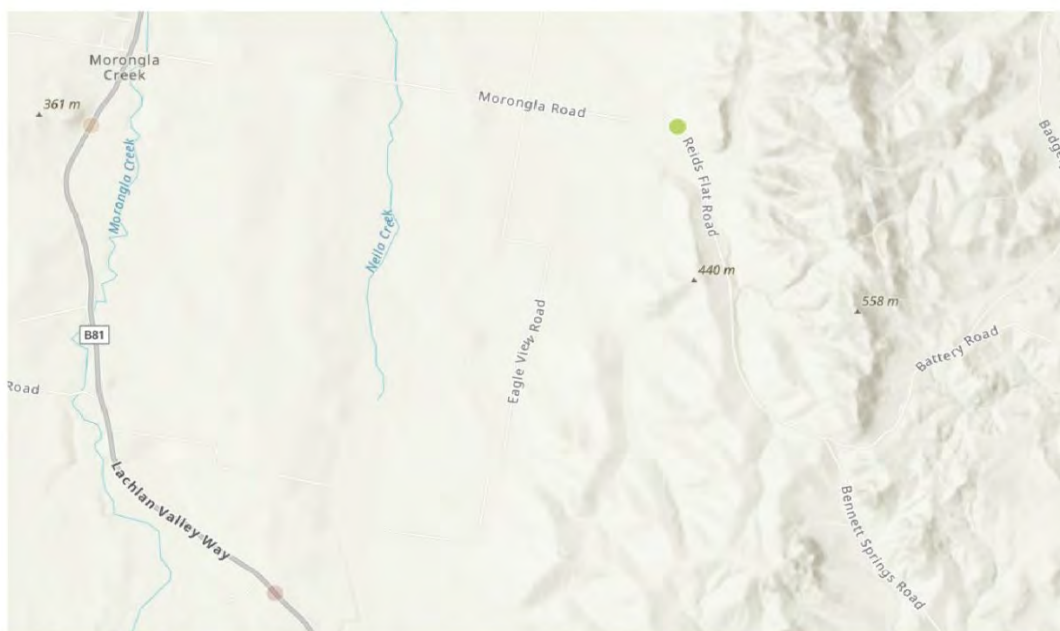
An undivided roadway with a 100 km/h speed limits shall:

- have a sealed pavement width of 9.5 m (3.5 m lanes with a BB1 centreline and 1 m sealed shoulders)..... NO
- align with TfNSW design requirements..... NO
- have less than one regularly used accesses per kilometre on both sides of carriageway, all with adequate sight distance – access should be limited to left in left out NO
- have a crash rate that does not to exceed 8.3 crashes/100 MVK, calculated with finalised crash data over a period of 5 years YES
- have a roadside that provides a good opportunity for drivers to regain control of their vehicles, and sealed shoulders and roadside safety barrier should be provided..... NO

A desktop assessment indicates the existing rural roads that make up the currently approved haul route do not meet a number of requirements for a 100kmh speedzone, particularly in regard to road width, while many of the curves do not appear to meet design guides for 100kmh. Sections of the existing haul route exceed the recommended maximum number of regularly used driveways per kilometre and the roadside in some locations are not suitable for a wayward vehicle to re-gain control. Also, StreetWise observed numerous hazards close to the sealed roadway at numerous locations, including narrow bridges, culverts, tabledrains & steep batters, large trees, fence posts etc. In summary, StreetWise do not consider the existing 100kmh speedzone is appropriate for Morongla Road, Reids Flat Road and Battery Road

9.7 Crash History

StreetWise checked the Transport for New South Wales website for both Council areas in regard to recent crashes on the existing haul roads. The website indicates there has been 1 recorded crash on the subject roads in recent years. The crash involved a vehicle losing control at the intersection of Morongla Road and Reids Flat Road in 2022, which resulted in serious injuries. It should be noted that the layout of this intersection has been changed during a recent upgrade.



Reporting year	Crash Id	Degree of crash	RUM - code	RUM - description	Type of location	Natural lighting	Longitude	Latitude	Number killed	Number injured
2022	1291024	Serious Injury	81	Off right/left bend	T-junction	Daylight	148.744747	-33.961071		1

10. PUBLIC TRANSPORT

Currently there are no regular public bus routes in the vicinity of the quarry. However, Edwards Coaches provide a daily school bus service for students in the Morongla Road, which utilise Lachlan Valley Way and part of Morongla Road. A morning service picks up school students around 8:30am and then drops kids off around 4pm in the afternoon.

There are a number of informal bus stops along Morongla Road, which are also located along the currently approved haul route. All of these 'bus stops' are unsealed with no facilities such as shelters, parking area or widening for deceleration or acceleration. Pick up and drop off locations are as located along Lachlan Valley Way.

The current 'Driver Code of Conduct' issued to all Glenella Quarry staff, including haulage truck drivers, includes information in regard to safety along the haulage route. The code informs drivers of the main residential areas along the route, as well as reminders of the location of STOP and Give Way signs, and locations where animals may be a hazard. The code also informs drivers of the school bus routes and timetables, as well as recommending a maximum speed limit for heavy vehicles of 80kmh on the haul route.

11. ASSESSMENT SUMMARY

StreetWise Road Safety & Traffic Services Pty Ltd (StreetWise) have been engaged by Glenella Quarry to prepare a Traffic Impact Assessment for an existing quarry at Battery Road, Cowra. The traffic impact assessment is required to support a proposed s.4.55 modification for modification of Glenella Quarry, which will result in increased daily truck numbers from a current allowable maximum of 35 loads per day to 50 loaded trucks per day.

The subject site is an existing quarry at 483 Battery Road, Mount Collins (Lot 63 DP754584). It is located within the Cowra Council area, and approximately 25kms south-east of the Cowra CBD. The property on which the existing quarry is located is approximately 230ha in area. The existing Glenella quarry is located on the border of the Cowra and Hilltop Councils area, with the majority of the roads that make up the approved haul route, including Lachlan Valley Way, being located within the Cowra Council boundaries.

The existing quarry is located within a rural precinct, approximately 20 minutes drive from the Cowra township. The roads in the immediate vicinity of the quarry are low volume, rural roads owned and maintained by the local council. The local roads which make up the existing haul route connect with Lachlan Valley Way approximately 12 kms to the west of the quarry. The haul route connects with Lachlan Valley Way, which is a TfNSW approved B-double route (up to 26m)

The intersection of Lachlan Valley Way and Morongla Road is a 4-way intersection with 1 lane in either direction on all 4 legs. The layout does not include any auxiliary lanes, or other widening to assist turn movements. Give Way signs on the side roads give priority to the major road (Lachlan Valley Way). Centrelines and edge lines are painted on Lachlan Valley Way, but no delineation on Morongla Road. The intersection does not currently include streetlighting. The posted speed limit on Lachlan Valley Way reduces from 100kmh to 80kmh for approximately 400m at both approaches to the intersection.

A manual traffic count was undertaken at the intersection of Lachlan Valley Way and Morongla Road on 31 May 2023. The counts indicated traffic volumes are low in this area, with a total of 96 vehicles per hour, with a heavy vehicle percentage of 18 – 19%. The peak hours are:

Morning	8:00 – 9:00am
Afternoon	5:00 – 6:00pm



Cowra Council provided daily traffic volumes for the intersection of Lachlan Valley Way and Morongla Road. The information shows total daily traffic volumes (AADT) on all 4 legs of the intersection (i.e. a total of both directions).

For the purposes of this assessment, StreetWise have adopted the AADT volumes provided by Cowra Council and adjusted the numbers using a 1% annual growth.

It is proposed to increase the rate of extraction at the existing quarry from 200,00 tonnes per year to 499,00 tonnes per year. The quarry utilises a range of haulage trucks generally hauling between 32 and 42 tonnes. The increased output will result in an increase in laden haulage movements from around 100 per week to 248 per week, and the average laden trips per hour from 2 to 5. It is proposed to limit the maximum number of daily trips to 50 laden movements. However, the Glenella Quarry is not proposing to change the hours of operation for product loading and transport activities.

The quarry also generates a number of light to medium vehicle movements per day include staff trips, fuel trucks, water trucks, service vehicles, couriers etc. The increased output may require up to 4 additional staff during peak operation, resulting in a minor increase in light vehicle movements. It should be noted that some staff arrive at 6am and the remaining between 6.30-7.00am, which will not impact on peak hour traffic within the local road network. The majority of the staff leaving around 5pm. The proposed quarry modification may require up to 4 additional staff during peak operation.

The estimated increase in quarry generated trips will likely result in an additional 16 movements through the intersection of Lachlan Valley Way and Morongla Road i.e. 8 in and 8 out. It is estimated that vehicles will turn 50% to the north (to Cowra) and 50% to the south (to Boorowra) and dissipate quickly within the local road network.

This report has estimated that less than 160 vehicles will pass through the existing intersection of Lachlan Valley Way and Morongla Road in the future (2035), based on current volumes and 1% per annum growth. The estimated increase in vehicle movements due to the proposed modification of the Glenella Quarry is a maximum of 16, which means that the total number of peak hour movements through the intersection will be less than 180. StreetWise consider that computer modelling (SIDRA) is not required for the intersection of Lachlan Valley Way and Morongla Road. Austroads Intersection Warrant (Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings) for an 80kmh speedzone indicates the layout only requires a BAR / BAL intersection. In simple terms, this would require widening of the intersection to allow vehicles on Lachlan Valley Way adequate width to safely pass any vehicles slowing, queuing or turning into Morongla Road.

The existing approved haulage route from the Glenella Quarry utilises:

- Morongla Road – 6.20km (Lachlan Valley Way to Reids Flat Road)
- Reids Flat Road – 4.30km (Morongla Road to Battery Road)
- Battery Road – 4.9km (Reids Flat Road to Glenella Quarry Gate)

The above haulage route is 15.4kms in length, and connects the existing quarry with Lachlan Valley Way, which is an approved heavy vehicle route for trucks up to 26m B-doubles. StreetWise inspected the existing haul route and found the road surfaces were generally in good condition, with some defects and repairs noted. The existing sealed road widths varied between 5.5m and 7.0m, with only gravelled shoulders in most locations.

Current traffic volumes on the haulage route roads (Morongla Road, Reids Flat Road and Battery Road) are low, with less than 20 vehicles an hour at peak times at the Lachlan Valley Way intersection, and significantly less in the vicinity of the existing quarry – say 10 per hour (5 in each direction), which equates to an average of 6 minutes gap between vehicles. Given that the quarry will



generate a maximum of 8 laden truck & dog trips per hour at peak times, the likelihood of conflict on the haul route between local vehicles and quarry-generated movements is relatively low.

The Austroads '*Guide to Road Design Part 3: Geometric Design*' and indicates the recommended sealed lane width for rural roads catering for up to 150 vehicles per day is 3.7m, while 6.2m should be provided for rural roads with daily volumes of 150 – 500. All 3 of the local roads that make up the existing approved haulage route exceed Austroads minimum lane width requirements for the current low traffic volumes, but do not include the minimum required sealed shoulders. However, unsealed shoulders are available in most locations.

The original DA consent (July 2007) included a Voluntary Planning Agreement, which was signed by both parties. The VPA listed a number of improvements to sections of Morongla Road and Reids Flat Road. The VPA states that Council will undertake the work, while the developer will contribute costs and also undertake works in kind (i.e. provide suitable quarry material). Following StreetWise's inspection of the haul road, it appears that the agreed roadworks have not been completed as yet.

A desktop assessment indicates the existing rural roads that make up the currently approved haul route do not meet a number of requirements for a 100kmh speedzone (Section 9.4.19 of the Transport for New South Wales '*Speed Zoning Standard*' (TS 03631:1.0)), particularly in regard to road width, while many of the curves do not appear to meet design guides for 100kmh. Also, StreetWise observed numerous hazards close to the sealed roadway at numerous locations, including narrow bridges, culverts, tabledrains & steep batters, large trees, fence posts etc. In summary, StreetWise do not consider the existing 100kmh speedzone is appropriate for Morongla Road or Reids Flat Road.

StreetWise notes there has been 1 recorded crash on the subject roads in recent years. The crash involved a vehicle losing control at the intersection of Morongla Road and Reids Flat Road in 2022, which resulted in serious injuries. It should be noted that the layout of this intersection has been changed during a recent upgrade.

While there are no regular public bus routes in the vicinity of the quarry, daily school bus service for students in the Morongla area, which utilise Lachlan Valley Way and part of Morongla Road. A morning service picks up school students around 8:30am and then drops kids off around 4pm in the afternoon. There are a number of informal bus stops along Morongla Road, which are also located along the currently approved haul route.

12. RECOMMENDATIONS

This assessment indicates the proposed increase in quarry products from 200,000 tonnes to 499,000 tonnes per annum at the existing Glenella Quarry will not result in any significant increase on hourly or daily laden truck movements within the local road network. It should also be noted that the maximum number of laden haulage truck movements will be limited to 50 per day, an increase of 15 laden trips per day from the current maximum of 35 laden trips per day – or an increase of 1.5 per hour.

Traffic volumes on Lachlan Valley Way are relatively low, and the local roads currently utilised as part of the existing approved haulage route also have low volumes. The additional laden truck & dog trips arising from the proposed modification will not have a significant impact on the efficiency or safety of the local road network. The local roads and intersections have the capacity to cater for the additional trips generated by the development, with minimal upgrades required (i.e. appropriate linemarking, signage and speed limits of which Cowra Council is obligated to complete as part of an existing agreement). These upgrades had been recognised previously as a means to reduce any potential road safety issues along the currently approved haul route. Once these upgrades are completed, there should be no requirement for Glenella Quarry to undertake any further upgrades



along the haul route. Also, the proposed increase in quarry truck traffic, as estimated in the modification application, will not give rise to the need for any additional road works over and above those specified in the original consent.

In summary, the quarry operator has placed and will continue to place emphasis upon the safe and efficient delivery of its quarry products along the haul route with the continued objectives of minimising impacts upon other motorists, road users and roadside residents. StreetWise Road Safety and Traffic Services recommend that the proposed development as being a suitable development based on the predicted traffic impacts.

To further improve road safety, StreetWise recommend the following:

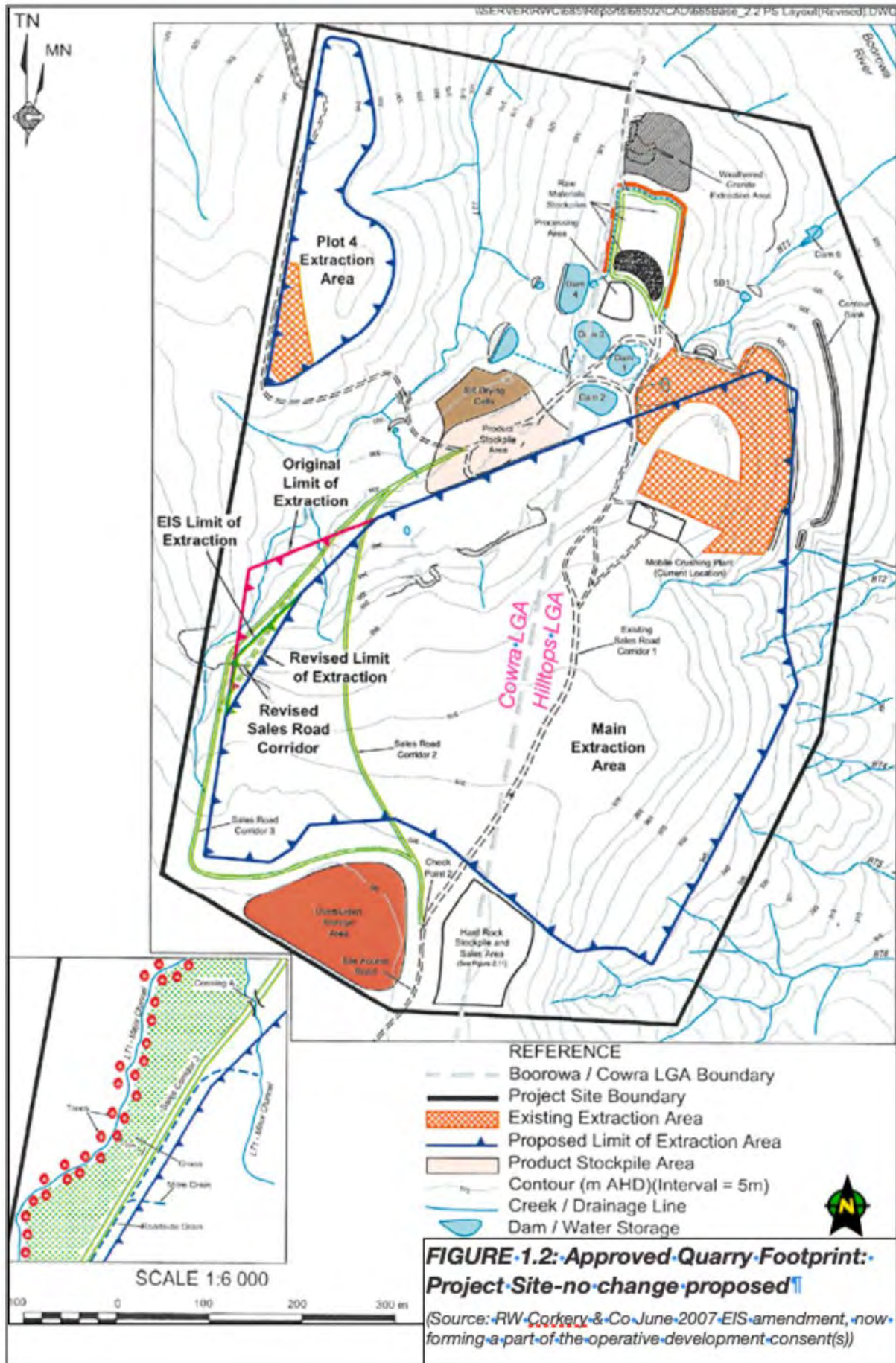
- Update the current Drivers Code of Conduct to reflect any changes due to the increased number of annual haulage movements
- Cowra Council to contact Transport for New South Wales in regard to assessing the existing speedzones on the current haul roads, with a review to reducing the existing 100kmh speedzones.
- Provision of appropriate linemarking and curve signage on Morongla Road, Reids Flat Road and Battery Road, where required.
- An inspection of the current haul route should be undertaken to determine the current status of the agreed roadworks to upgrade sections of Morongla Road and Reids Flat Road, as outlined in the Voluntary Planning Agreement (included as part the original DA consent - July 2007). Any outstanding works should be completed as soon as possible to minimise any perceived road safety issues.



A J Davis
BTech (Civil Engineering)
Level 3 Road Safety Auditor
Director StreetWise Road Safety & Traffic Services

Appendix A Proposed Layout of Future Glenella Quarry





Appendix B
Proposed Upgrade of Lachlan Valley Way
at Intersection with Morongla Road

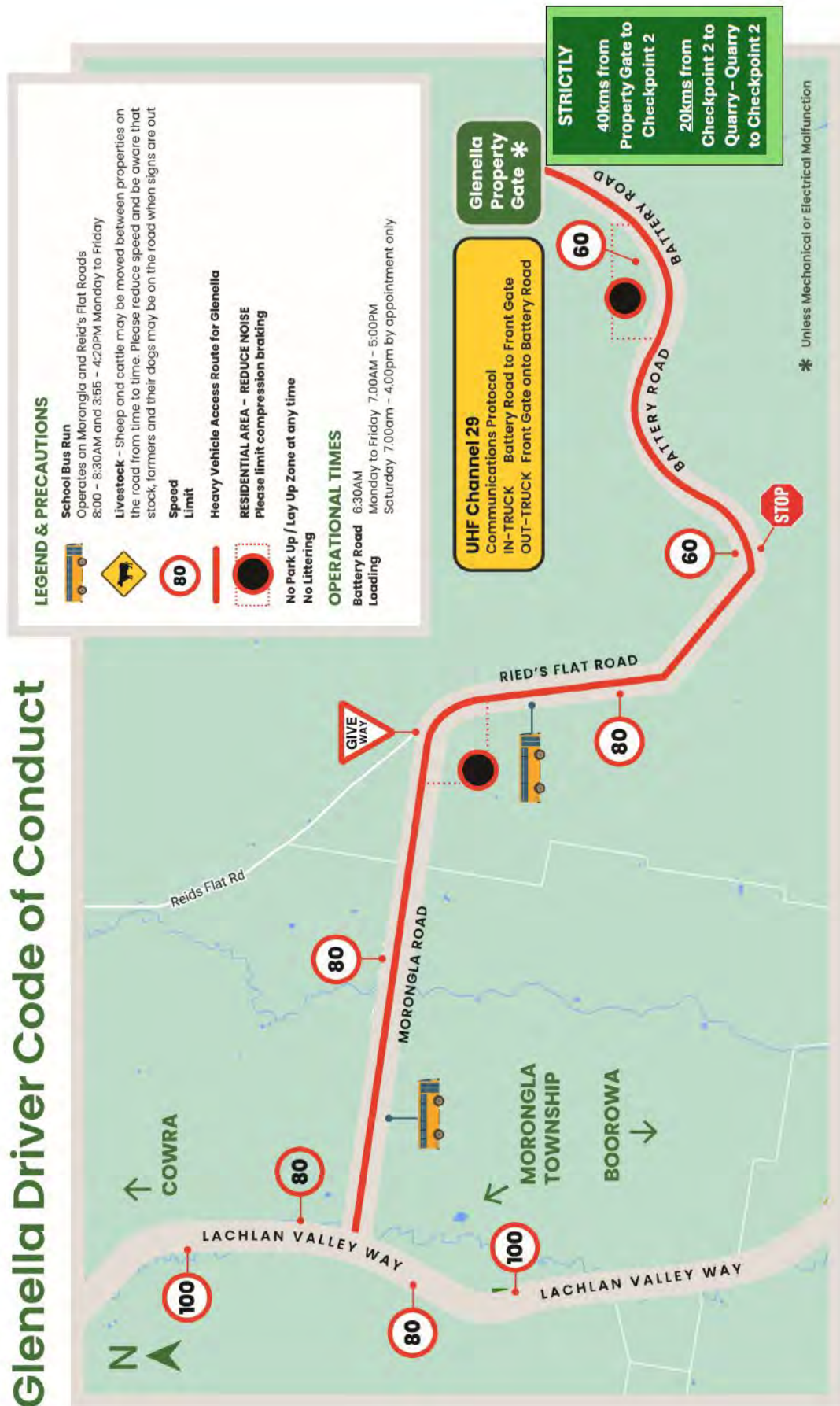




Appendix C
Except from current Driver Code of Conduct
- Heavy Vehicle Route



Glenella Driver Code of Conduct



Appendix D
Except from Existing Voluntary Planning Agreement



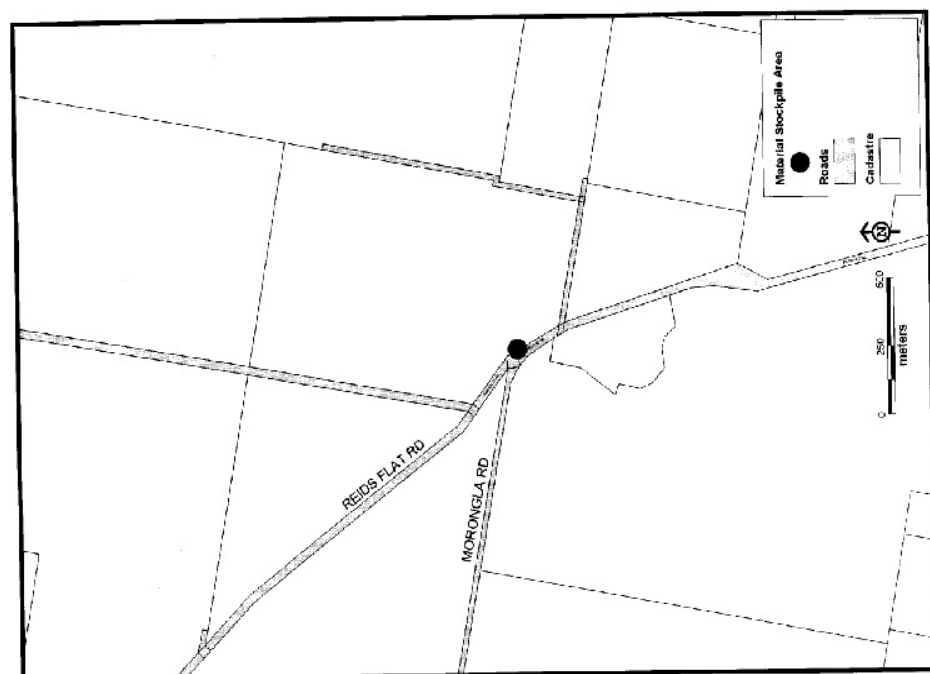
Road Works Schedule A

Year	Description	Developer's Cash Contribution (\$)	Developer's In-Kind Contribution
1	Extend Culverts on Reids Flat Road	33,421.30	Nil
2	Widen and Overlay Morongla Road 0-1km from Reids Flat Rd	56,184.28	1,914m ³ uncompacted gravel road base (Minimum DGB20, RTA Specification 3051) 84m ³ sealing aggregate (RTA Specification 3151)
2	Widen Box Culvert 0.76 on Morongla Road	15,456.86	Nil
3	Widen and Overlay Morongla Road 1-2km from Reids Flat Rd	56,184.28	1,914m ³ uncompacted gravel road base (Minimum DGB20, RTA Specification 3051) 84m ³ sealing aggregate (RTA Specification 3151)
3	Widen and Overlay Morongla Road 2-3km from Reids Flat Rd	56,184.28	1,914m ³ uncompacted gravel road base (Minimum DGB20, RTA Specification

			3051) 84m ³ sealing aggregate (RTA Specification 3151)
4	Widen and Overlay Reids Flat Road 0.25- 1.25km from Battery Rd	56,184.28	1,914m ³ uncompacted gravel road base (Minimum DGB20, RTA Specification 3051) 84m ³ sealing aggregate (RTA Specification 3151)
5	Widen and Overlay Morongla Road 3-4km from Reids Flat Rd	56,184.28	1,914m ³ uncompacted gravel road base (Minimum DGB20, RTA Specification 3051) 84m ³ sealing aggregate (RTA Specification 3151)
6	Widen and Overlay Morongla Road 4-5km from Reids Flat Rd	56,184.28	1,914m ³ uncompacted gravel road base (Minimum DGB20, RTA Specification 3051) 84m ³ sealing aggregate (RTA Specification 3151)
6	Widen and Overlay Morongla Road 5-6.1km from Reids Flat Rd	58,690.72	2,105m ³ uncompacted gravel road base (Minimum DGB20, RTA Specification 3051) 84m ³ sealing aggregate (RTA

			Specification 3151)
7	Widen and Overlay Reids Flat Road 1.4- 2.6km from Battery Rd	62,633.12	2,299m ³ uncompacted gravel road base (Minimum DGB20, RTA Specification 3051) 84m ³ sealing aggregate (RTA Specification 3151)
7	Widen and Overlay Reids Flat Road 3.03- 3.58km from Battery Rd	45,184.92	1,053m ³ uncompacted gravel road base (Minimum DGB20, RTA Specification 3051) 84m ³ sealing aggregate (RTA Specification 3151)

Material Stockpile Area Map Schedule B



Water Balance Assessment

483 Battery Road, Cowra NSW 2794

Final Report

P2511190JR01V01

January 2026

Prepared for Outline Planning Consultants Pty Ltd

environmental science & engineering

Project Details

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Contents

1	Introduction	5
1.1	Overview	5
1.2	Relevant Guidelines.....	5
2	Site Description	6
2.1	Site Description and Location	6
2.2	Proposed Development.....	7
3	MUSIC Water Balance Assessment	8
3.1	Methodology	8
3.1.1	Overview	8
3.1.2	Approach.....	8
3.1.3	Climate Data	8
3.1.4	Input Parameters	9
3.1.5	Model parameters.....	9
3.1.6	Catchment Area.....	9
3.1.7	Site Water Demand	10
3.1.8	Site Water Supply	10
3.1.9	Site Water Balance Results.....	10
4	Conclusion.....	12
5	References	13
	Appendix A – MUSIC Modelling Inputs.....	14
	Appendix B – Water Storages and Sub-catchments	15

Tables

Table 1: Development consent details.	5
Table 2: Site description summary.	6
Table 3: Summary of catchment areas.	9
Table 4: Summary of modelled catchment areas.	10
Table 5: Summary of site water demand / losses for all stages.	10
Table 6: Summary of site water balance – dry year.	11
Table 7: Summary of site water balance – average year.	11
Table 8: Summary of site water balance – wet year.	11

Figures

Figure 1: Extents of the proposed quarry (picture provided by Outline Planning Consultants).	6
Figure 2: Water storage and sub-catchments (picture provided by Outline Planning Consultants).	15

1 Introduction

1.1 Overview

Martens & Associates Pty Ltd (**MA**) have been engaged by Outline Planning Consultants Pty Ltd (the **client**) to prepare a water balance assessment report to support an application pursuant to section 4.55(2) of the Environmental Planning and Assessment Act 1979 (**EP&A Act**) to modify existing Development Consents (refer to Table 1, hereafter jointly referred to as '**the DAs**' for ease of reference) for the approved quarry operations at 483 Battery Road, Cowra NSW 2794 (the **site**).

The existing quarry operates under the DAs, as summarised in Table 1, which authorise the extraction of basalt, quartz pebble/sand, gold and clays from the approved extraction areas.

Table 1: Development consent details.

Consent Authority	Development Application No.	Date Issued
Cowra Council	73/2007	27 August 2007
Hilltops Council (formerly Boorowa Council)	117/2006	25 September 2007

The purpose of this report is to assess the potential water balance implications associated with the proposed modifications to the approved quarry operations, including water demand, site runoff, sediment and erosion controls, and water reuse, and to demonstrate that the proposed modifications will not result in any adverse environmental impacts beyond those previously approved. The proposed modifications are consistent with the approved quarry development and do not alter the fundamental nature of the development or the approved quarry footprint as authorised under the existing consents.

1.2 Relevant Guidelines

This report has been prepared in accordance with the following standards / guidelines:

- BMT WBM (2015) NSW MUSIC Modelling Guidelines.
- NSW Health (2012) Septic Tank and Collection Well Accreditation Guideline.

2 Site Description

2.1 Site Description and Location

The DAs provide for the operation of Glenella Quarry and associated site facilities. The Glenella Quarry and the site facilities area are located within the larger 'Glenella' freehold property, refer to Figure 1, with a total site area approximately 700 ha. The Glenella Quarry is approximately 54 ha, of which 29 ha are located within the Hilltops Council and the remaining 35 ha within the Cowra Council. The subject area forms a relatively small portion of the total freehold property.

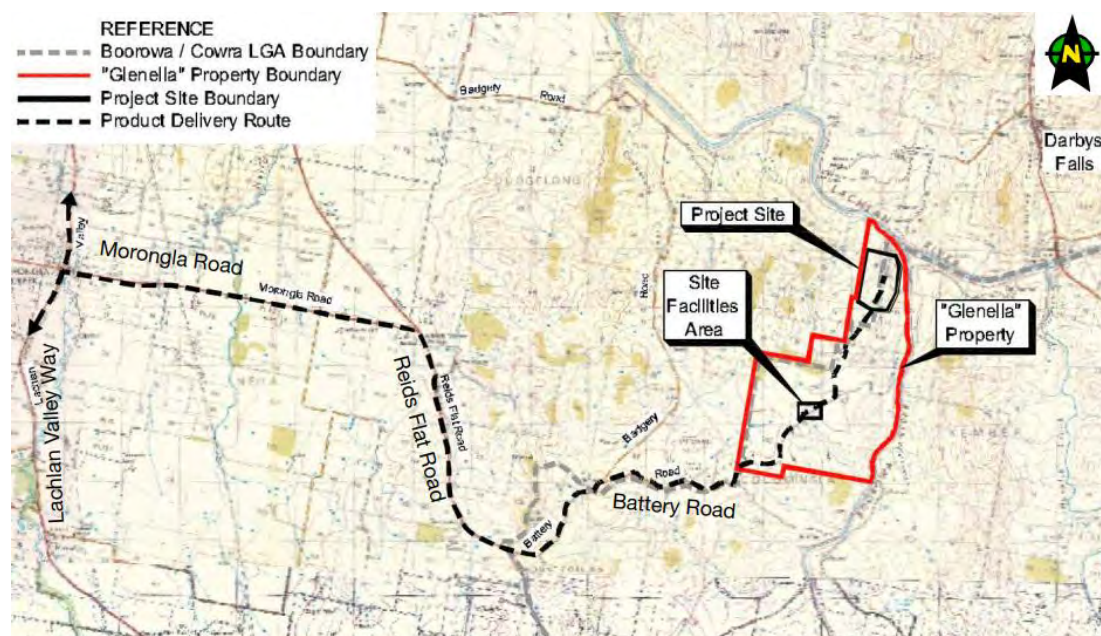


Figure 1: Extents of the proposed quarry (picture provided by Outline Planning Consultants).

A site description has been provided in Table 2.

Table 2: Site description summary.

Item	Description / Comment
Address	483 Battery Road, Cowra NSW 2794
Lot/DP	Lots 35 & 44 DP 752935, Lots 1-3 DP795553, Lot 106 DP 752935 Lots 27, 28, 63 & 123 DP 754584
Land Zoning	RU1: Primary Production
Local Government Area	Cowra Council Hilltops Council (formerly Boorowa Council)
Quarry Area	54.0 ha (approximately)

Item	Description / Comment
Existing Site Development	The site consists of quarry operational and extraction areas, haul roads, and an associated network of water management structures.
Neighbouring Environment	The property is bounded to the east by the Boorowa River, which joins the Lachlan River to the north. Surrounding land is primarily agricultural grazing, with valleys and ridgelines enclosing the quarry. The nearest residences are located more than 1.5 km from the quarry footprint, and 14 residences front the product delivery route.
Site Topography	The site is hilly and undulating, with ridge lines grading into plateau areas. Elevations range from approximately 290 mAHD near the rivers to 420 mAHD within the quarry footprint, with isolated hills exceeding 470 mAHD. Slopes are moderate to steep in the surrounding valleys.
Site Drainage	Runoff from the exposed quarry surfaces is directed to a series of sediment dams located downstream of the extraction and storage areas. These basins act as stormwater treatment measures, allowing sediment to settle before water is discharged. They also function as water harvesting facilities, supplying water for processing activities and dust suppression. In the event of overflow, excess water is directed to nearby watercourses.

2.2 Proposed Development

The following modifications, as advised by the client, are sought as part of this application:

- Clarifying the nature of the quarry operation and increasing the maximum allowable extraction rate from 200,000 tonnes per annum to 499,000 tonnes per annum, with no change to the approved quarry footprint.
- Increasing the number of loaded trucks from 35 to 50 per day.
- Updating daytime noise limits and monitoring requirements, following a noise assessment, to align the operation with the NSW Noise Policy for Industry (2017).

The quarry development proposed under this modification is substantially the same as the approved quarry development in terms of the nature of the works and potential environmental impacts. No changes are proposed to the approved extraction area or operating hours, and the overall quarry operation remains consistent with the existing consents.

3 MUSIC Water Balance Assessment

3.1 Methodology

3.1.1 Overview

The Model for Urban Stormwater Improvement Conceptualisation (*MUSIC*, Version 6.3) developed by the CRC for Catchment Hydrology was used to undertake the site water balance assessment to detail potable and non potable water supply and demands for the development.

Modelling has been undertaken in accordance with NSW MUSIC Modelling Guidelines (2015) with the developed site based on design briefs.

3.1.2 Approach

The water balance is assessed considering the following components:

1. **Site Water Demand:** Consideration of quarry operational water demands.
2. **Site Water Supply:** Assessment of site water supply (surface water runoff).
3. **Site Water Balance:** The balance of supply and demand is assessed based on a range of climatic conditions to determine the need for additional supply.

The details of the MUSIC model inputs are presented in Appendix A.

3.1.3 Climate Data

The water balance assessment was completed using the following:

1. Daily rainfall data obtained from the Bureau of Meteorology (**BoM**) for the Wyangala Dam climatological station (Station No. 63267).
2. Potential evapotranspiration (**PET**) data obtained from the Scientific Information for Land Owners (**SILO**) database, using records from the nearest available source, the SILO grid point located at latitude -33.95, longitude 148.80.

The water balance was prepared to assess the following range of rainfall scenarios:

1. **Dry year:** Annual rainfall equal to 10th percentile rainfall of all years to assess 'severe' water deficit (482.0 mm).
2. **Average year:** Annual rainfall equal to average rainfall of all years (702.3 mm).
3. **Wet year:** Annual rainfall equal to 90th percentile rainfall of all years to assess 'severe' water surplus (940.3 mm).

The assessment modelled three rainfall scenarios from the historical rainfall data for Wyangala Dam as proxy for an average rainfall case, and worse case rainfall scenarios (wet and dry years), refer below:

3. **Dry year (1972):** recorded rainfall 488.2 mm
4. **Average year (2000):** recorded rainfall 699.7 mm
5. **Wet year (1992):** recorded rainfall 936.1 mm

3.1.4 Input Parameters

Refer Appendix A for listed input parameters.

3.1.5 Model parameters

Base and storm flow concentration inputs were adopted based on NSW MUSIC Modelling Guidelines (2015) and MUSIC defaults for the proposed modification.

3.1.6 Catchment Area

Catchment areas have been provided by the client, refer to Appendix B and Table 3.

Table 3: Summary of catchment areas.

Catchment	Approximate Area (ha)
N1	0.29
N2	0.75
N3	0.76
N4	0.44
7	0.17
8	0.89
9	0.71
10a	12.55
10b	2.38
11	9.86
EB1	7.54
EB2	4.51
Void	5.50

For modelling purposes, catchment areas and existing water structures were grouped based on their water reuse and treatment:

- All quarry operational areas were combined into a single catchment node, discharging to a combined sediment basin representing all existing water structures and supplying water for non-potable site uses.
- Roof areas were modelled as a separate catchment node with runoff directed to a combined rainwater tank representing two existing 30 kL rainwater tanks for potable water use.

Modelled catchment areas are provided in Table 4.

Table 4: Summary of modelled catchment areas.

Catchment	Approximate Area (ha)
Combined Quarry Area	46.35
Roof Area	0.04

3.1.7 Site Water Demand

Non potable water demands for the site are based on the water required for quarry operations and dust suppression, the estimates below have been provided by the client.

The potable water demand for the site is estimated as 27 L/person/day (based on NSW Health (2012) guidelines for industrial use). Based on information provided by the client, up to 6 employees will be on site for 6 days a week (excluding public holidays) providing an annual demand of 0.05 ML/yr.

Water demands for the quarry are summarised in Table 5.

Table 5: Summary of site water demand / losses for all stages.

Activity	Water Demand ML/year
Dust suppression	13.65
Production	2.90
Staff amenities (toilet flushing)	0.05
Total non potable water demand	16.55
Total potable water demand	0.05

3.1.8 Site Water Supply

Non potable water supply is to reuse stormwater runoff which is captured in the water structures. Water supply is based on the MUSIC modelling using the climate data detailed in Section 3.1.3.

The site is not serviced by town water supply. Staff amenities water therefore is provided via collected roof water. Drinking water is supplied separately via bottled water purchased in bulk for staff consumption.

3.1.9 Site Water Balance Results

The site water balance for the proposed quarry is summarised in Table 6 (dry year); Table 7 (average year) and Table 8 (wet year).

Table 6: Summary of site water balance – dry year.

Supply	ML/year	Demand	ML/year
Non-Potable			
Runoff to sediment basin	+173.52	Road dust suppression	-13.65
Storage (evaporative & seepage) losses	-19.11	Production	-2.90
Non-Potable Balance			+137.86
Potable			
Runoff to rainwater tank	+0.19	Staff amenities	-0.05
Potable Balance			+0.14

Note:

Positive number denotes a surplus / negative number denotes a deficit.

Table 7: Summary of site water balance – average year.

Supply	ML/year	Demand	ML/year
Non-Potable			
Runoff to sediment basin	+250.27	Road dust suppression	-13.65
Storage (evaporative & seepage) losses	-19.11	Production	-2.90
Non-Potable Balance			+214.61
Potable			
Runoff to rainwater tank	+0.27	Staff amenities	-0.05
Potable Balance			+0.22

Note:

Positive number denotes a surplus / negative number denotes a deficit.

Table 8: Summary of site water balance – wet year.

Supply	ML/year	Demand	ML/year
Non-Potable			
Runoff to sediment basin	+346.62	Road dust suppression	-13.65
Storage (evaporative & seepage) losses	-19.11	Production	-2.90
Non-Potable Balance			+310.96
Potable			
Runoff to rainwater tank	+0.36	Staff amenities	-0.05
Potable Balance			+0.31

Note:

Positive number denotes a surplus / negative number denotes a deficit.

4 Conclusion

The water balance analysis results show that the site will be provided with sufficient non-potable and potable water supply from the existing water structures and rainwater tanks (supplied by roof water) under all modelled scenarios including average, dry, and wet years. On this basis, we conclude that surface water collection and re-use within the site will be sufficient to meet site demands without reliance on other sources of water supply.

5 References

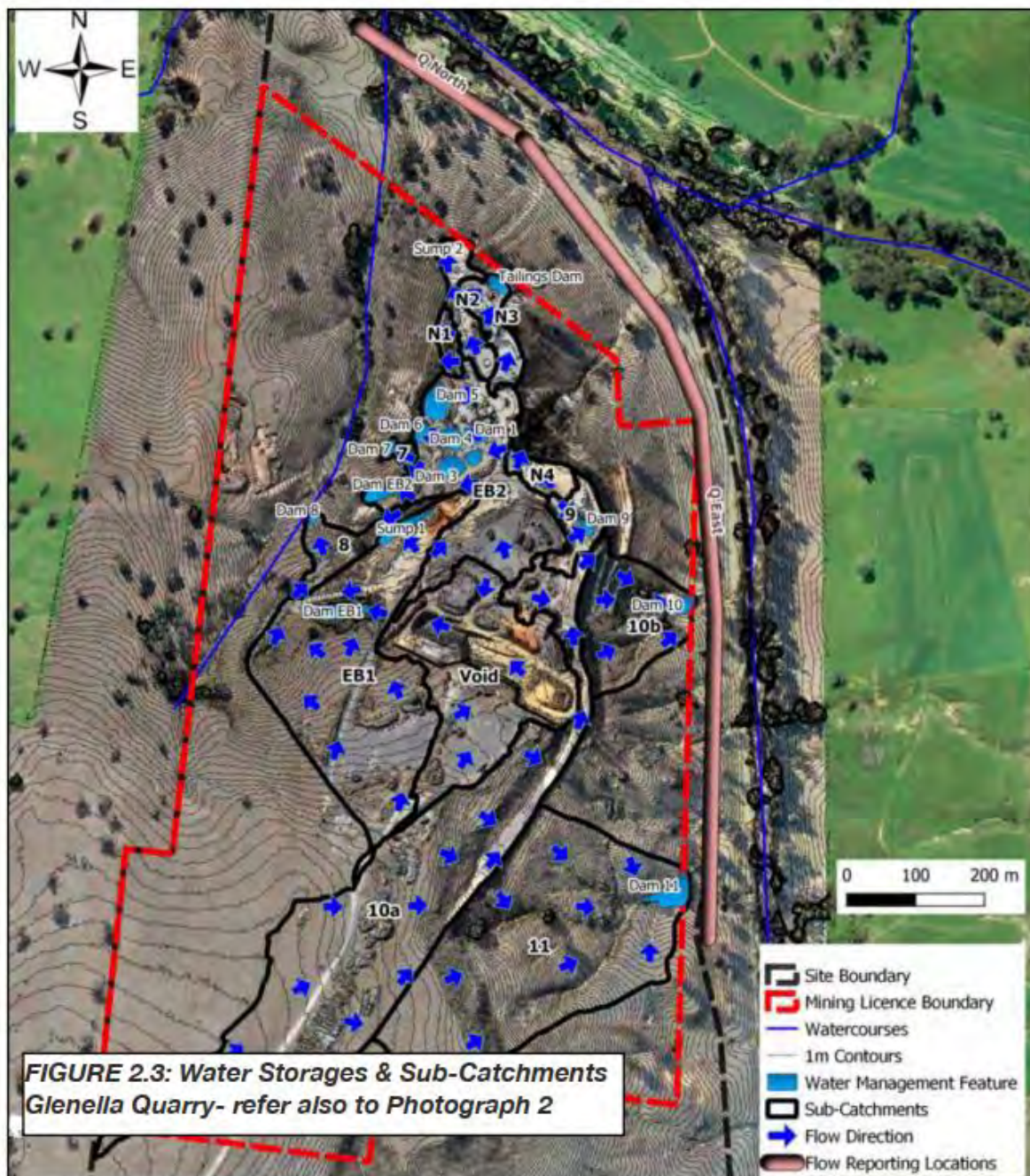
BMT WBM (2015), *NSW MUSIC Modelling Guidelines*.

NSW Health (2012), *Septic Tank and Collection Well Accreditation Guideline*

Appendix A – MUSIC Modelling Inputs

Parameter	Description	Input	Reference
Setup	Climate File	Rainfall data from BOM, Wyangala Dam Station No. 63267 and PET data from SILO (grid point located at latitude -33.95, longitude 148.80) were used to create the MLB files for each scenario in Section 3.1.3.	BOM and SILO
Source Nodes	Rainfall Threshold	Based on surface type specified in Table 5-4 of NSW MUSIC Modelling Guidelines	BMT WBM MUSIC Modelling Guidelines (2015)
	Base & Storm flow Parameter	As per Table 5-6 & 5-7 of NSW MUSIC Modelling Guidelines	BMT WBM MUSIC Modelling Guidelines (2015)
	Estimation Method	Stochastically generated	BMT WBM MUSIC Modelling Guidelines (2015)
Sediment Basins	Low Flow By-Pass	0 m ³ /s	Assumed no bypass
	High Flow By-Pass	100 m ³ /s	Assumed no bypass
	Extended Detention Depth	0.01 m	Nominally zero (no detention depth modelled)
	Surface Area	13957 m ²	Provided by the client
	Permanent Volume	45158 m ³	Provided by the client
	Initial Volume	45158 m ³	By design
	Exfiltration Rate	0.0 mm/hr	By design
	Evaporative Loss	75 %	MUSIC default
	Equivalent Pipe Diameter	300 mm	MUSIC default
	Overflow Weir width	2 m	MUSIC default

Appendix B – Water Storages and Sub-catchments



s.4.55 application Glenella Quarry Pty Ltd, Cowra NSW

Outline Planning Consultants Pty Ltd
Town Planning | Environmental Assessment

Page 19

Figure 2: Water storage and sub-catchments (picture provided by Outline Planning Consultants).



northstar



This document has been prepared for **Glenella Quarry Pty Ltd** by:

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Glenella Quarry – Proposed Increase in Extraction Rate

Air Quality Impact Assessment

Addressee(s):	Glenella Quarry Pty Ltd
Site Address:	483 Battery Road, Cowra NSW
Report Reference:	25.1140.FR1V1
Date:	14 August 2025
Status:	Final

Quality Control

Report	Reference	Status	Prepared by	Checked by	Authorised by
Glenella Quarry – Proposed Increase in Extraction Rate – Air Quality Impact Assessment	25.1140.FR1V1	Final	Northstar	VM	MD

Report Status

Northstar References		Report Status	Report Reference	Version
Year	Job Number	(Draft: Final)	(R ~~x~~)	(V ~~x~~)
2025	1140	Final	1	1
Based upon the above, the specific reference for this version of the report is:				25.1140.FR1V1

Final Authority

This report must be regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below. A draft report is a working document, is issued without prejudice and is subject to change.



Martin Doyle

14 August 2025

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NON-TECHNICAL SUMMARY

Glenella Quarry Pty Ltd has engaged Northstar Air Quality Pty Ltd to perform an Air Quality Impact Assessment for proposed increase in the rate of extraction to 499 000 tonnes per year at Glenella Quarry.

The Air Quality Impact Assessment forms part of the modification report prepared to accompany the Section 4.55(2) modification application for the Quarry under Part 4 of the *Environmental Planning and Assessment Act 1979*.

The Air Quality Impact Assessment has been performed in accordance with the NSW Environment Protection Authority Approved Methods for the Modelling and Assessment of Air Pollutants in NSW document and includes a detailed description of the operations to be performed as part of the Proposal and includes a description of the management measures that would be employed to minimise particulate generation. The locations of surrounding sensitive receptor locations, a description of existing air quality and meteorology, and a description of the method used to assess potential impacts are also provided.

The results of the Air Quality Impact Assessment indicate that the incremental impacts of the Proposal are predicted to be small at all surrounding receptor locations.

In relation to annual average criteria (TSP, PM₁₀, PM_{2.5}, and dust deposition), the addition of those minor incremental impacts to existing background air quality results in compliance with NSW Environment Protection Authority air quality criteria, and the Proposal is predicted to result in no additional exceedances of the 24-hour maximum PM₁₀ or PM_{2.5} criteria. A summary of compliance with the relevant air quality criteria is presented in the table below.

Pollutant	Averaging period	Compliance at maximum impacted non-Project related receptor
PM ₁₀	Annual average	Compliant
	Maximum 24-hour average	Compliant
PM _{2.5}	Annual average	Compliant
	Maximum 24-hour average	Compliant
TSP	Annual average	Compliant
Dust deposition	Annual average	Compliant

A range of management measures, including an air quality management plan, real-time air quality monitoring, and a trigger action response plan are currently adopted as part of the Quarry operation, which are considered to represent best practice air quality management, and these would continue to be adopted as part of the Proposal.

It is respectfully considered that the Proposal should not be rejected on the grounds of air quality.

CONTENTS

NON-TECHNICAL SUMMARY.....	III
1. INTRODUCTION	7
2. THE QUARRY	8
2.1. Overview	8
2.2. Identified Potential for Emissions to Air.....	12
2.3. Air Quality Management.....	13
3. LEGISLATION, REGULATION AND GUIDANCE	22
3.1. NSW EPA Approved Methods	22
3.2. Protection of the Environment Operations Act 1997	23
3.3. Protection of the Environment (Clean Air) Regulation 2022	23
4. EXISTING CONDITIONS.....	24
4.1. Discrete Receptor Locations	24
4.2. Meteorology	26
4.3. Air Quality.....	26
4.4. Topography	29
4.5. Potential for Cumulative Impacts	30
5. APPROACH TO ASSESSMENT.....	31
5.1. Dispersion Modelling	31
5.2. Emissions Estimation	31
5.3. Emissions Controls.....	32
6. IMPACT ASSESSMENT	34
6.1. Particulate Matter – Annual Average PM ₁₀ and PM _{2.5}	34
6.2. Particulate Matter – Annual Average Dust Deposition Rates	35
6.3. Particulate Matter - Maximum 24-hour Average	36
6.4. Summary.....	40
7. MITIGATION AND MONITORING.....	41
7.1. Air Quality Mitigation	41
7.2. Monitoring.....	41
8. CONCLUSION.....	42

9.	REFERENCES	43
	APPENDIX A	45
	APPENDIX B	50
	APPENDIX C	58
	APPENDIX D	64

FIGURES

Figure 1	Quarry location	8
Figure 2	Quarry layout	10
Figure 3	Locations of sensitive receptors and air quality and meteorological monitors	17
Figure 4	Time variation plot of 1-hour average PM ₁₀ and PM _{2.5} – Monitor B	17
Figure 5	Polar plot of 1-hour average PM ₁₀ and PM _{2.5} – Monitor B – all hours	18
Figure 6	Population density and sensitive receptors surrounding the Quarry Site	25
Figure 7	Three-dimensional representation of topography surrounding the Quarry Site	30
Figure 8	Calculated uncontrolled & controlled annual particulate emissions	33
Figure 9	Calculated uncontrolled & controlled peak 24-hour particulate emissions	33
Figure 10	Incremental 24-hour PM ₁₀ concentrations	39

TABLES

Table 1	Proposed characteristics of the Quarry operation	11
Table 2	Control measures for air emissions	14
Table 3	Trigger Levels	19
Table 4	Action level responses	20
Table 5	Additional controls	20
Table 6	NSW EPA impact assessment criteria	22
Table 7	POEO (Clean Air) Regulation – General standards of concentration	23
Table 8	Discrete sensitive receptor locations used in the study	25
Table 9	Closest DCCEEW AQMS to the Quarry Site	27
Table 10	Comparison of PM data at Millthorpe, Orange and Bathurst AQMS 2024	27

Table 11	Summary of background air quality used in the AQIA.....	28
Table 12	Summary of emission reduction methods adopted as part of Quarry operation.....	32
Table 13	Predicted annual average TSP, PM ₁₀ and PM _{2.5} concentrations.....	34
Table 14	Predicted annual average dust deposition.....	36
Table 15	Predicted maximum incremental 24-hour PM ₁₀ and PM _{2.5} concentrations.....	37
Table 16	Summary of contemporaneous impact and background – PM ₁₀	38
Table 17	Summary of contemporaneous impact and background – PM _{2.5}	38
Table 18	Summary of emission reduction methods adopted as part of Quarry operation.....	41

1. INTRODUCTION

Glenella Quarry Pty Ltd (the Proponent) has engaged Northstar Air Quality Pty Ltd (Northstar) to perform an air quality impact assessment (AQIA) for a proposed increase in the rate of extraction from 200 000 tonnes per year ($\text{t}\cdot\text{yr}^{-1}$) to 499 000 $\text{t}\cdot\text{yr}^{-1}$ (the Proposal), at Glenella Quarry (the Quarry) which is located at 483 Battery Road, Cowra NSW (the Quarry Site).

This AQIA forms part of the modification report prepared to accompany the Section 4.55(2) modification application for the Quarry under Part 4 of the *Environmental Planning and Assessment Act 1979*.

The AQIA presents an assessment of the predicted impacts of activities associated with the proposed operation of the Quarry. The AQIA has used a quantitative dispersion modelling approach, performed in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The results of the assessment are presented as predicted incremental change, and as a cumulative impact accounting for the prevailing background air quality conditions.

The policies, guidelines and plans which have been referenced during the performance of the AQIA include (in no order):

- *Protection of the Environment Operations Act 1997*.
- Protection of the Environment Operations (Clean Air) Regulation 2022.
- Approved Methods for the Modelling and Assessment of Air Quality in NSW (NSW EPA, 2022).
- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (NSW DEC, 2006).

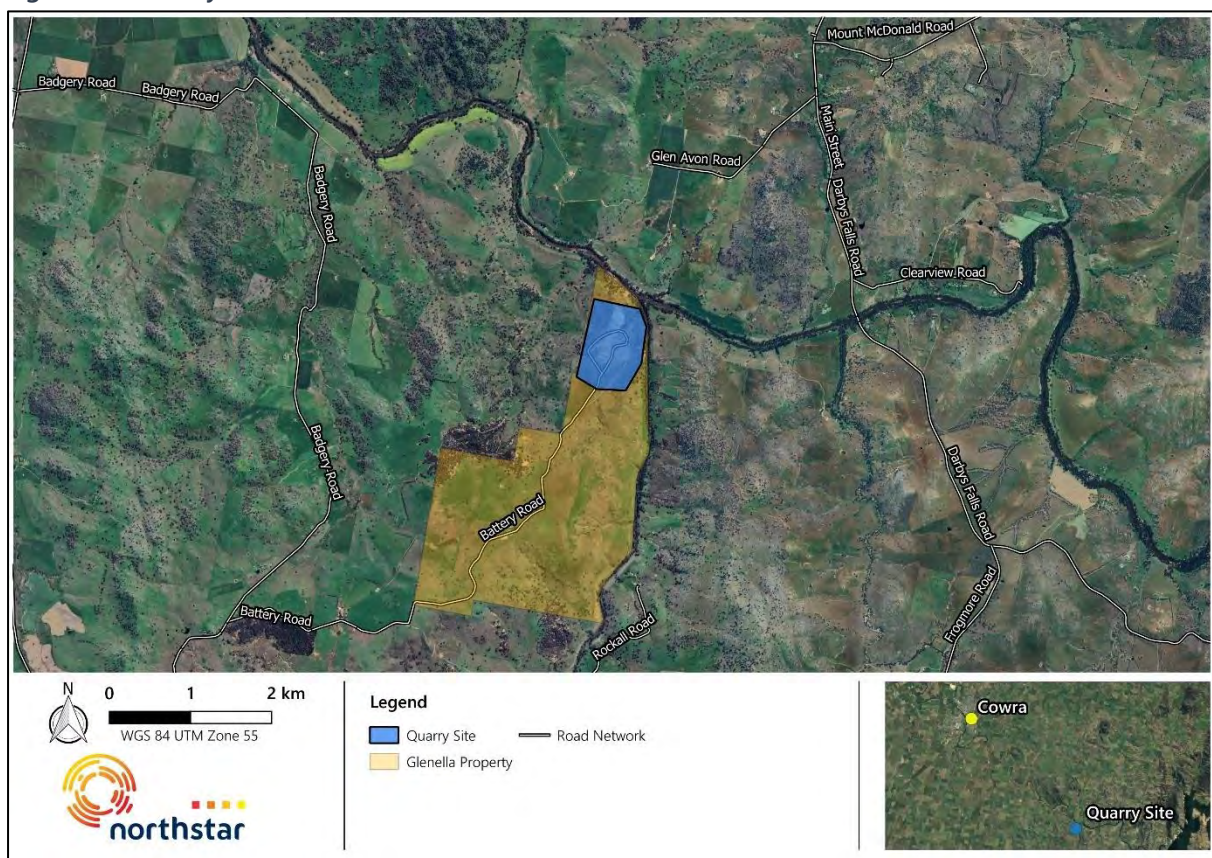
2. THE QUARRY

The following provides a description of the Quarry and describes the potential sources of air emissions associated with the operational phase.

2.1. Overview

Glenella Quarry is located in the Central West region of New South Wales, approximately 18 kilometres (km) southeast of the township of Cowra, NSW (refer to Figure 1).

Figure 1 Quarry location



Source: Northstar Air Quality

The Quarry currently operates under Development Consent DA73/2007 issued by Cowra Shire Council (Council) on 27 August 2007 and Development Consent DA117/06 issued by Boorowa Council (now Hilltops Shire Council) on 25 September 2007. The Quarry currently has consent to extract, process and transport up to 200 000 t·yr⁻¹ of hard rock (basalt), clay, and gravel (pebbles and sand) and some gold.

The Proponent is seeking development consent for an increase in the rate of extraction from 200 000 t·yr⁻¹ to 499 000 t·yr⁻¹ inside their existing development consent boundary.

The Proponent is not proposing to alter the operational profile of the Quarry.

The Quarry Site is located in an area zoned RU1 (Primary Production) under the Cowra Local Environmental Plan 2012, which permits extractive industries with consent. The existing DA area (also the area of proposed increase of extraction rate) covers approximately 54 hectares (ha), 29 ha of which is located within the Hilltops local government area (LGA) with the remaining 35 ha located within the Cowra LGA.

Operations at the Quarry consist of drilling and blasting to remove the hard basalt cap, followed by excavation, transport and separate stockpiling of basalt, weathered basalt, clay, and gravel (pebbles and sand). Overburden overlying the basalt is minimal.

The basalt resource is removed through drilling and blasting on a campaign basis that yields up to 100 000 tonnes (t) per blast.

The underlying clay horizon (in the current extraction area) has an average depth of 8 metres (m) to 10 m and is extracted in benches that allow for access to the underlying quartz pebble/sand resource. When extracted, the clay material is loaded into dump trucks where it is transported and stockpiled in the product stockpile and load out area. No processing of the clay is undertaken on site.

The quartz pebble/sand horizon, beneath the clay horizon has an average depth of between 3 m and 8 m. The recovered gravel is washed through a custom designed plant incorporating a log washer and screens to clean and separate the various grades of pebble. The fines (sand, silt, and clay) pass through a sand recovery unit that effectively removes the silt and clay to settling ponds, leaving a clean product. The volume of silt and clay residue is minor (less than 10 % of the feed). Gold has the potential to be recovered during the washing process.

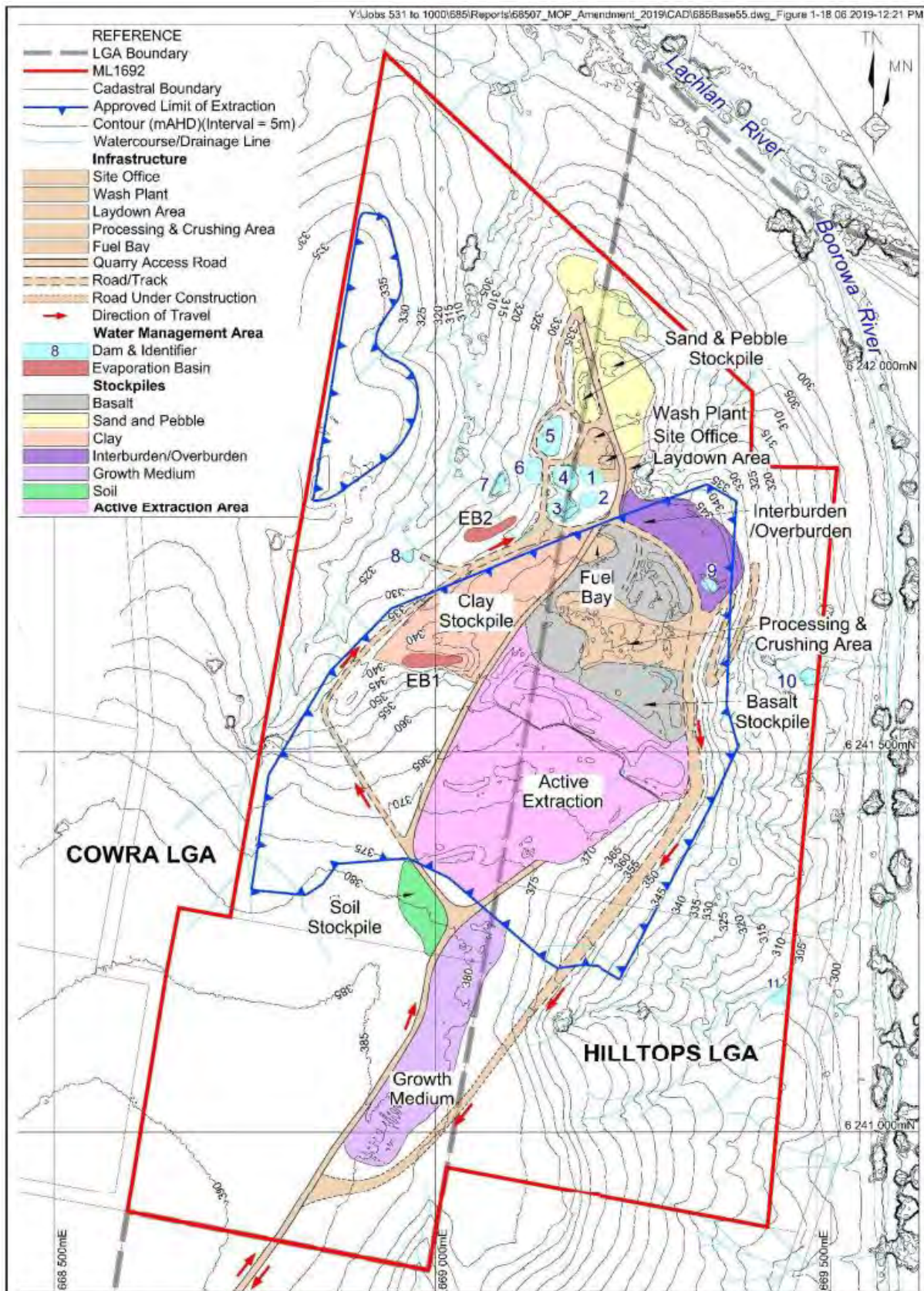
The wash plant capacity is 100 tonnes per hour ($t \cdot hr^{-1}$), adequate for current and projected demand, but can be increased if required.

Waste (mixed materials, unsaleable products, and dried settling pond tailings) is backfilled behind the mining operation and will be landscaped, covered with topsoil, and revegetated.

Product is transported from the site by subcontractor haulers. Facilities on the site include an office and an electronic calibrated weighbridge which is intended to remain to accommodate the proposed increase in the rate of extraction.

Figure 2 displays the proposed indicative Quarry Site layout.

Figure 2 Quarry layout



Source: (RW Corkery & Co Pty Ltd, 2019)

Table 1 provides a summary of the proposed operational characteristics of the Quarry.

Table 1 Proposed characteristics of the Quarry operation

Parameter	Value
Hours of Operation	Extraction Activities: 7 am to 5 pm Monday to Friday and 7 am to 3 pm Saturdays. Blasting: 9 am to 5 pm Monday to Friday. Crushing: 7 am to 6 pm Monday to Friday and 7 am to 3 pm Saturdays. Loading: 7 am to 10 pm Monday to Friday and 7 am to 4 pm Saturdays.
Working days per year	300
Annual rock extraction rate	499 000 t·yr ⁻¹
Average daily rock extraction rate	1 664 t·day ⁻¹
Maximum daily rock extraction rate	5 000 t·day ⁻¹
Number of blast holes drilled	50 to 100 per blast on average
Blast holes spacing	3 m to 4 m
Blasting frequency	Once per month on average, in peak conditions
Mass of material removed per blast	Up to 100 000 t per blast
Quarry equipment (type, or equivalent)	Drill - Sandvik Rock Ranger HL800T Excavators - 1 × Hyundai RL480-7, 1 × 2020 Hyundai HX350-LT3 Front End Loaders – 1 x 2020 Cat972M, 1 x 2024 Hyundai 975 Dozer - Komatsu D155AX-6 Articulated Dump Trucks - 2 × Terex 2020 TA400's
Annual material processing rate	450 000 t·yr ⁻¹ (49 000 tpa of clay not processed)
Average daily processing rate	1 500 t·day ⁻¹
Maximum daily processing rate	Crushing: 1 600 t·day ⁻¹ Washing: 1 000 t·day ⁻¹
Processing equipment (type, or equivalent)	Crushing Train: Sandvik 2013 QJ341 Jaw Crusher Sandvik 2014 QH441 Cone Crusher Sandvik 2013 QA440 20 x 5 double deck screen Sandvik 2018 QE342 Scalping Screen Wash Plant: Electric plant powered by a 2023 Cummins 550 kVa generator
Annual material haulage rate	499 000 t·yr ⁻¹
Average daily material haulage rate	1 664 t·day ⁻¹
Maximum daily material haulage rate	2 520 t·day ⁻¹
Haulage truck capacity	42 t
Annual vehicle trips	11 881
Peak daily vehicle trips (1-way)	50 to 60
Average daily vehicle trips (1-way)	40
Extraction area	7.3 ha
Processing area	1.5 ha
Pebble and sand stockpiling area	1.8 ha

Parameter	Value
Clay stockpile	1.7 ha
Basalt Stockpile	1.9 ha
Product Transportation	Internally: raw material will continue to be transported in a combination of front-end loaders and articulated dump trucks. Off site: will be via heavy vehicles as is currently the case (Battery Road to Reids Flat Road onto Morongla Road turning left or right on Lachlan Valley Way).
Waste Management	Waste (mixed materials, unsalable products, and dried settling pond tailings) is backfilled behind the mining operation and will be landscaped, covered with topsoil, and revegetated.

Assumptions adopted in the construction of Table 1 are presented below:

- Blasting would occur on a campaign basis, with blasting occurring once per month on average in peak conditions. Up to 100 000 t of material would be fragmented during each blast and it is likely that during the day of blasting, other operations such as materials handling, processing etcetera would be limited below their relevant maximum capacities. However, to provide a worst-case assessment, blasting has been assumed to occur concurrently with all other activities at their maximum rates to provide confidence that the Proposal can be operated without exceedance of the relevant short-term air quality criteria (refer Section 3).
- Peak daily transportation of material from the Quarry has been assumed to consist of 60 × 42 t loads (2 520 t·day⁻¹), whilst this may range from 50 to 60 loads. Average daily transportation has been assumed to consist of 40 × 42 t loads (1 664 t·day⁻¹).

2.2. Identified Potential for Emissions to Air

The processes which may result in the emission of pollutants to air during quarrying operations would include:

- Drilling and blasting;
- Loading of dump truck and transport of blasted material to processing area;
- Loading of processing equipment and processing of material;
- Movement of material to relevant product stockpiling areas;
- Loading of product trucks, and transport of material offsite;
- Wind erosion of the extraction, processing, and stockpiling areas; and
- Emissions from vehicle and equipment exhaust.

The specific pollutants of interest associated with those activities are:

- Total suspended particulate (TSP);
- Particulate matter with an aerodynamic diameter of 10 microns (PM₁₀); and

- Particulate matter with an aerodynamic diameter of 2.5 microns (PM_{2.5}).

Emissions of NO_x, carbon monoxide (CO) and sulphur dioxide (SO₂) related to diesel combustion in plant and machinery would also be experienced (in addition to particulates considered above), however given the quantity of equipment operating on site it is not anticipated that emissions associated with diesel combustion (other than particulate matter which have been assessed) would be a significant contributor to total site emissions and have not been addressed further.

2.3. Air Quality Management

On 4 August 2023 NSW EPA provided the Licensee with a Prevention Notice (Notice No. 3506243), issued under section 96 of the Protection of the Environment Operations Act 1997 (POEO Act).

Since the issuance of the prevention notice, a significant amount of work in relation to air quality management has been performed by the Proponent since August 2023 in response to three Pollution Reduction Programs (PRP) included on the Environment Protection Licence (EPL 20632) for the Quarry.

The following reports have been submitted to NSW EPA to meet the requirements of the PRPs, with the following sections providing a summary of the conclusions of those reports:

- Section 2.3.1- Dust Control Audit, September 2023 (Northstar, 2023a);
- Section 2.3.2 - Air Quality Management Plan & Trigger Action Response Plan (Northstar, 2023c); and
- Section 2.3.3 - Air Monitoring Plan, October 2023 (Northstar, 2023b) and Air Monitoring Report (Northstar, 2024).

2.3.1. Dust Control Audit

On 4 August 2023 NSW EPA provided the Licensee with a Prevention Notice (Notice No. 3506243), issued under section 96 of the Protection of the Environment Operations Act 1997 (POEO Act). As outlined within that Prevention Notice, NSW EPA had been investigating ongoing complaints, alleging dust from the Premises has been impacting human health and the environment since August 2022. NSW EPA was of the opinion that during times of operation the Premises had generated fugitive dust emissions that have been experienced outside of the Premises site boundary. NSW EPA was also of the opinion that the Premises have the capacity to generate excessive dust emissions, particularly through the movement of heavy-duty vehicles traversing along internal roads.

A site inspection and audit were conducted by Northstar in August 2023 to identify the potential sources of particulate emissions at the Quarry, review the efficacy of currently adopted controls, and recommend further measures which could be implemented to reduce those emissions. A range of mitigation measures were

identified and presented to the Proponent. A number of these mitigation measures were subsequently adopted and implemented at the Quarry site and outlined in an Air Quality Management Plan (refer Section 2.3.2).

2.3.2. Air Quality Management Plan

The Air Quality Management Plan (AQMP) was developed for the Quarry by Northstar in November 2023 (Northstar, 2023c) which includes a range of emissions controls, which are summarised in Table 2.

Table 2 Control measures for air emissions

ID	Control measure	Timing
General		
AQ1 Proactive Minimise/Control	Disturbance is limited to the area required for 6 to 12 months operations and soil stockpiles retained for periods greater than 3 months are sown with a sterile cover crop. Performed in accordance with the Soil and Water Management Plan, and Rehabilitation Management Plan.	Ongoing
AQ2 Proactive Minimise/Control	Wherever possible, soil stripping is undertaken at a time when there is sufficient soil moisture to prevent significant dust lift off. Performed in accordance with the Soil and Water Management Plan	Ongoing
AQ3 Proactive Prevent	Whenever possible, the Applicant will avoid stripping soil in periods of high winds.	Ongoing
AQ4 Proactive Minimise/Control	The drill rig used for drilling blast holes will utilise water injection or alternatively, be fitted with dust collectors.	Ongoing
AQ5 Proactive Prevent	The exhausts of all earthmoving equipment will be diverted away from the ground surface so as not to generate dust.	Ongoing
AQ6 Proactive Minimise/Control	Application of water sprays using handheld hoses during particularly dry and windy conditions	As required
Haulage		
AQ7 Proactive Minimise/Control	The Applicant has sealed the length of Battery Road from the "Glenella" property front gate to the existing sealed section at the intersection with Reids Flat Road.	Implemented
AQ8 Proactive Minimise/Control	Two-way road section from "Glenella" property gate to weighbridge sealed to minimise dust emissions	Implemented
AQ9 Proactive Minimise/Control	One-way road section from load-out area to two-way road section sealed to minimise dust emissions	Implemented

ID	Control measure	Timing
AQ10 Reactive Minimise/Control	When conditions require, a contract water cart is employed on the unsealed section of the internal haul route, to reduce dust nuisance.	As required
AQ11 Proactive Minimise/Control	Regular road maintenance is conducted on the internal access road with grader and loaders.	Ongoing
AQ12 Proactive Prevent	The site access road and internal haul roads are clearly defined and vehicles and equipment restricted to those roads during normal operational activities.	Ongoing
AQ12 Proactive Minimise/Control	Vehicle restrictions in accordance with the Traffic Management Plan.	Ongoing
AQ12 Proactive Minimise/Control	Operation of manually operated sprinkler system in key areas of heavily tracked haulage routes	As required
Materials Processing		
AQ13 Proactive Minimise/Control	Misting water sprays or similar are used during crushing operations to reduce dust generation.	Ongoing
AQ14 Proactive Minimise/Control	In dry and windy conditions, materials processing is performed in less exposed areas where water suppression is available	As required
Materials Handling		
AQ15 Proactive Minimise/Control	In dry and windy conditions, materials handling is performed in less exposed areas	As required
AQ16 Proactive Minimise/Control	Minimising working areas of stockpiles i.e. work only one face at any one time	Ongoing
AQ17 Proactive Minimise/Control	Materials handling activities such as FEL loading trucks and FEL working stockpiles performed as close to protected side of stockpiles where possible during windy conditions (nominally wind speeds >15 km hr ⁻¹)	As required
Wind Erosion		
AQ18 Proactive Prevent	Areas of disturbance would be minimised through progressive rehabilitation over the life of the mine to reduce dust lift-off from wind erosion	Ongoing
AQ19 Proactive Minimise/Control	Minimising working areas of stockpiles i.e. work only one face at any one time	Ongoing
AQ20 Proactive Minimise/Control	Undertake soil stripping at a time where there is sufficient soil moisture to prevent dust lift off	Ongoing

These emissions controls are currently implemented at the Quarry and would continue to be implemented as part of the proposed modification.

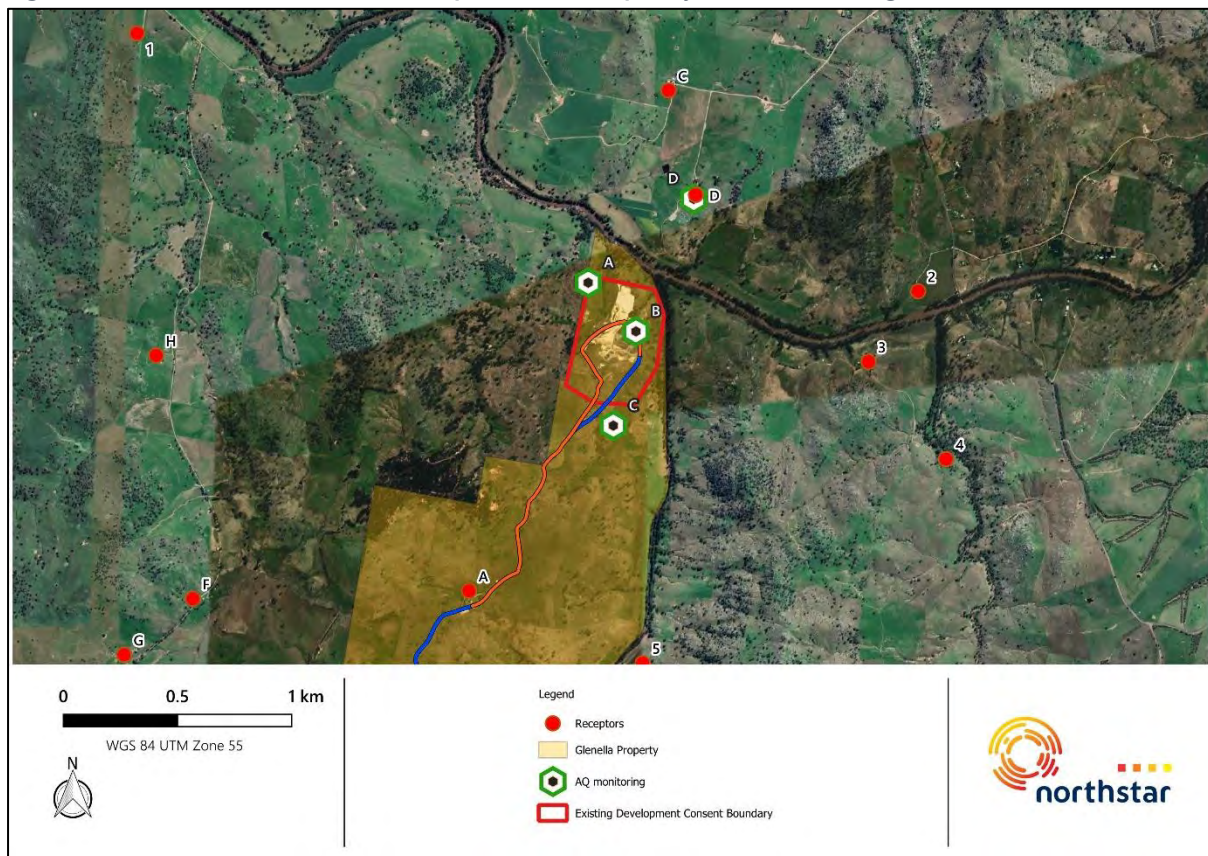
2.3.3. Air Quality Monitoring

EPL 20632 requires the real-time monitoring of air quality and meteorological parameters either within the Quarry boundary (three locations), or at a surrounding residence (Glenavon, residence D [refer Section 4.1]). An Air Monitoring Plan was developed by Northstar in October 2023 (Northstar, 2023b), in response to a PRP which outlines the objectives of the monitoring, being:

1. To meet the requirements of the EPL;
2. To support the collection of data to inform the Licensee on the efficacy of dust control measures operated on-site, and to allow the provision of quantitative triggers to identify when additional / supplementary dust controls are required; and
3. To support the provision of information on the ongoing compliance status of the Quarry against relevant air quality standards.

Air quality monitoring for PM₁₀ and PM_{2.5} is performed at the four locations shown in Figure 3. The locations were selected to allow the calculation of potential offsite impacts during wind directions which would be most likely to result in transport of particulate matter from the Quarry to nearby sensitive receptors. The data is used as part of a Trigger Action Response Plan (TARP), which allows the Proponent to identify in real-time the incremental impacts resulting from Quarry operations, and adjust those operations, or implement additional controls, should they be required.

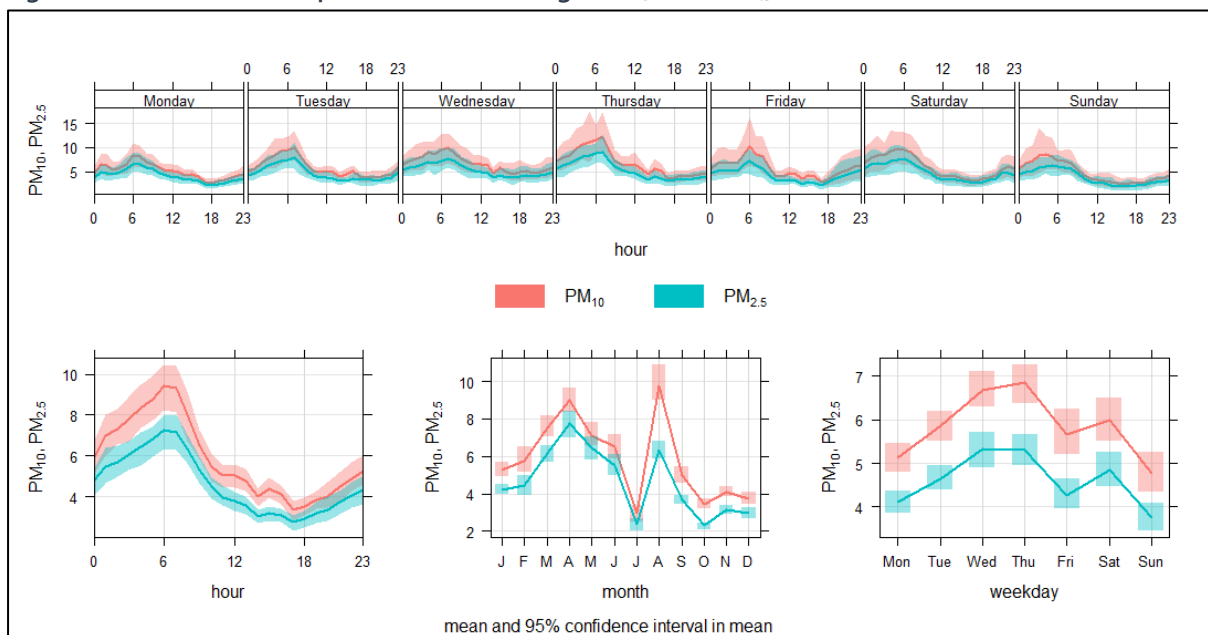
Figure 3 Locations of sensitive receptors and air quality and meteorological monitors



Source: Northstar

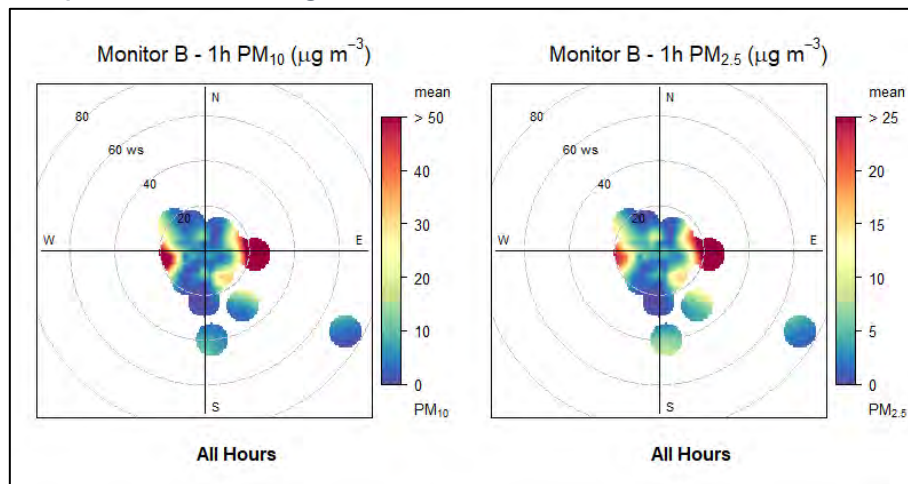
An example of the air quality monitoring outputs provided in the Air Quality Monitoring Report as part of the EPL conditions are presented in Figure 4 and Figure 5 (for monitor B).

Figure 4 Time variation plot of 1-hour average PM_{10} and $PM_{2.5}$ – Monitor B



Source: Northstar

Figure 5 Polar plot of 1-hour average PM_{10} and $PM_{2.5}$ – Monitor B – all hours



Source: Northstar

These show a summary of the data collected over a 12-month period, but the outputs are available to the Proponent in real-time via a dashboard. Furthermore, should any values for particulate matter, wind speed, and wind direction defined under the TARP (refer Section 2.3.4) be triggered, then alerts are sent to site personnel, which can then initiate the required response.

The results of the air quality monitoring performed at the Quarry indicate that all relevant air quality criteria are achieved. As outlined in (Northstar, 2024):

These data indicate that the air quality criteria (PM_{10} and $PM_{2.5}$) were achieved during the 12-month monitoring period. These measurements were performed within the Quarry Boundary (Monitors A, B, and C) and at an off-site location (Monitor D). It can confidently be assumed that, based on the measurements reviewed, and the placement of the monitoring equipment, that compliance with the relevant air quality criteria would be experienced at off-site locations.

This system, and the measures outlined in the AQMP, represents best management particulate matter control at quarry sites.

2.3.4. Trigger Action Response Plan

The TARP was developed as part of the AQMP (Northstar, 2023c) in accordance with Condition U3 of the EPL. The TARP describes the actions to be taken when specific triggers are exceeded.

The purpose of the TARP is to provide a process to identify conditions that may lead to unacceptable dust impacts if not adequately managed, and to provide pro-active and reactive actions to manage that risk. Triggers have been defined to assist the Proponent to meet dust management obligations when:

- Ground-level concentrations at the monitoring locations have the potential to be elevated due to activities onsite; and
- Onsite activities are generating visible dust outside of the normal observed range.

The monitoring program is designed to enable and facilitate pro-active modification of site activities to reduce the likelihood of unacceptable air quality impacts at surrounding receptor locations. In conditions when the background particulate environment is significantly affected by external sources (such as dust storms or bushfire), then modification of activities may not result in any meaningful reductions in off-site impacts associated with the activities on site. However, the TARP has been designed to enable minimisation of the Quarry impact in all conditions.

To allow an appropriate management response / action associated with increasing risk of off-site particulate impacts, a 'traffic light' system is implemented, adopting a cascading action level. These trigger levels are presented in Table 3.

Table 3 Trigger Levels

Action Level	1-hour average PM ₁₀ concentration (µg·m ⁻³)
None	Concentration at any monitor <50 µg·m ⁻³ <i>or</i> No visible dust observed leaving the site boundary <i>or</i> Wind speeds < 5.4 m·s ⁻¹ (< 19.4 km·hr ⁻¹)
A	Concentration at any monitor ≥50 µg·m ⁻³ <i>and</i> 1-hour average DWI <5 µg·m ⁻³ <i>or</i> Visible dust observed leaving the site boundary <i>or</i> Wind speeds ≥ 5.5 m·s ⁻¹ (≥ 19.8 km·hr ⁻¹)
B	Concentration at any monitor ≥50 µg·m ⁻³ <i>and</i> 1-hour average DWI ≥5 µg·m ⁻³ and <10 µg·m ⁻³ <i>or</i> Visible dust observed leaving the site boundary <i>or</i> Receipt of a justified complaint <i>or</i> Wind speeds ≥ 6.8 m·s ⁻¹ (≥ 24.5 km·hr ⁻¹)
C	Concentration at any monitor ≥50 µg·m ⁻³ <i>and</i> 1-hour average DWI >10 µg·m ⁻³ <i>or</i> Visible dust observed leaving the site boundary

Action Level	1-hour average PM ₁₀ concentration (µg·m ⁻³)
	<i>or</i> Receipt of a justified complaint <i>or</i> Wind speeds ≥ 8 m·s ⁻¹ (≥ 28.8 km·hr ⁻¹)

Should trigger levels outlined in Table 3 be reached, then a hierarchy of management and mitigation options are initiated as identified in Table 4 and Table 5. These controls are implemented appropriate to the activities being performed at the Quarry at that time and are reflective of increased risk of dust generation and potential impact of dust emissions.

Table 4 outlines the actions and responsibilities if a level is triggered.

Table 4 Action level responses

Action level	Response
None	No response required beyond the continued implementation of standard dust controls
A	Identify activities being performed and whether any additional emission controls can be applied to those activities (e.g. watering of roads and stockpiles, water sprays etc.)
B	Apply the controls identified during Action Level A
C	Depending on the activities being performed, progressively decrease the rate of activity or cease operations if emissions cannot be adequately controlled

The identification of additional control measures includes, but is not limited, to the measures outlined in Table 5.

Table 5 Additional controls

Emission source group	Additional controls
Transport	Water sprays on unpaved road surfaces Reduction in vehicle speeds Re-routing vehicles where possible
Material handling	Minimise drop heights Additional watering at transfer points (loading and unloading)
Material processing	Additional watering on materials processing activities
Wind erosion	Additional watering Limit activities on stockpiles

2.3.5. Summary

The approach to air quality management at the Quarry can be considered to represent best practice, and includes an AQMP, real-time air quality monitoring, and a TARP to manage any potential for off-site elevated particulate matter concentrations.

Air quality management measures in place at the Quarry are significantly more robust since the provision of the original DA in 2007. These include, but are not limited to the following measures:

- Improvements in road surfaces (paving/gravelling of road from weighbridge to site entrance, and the one-way road on the eastern side of the Quarry from the processing area to the two-way road);
- Additional air quality management measures outlined in the AQMP, determined through the performance of a site audit; and
- Operation of an extensive real-time air quality monitoring program, linked to a trigger action response plan, to allow responsive management to reduce particulate emissions from the Quarry operations, and minimise impacts on surrounding sensitive receptors.

The results of the air quality monitoring program indicate that the Quarry is being operated so as to not result in any exceedances of the relevant air quality criteria. With three of the four monitoring locations being within the Quarry boundary, this indicates that impacts at surrounding sensitive receptors would be compliant with the NSW EPA air quality criteria, with concentrations significantly lower than those measured.

Since August 2023, at the request of NSW EPA, the Applicant has responded to three Pollution Reduction Programs (PRP), as outlined in the preceding sections. It is noted that the only PRP which remains on the EPL for the Quarry is related to ongoing air quality monitoring and reporting. All other PRPs have been removed from the licence which indicates that NSW EPA are satisfied with the outcome of those studies and implementation of air quality management measures at the Quarry.

3. LEGISLATION, REGULATION AND GUIDANCE

3.1. NSW EPA Approved Methods

State air quality guidelines adopted by the NSW EPA are published in the *'Approved Methods for the Modelling and Assessment of Air Quality in NSW'* (the Approved Methods (NSW EPA, 2022)) which has been consulted during the preparation of this assessment report.

The Approved Methods lists the statutory methods that are to be used to model and assess emissions of criteria air pollutants from stationary sources in NSW. Section 7.1 of the Approved Methods clearly outlines the impact assessment criteria to be applied.

The criteria listed in the Approved Methods are derived from a range of sources (including National Health and Medical Research Council [NHMRC], National Environment Protection Council [NEPC], Department of Environment [DoE], and World Health Organisation [WHO]).

The criteria specified in the Approved Methods are the defining ambient air quality criteria for NSW. The standards adopted to protect members of the community from health impacts in NSW are presented in Table 6.

Table 6 NSW EPA impact assessment criteria

Pollutant	Averaging period	Units	Criterion	Notes
Particulates (as PM ₁₀)	24 hours	µg·m ⁻³	50	Numerically equivalent to the Ambient Air Quality National Environment Protection Measure (AAQ NEPM) ^(b) standards and goals.
	1 year	µg·m ⁻³	25	
Particulates (as PM _{2.5})	24 hours	µg·m ⁻³	25	
	1 year	µg·m ⁻³	8	
Particulates (as total suspended particulate [TSP])	1 year	µg·m ⁻³	90	
Deposited dust	1 year	g·m ⁻² ·month ^{-1(c)}	2	Assessed as insoluble solids as defined by AS 3580.10.1
		g·m ⁻² ·month ^{-1(d)}	4	

Notes: (a): micrograms per cubic metre of air
 (b): National Environment Protection (Ambient Air Quality) Measure
 (c): Maximum increase in deposited dust level
 (d): Maximum total deposited dust level

3.2. Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations (POEO) Act* (1997) sets the statutory framework for managing air quality in NSW, including establishing the licensing scheme for major industrial premises and a range of air pollution offences and penalties.

Should the Quarry gain approval the operations would continue to be defined as a scheduled activity under the POEO Act. It is noted that the Quarry will continue to operate under the conditions outlined within EPL 20632.

3.3. Protection of the Environment (Clean Air) Regulation 2022

The Protection of the Environment Operations (POEO) (Clean Air) Regulation (2022) sets standards of concentration for emissions to air from both scheduled and non-scheduled activities. For the activities performed at the Quarry, the POEO (Clean Air) Regulation provides general standards of concentration for scheduled premises which are presented in Table 7 for the pollutants of relevance to this assessment.

Table 7 POEO (Clean Air) Regulation – General standards of concentration

Air Impurity	Activity	Standard of Concentration (Group 6) ¹
Solid particles (total)	Any activity or plant (except as listed below)	50 mg·m ⁻³
	Any crushing, grinding, separating or materials handling activity	20 mg·m ⁻³
Nitrogen dioxide (NO ₂) or nitric oxide (NO) or both, as NO ₂ equivalent	Any activity or plant (except boilers, gas turbines and stationary reciprocating internal combustion engines listed below)	350 mg·m ⁻³

Note: (1) Group 6 – pursuant to application made on or after 1 September 2005

Further to the requirements in Table 7, Part 4 Clause 20 of the POEO (Clean Air) Regulation requires that motor vehicles do not emit excessive air impurities which may be visible for a period of more than 10-seconds when determined in accordance with the relevant standard.

Schedule 1 Part 3 of the POEO (Clean Air) Regulation indicates that burning of anything other than vegetation is prohibited (except with approval) in the Hilltops LGA, no burning of materials would be performed as part of the quarrying operations.

All vehicles, plant and equipment to be used either at the Quarry Site or to transport materials to and from the Quarry Site will be maintained regularly and in accordance with manufacturers' requirements, where these vehicles are under the operational control of the Proponent.

4. EXISTING CONDITIONS

4.1. Discrete Receptor Locations

Air quality assessments typically use a desk-top mapping study to identify 'discrete receptor locations', which are intended to represent a selection of locations that may be susceptible to changes in air quality. In broad terms, the identification of sensitive receptors refers to places at which humans may be present for a period representative of the averaging period for the pollutant being assessed. Typically, these locations are identified as residential properties although other sensitive land uses may include schools, medical centres, places of employment, recreational areas or ecologically sensitive locations.

It is noted that in addition to the identified 'discrete' receptor locations, the entire modelling area is gridded with 'uniform' receptor locations that are used to plot out the predicted impacts, and as such the accidental non-inclusion of a location sensitive to changes in air quality does not render the AQIA invalid, or otherwise incapable of assessing those potential risks.

To ensure that the selection of discrete receptors for the AQIA are reflective of the locations in which the population of the area surrounding the Proposal site reside, population density data has been examined. Population density data based on the 2016 census have been obtained from the Australian Bureau of Statistics (ABS) for a 1 square kilometre (km²) grid, covering mainland Australia (ABS, 2017). Using a Geographical Information System (GIS), the locations of sensitive receptor locations have been confirmed with reference to their population densities.

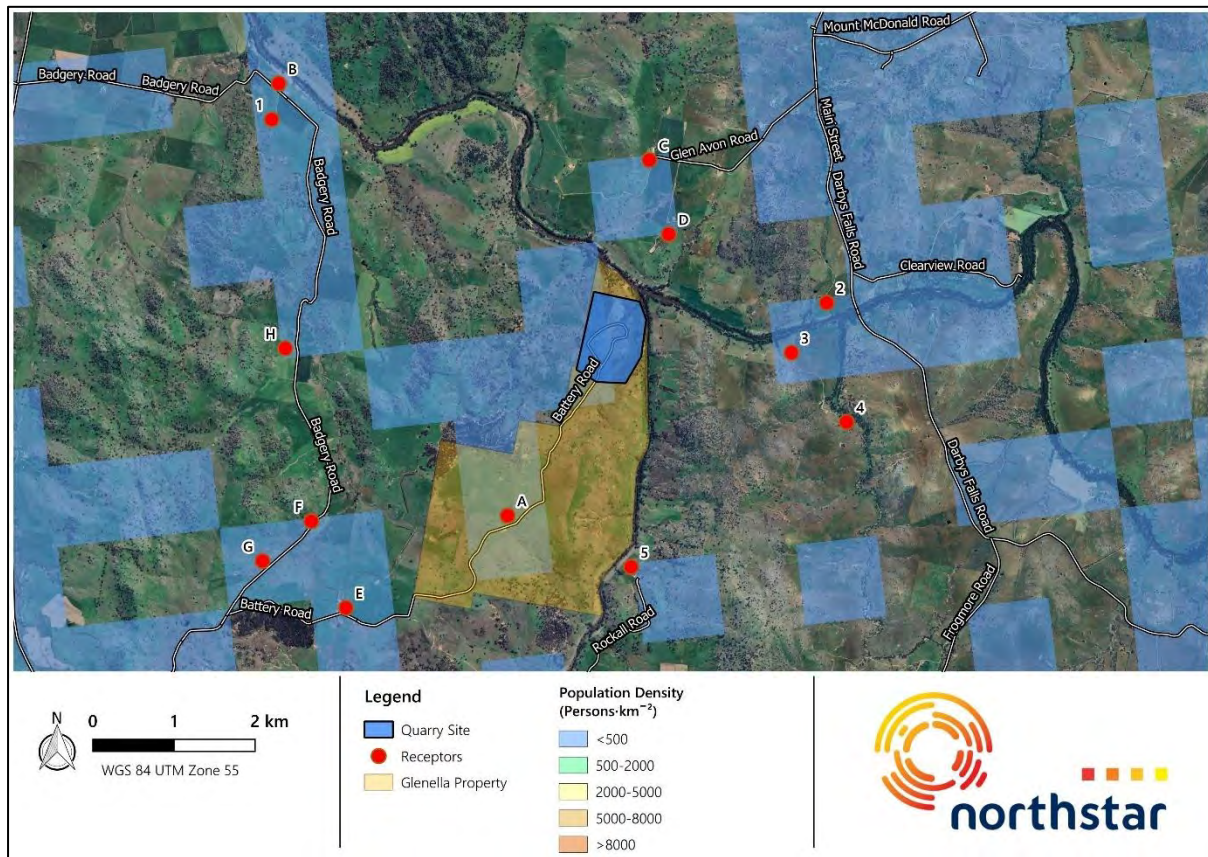
For clarity, the ABS use the following categories to analyse population density (persons·km⁻²):

- Very high > 8 000
- High > 5 000
- Medium > 2 000
- Low > 500
- Very low < 500
- No population 0

Using ABS data in a GIS, the population density of the area surrounding the Proposal site are presented in Figure 6. The Quarry Site is located in an area of low to very low population density (between 0 and <500 persons·km⁻²).

A number of residential locations surrounding the Quarry Site have been identified and these receptors have been adopted for use within this AQIA as presented in Table 8.

Figure 6 Population density and sensitive receptors surrounding the Quarry Site



Note: Areas with no colour represents a 1 km² grid cell with zero population

Figure 6 identifies a number of 1 km² grids that are identified by the ABS as being populated. The desk-top mapping study performed for this AQIA examined those grid cells to ensure all relevant receptor locations had been identified. Receptor A is identified as being Proposal related and impacts at that location are reported and discussed with that in mind.

Table 8 Discrete sensitive receptor locations used in the study

ID	Landowner	Comment	Location (m, UTM 55)	
			Eastings	Northings
A	Glenella	Project related	667 868	6 239 446
B	Badgery	Privately owned	665 047	6 244 767
C	Lachoon	Privately owned	669 616	6 243 825
D	Glenavon	Privately owned	669 855	6 242 911
E	Duallie	Privately owned	665 875	6 238 310
F	Golong	Privately owned	665 449	6 239 377
G	Keronga	Privately owned	664 846	6 238 887
H	Spring Creek	Privately owned	665 128	6 241 506
1	Unknown	Privately owned	664 961	6 244 324
2	Unknown	Privately owned	671 802	6 242 067
3	Unknown	Privately owned	671 367	6 241 451

ID	Landowner	Comment	Location (m, UTM 55)	
			Eastings	Northings
4	Unknown	Privately owned	672 046	6 240 599
5	Unknown	Privately owned	669 389	6 238 814

4.2. Meteorology

In accordance with the requirements of the NSW EPA Approved Methods, the AQIA is required to describe and account for the influence of the prevailing meteorological conditions.

The meteorology experienced within an area can govern the generation (in the case of wind dependent emission sources), dispersion, transport and eventual fate of pollutants in the atmosphere. The meteorology of the area surrounding the Quarry Site has been examined using data collected by the Australian Government Bureau of Meteorology (BoM) at the Cowra Airport Automatic Weather Station (AWS), which is located approximately 21 km northwest of the Quarry Site. This AWS is considered the most representative station for the area surrounding the Quarry Site.

To provide a characterisation of the meteorology which would be expected at the Quarry Site, a meteorological modelling exercise has been performed.

Data from the year 2024 have been selected for use in the AQIA to provide an approximation of 'representative' conditions surrounding the Quarry. This year has been selected through an analysis of the correlation coefficients between each year for wind speed, wind direction and particulate matter for the five-year period 2020 to 2024 (refer Appendix B). Following this analysis, the year 2024 was selected as the most representative year for meteorological modelling.

A summary of the inputs and outputs of the meteorological modelling assessment, including model validation, is presented in Appendix B. This analysis includes a discussion of data availability and variability.

4.3. Air Quality

The air quality experienced at any location will be a result of emissions generated by natural and anthropogenic sources on a variety of scales (local, regional and global). The relative contributions of sources at each of these scales to the air quality at a location will vary based on a wide number of factors including the type, location, proximity and strength of the emission source(s), prevailing meteorology, land uses and other factors affecting the emission, dispersion and fate of those pollutants.

When assessing the impact of any particular source of emissions on the potential air quality at a location, the impact of all other sources of an individual pollutant should also be assessed. This 'background' (sometimes

called 'baseline') air quality will vary depending on the pollutants to be assessed and can often be characterised by using representative air quality monitoring data.

The Quarry Site is located at significant distance from any of the air quality monitoring stations (AQMS) operated by NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW). The locations of the nearest AQMS (listed by proximity) are briefly summarised in Table 9 and presented in Appendix C. The year 2024 is indicated in Table 9 as this is the year selected for assessment. Further information is provided below.

Table 9 Closest DCCEEW AQMS to the Quarry Site

AQMS Location	Approximate distance to Quarry (km)	Screening Parameters			
		2024 Data	Measurements		
			PM ₁₀	PM _{2.5}	TSP
Millthorpe	65	✓	✓	✓	✗
Orange	78	✓	✓	✓	✗
Bathurst	91	✓	✓	✓	✗
Goulburn	119	✓	✓	✓	✗

The closest representative AQMS with PM₁₀ and PM_{2.5} data available for the assessment year of 2024 is noted to be located at Orange and is considered to be the monitoring location most reflective of the 'background' air quality conditions (i.e. without the impact of Quarry operations). It is noted that whilst Millthorpe AQMS is more proximate to the Quarry site, it is not considered representative of PM measurements at the Quarry site due to its proximity to the Cadia mine. The Millthorpe AQMS was temporarily commissioned in July 2023 specifically to monitor PM levels near the Cadia mine, and as a result, records higher levels of PM compared to Orange and Bathurst AQMS. Given that the Quarry site is located more than 50 km from the Cadia mine, it is unlikely to be significantly affected by emissions from the mine. Therefore, PM data from Orange AQMS is considered more representative of 'background' air quality conditions. A summary of the PM₁₀ and PM_{2.5} results in 2024 at Millthorpe, Orange and Bathurst AQMS are presented in Table 10.

Table 10 Comparison of PM data at Millthorpe, Orange and Bathurst AQMS 2024

	PM ₁₀ (µg·m ⁻³)			PM _{2.5} (µg·m ⁻³)		
	Millthorpe	Orange	Bathurst	Millthorpe	Orange	Bathurst
Mean	14.1	11.3	12.7	6.5	6.8	5.5
Maximum	47.5	39.7	28.8	38.4	33.0	17.3
Minimum	2.8	0.7	2.6	1.0	-0.5	0.6

The adoption of air quality monitoring data, often collected at significant distances from proposed projects, to represent conditions at those locations is a routinely adopted approach in NSW. NSW DCCEEW operates an extensive air quality monitoring network, generally reflective of the most populated areas of the State. Site

specific air quality monitoring funded by proponents can sometimes be used, although for the purposes of use within an AQIA, at least a full year of continuous measurement is required.

Data from the year 2024 have been selected for use in the AQIA to provide an approximation of 'representative' conditions surrounding the Quarry (see Section 4.2). This year has been selected through examination of meteorology and air quality for the five-year period 2020 to 2024 (refer Appendix B).

For completeness, Appendix C provides a detailed assessment of the background air quality monitoring data collected at the Orange and Millthorpe AQMS.

It is noted that none of the AQMS identified in Table 9 measure concentrations of TSP. This pollutant is of relevance to the expected emissions from the Quarry. Other sources of data have been adopted to allow representation of the TSP environment in the area surrounding the Quarry, and a full discussion is provided in Appendix C.

The impact assessment criteria used for deposited dust (see Section 3.1) are presented as (i) a cumulative deposition rate of $4 \text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ and (ii) a discrete deposition rate of $2 \text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$. In lieu of a background deposition rate to derive a cumulative rate, the incremental impact assessment criterion ($2 \text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$) has been adopted. This is a commonly adopted approach when background dust deposition rates are not available.

A summary of the air quality monitoring data used in this assessment is presented in Table 11.

Table 11 Summary of background air quality used in the AQIA

Pollutant	Ave Period	Measured Value	Notes
Particles (as TSP)	Annual $\mu\text{g}\cdot\text{m}^{-3}$	25.4	Estimated on a TSP:PM ₁₀ ratio as per Appendix C
Particles (as PM ₁₀)	24-hour $\mu\text{g}\cdot\text{m}^{-3}$	Daily Varying	The 24-hour maximum PM ₁₀ in 2024 at Orange was measured to be $39.7 \mu\text{g}\cdot\text{m}^{-3}$
	Annual $\mu\text{g}\cdot\text{m}^{-3}$	11.3	
Particles (as PM _{2.5})	24-hour $\mu\text{g}\cdot\text{m}^{-3}$	Daily Varying	The 24-hour maximum PM _{2.5} in 2024 at Orange was measured to be $33.0 \mu\text{g}\cdot\text{m}^{-3}$
	Annual $\mu\text{g}\cdot\text{m}^{-3}$	6.8	
Dust deposition	Annual $\text{g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$	2	Difference in NSW EPA maximum allowable and incremental impact criterion

Note: Reference should be made to Appendix C

It is noted that whilst real-time air quality monitoring is performed at the Quarry (refer Section 2.3.3), this is not suitable for dispersion modelling purposes as

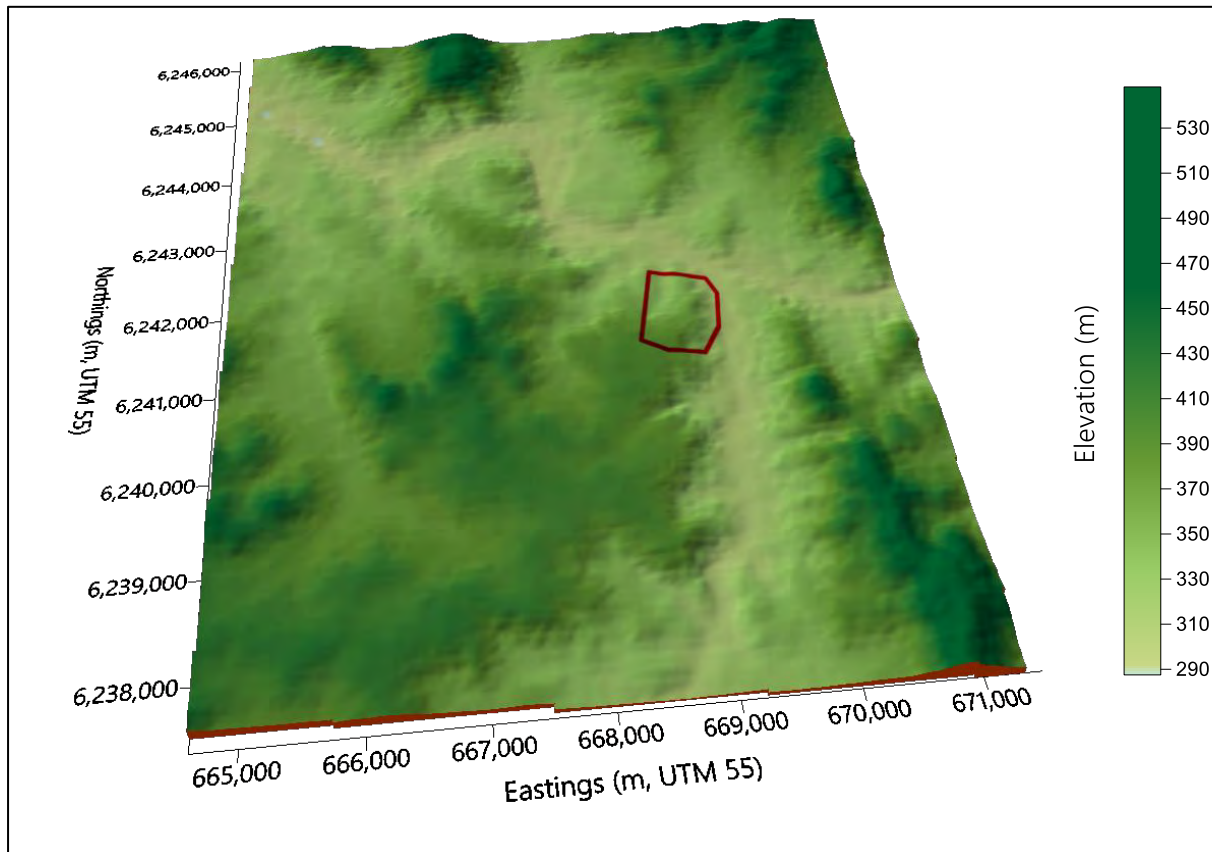
- i) It is not collected using reference methods; and
- ii) It is collected mainly at locations within the Quarry boundary and results would include a significant element of current quarrying operations. Addition of the incremental predictions generated through dispersion modelling would result in significant double counting.

The AQIA has been performed to assess the contribution of the operations at the Quarry to the air quality of the surrounding area. A full discussion of how the Quarry may impact upon air quality is presented in Section 6.

4.4. Topography

The elevation of the Quarry Site is between approximately 290 m and 420 m Australian Height Datum (AHD), with isolated hills rising to in excess of 470 m AHD. The topography is characterised by hilly undulating terrain. Ridge lines grade into flat plateau terrain with moderate to steep-sided valleys to the north, east and west of the Quarry. The topography of the area, and the locations of surrounding receptors in relation to the Quarry and surrounding topography has informed the approach to meteorological modelling (refer Section 5.1).

Figure 7 Three-dimensional representation of topography surrounding the Quarry Site



4.5. Potential for Cumulative Impacts

There are no significant sources of particulate matter that may cumulatively impact on nearby sensitive receptors with the Quarry. The inclusion of the background air quality data as described in Section 4.3 would appropriately account for any potential cumulative impacts associated with surrounding land uses, which may include agricultural activities which vary throughout the year.

5. APPROACH TO ASSESSMENT

5.1. Dispersion Modelling

A dispersion modelling assessment has been performed using the NSW EPA approved CALPUFF atmospheric dispersion model. The modelling has been performed in CALPUFF 3-dimensional (3-D) mode, adopting a 'No-Obs' meteorological modelling simulation, in accordance with NSW EPA guidance (Barclay & Scire, 2011) (please refer to Appendix B for further information). This approach allows the inclusion of topographical features which are present in the area surrounding the Quarry, as discussed in Section 4.4.

An assessment of the impacts of the operation of activities at the Quarry has been performed which characterises the likely day-to-day operation of the Quarry, approximating average operational characteristics which are appropriate to assess against longer term (annual average) criteria for particulate matter. The likely peak activities at the Quarry have also been characterised to allow comparison of potential impacts against shorter term (24-hour) criteria for particulate matter.

The modelling scenarios provide an indication of the air quality impacts of the operation of activities at the Quarry Site. Added to these impacts are background air quality concentrations (where available and discussed in Section 4.2 and Appendix C) which represent the air quality which may be expected within the area surrounding the Quarry Site, without the impacts of the Quarry itself.

The following provides a description of the determination of appropriate emissions of air pollutants resulting from the operation of the Quarry.

5.2. Emissions Estimation

The estimation of emissions from a process is typically performed using direct measurement or through the application of factors which appropriately represent the processes under assessment. This assessment has adopted emission factors for drilling, blasting, materials handling processes, movement of trucks on unpaved site roads, crushing and screening, and wind erosion contained within the US EPA AP-42 emission factor compendium (US EPA, 1995 and updates) to represent the emission of particulate matter resulting from the operations occurring at the Quarry Site as described in Section 2.2. These factors are appropriate for adoption in Australia and are routinely adopted in the assessment of operations of this nature.

Potential emissions of particulate matter during operations have been quantified, with an emissions inventory associated with the average and peak operational characteristics calculated.

The estimation of annual emissions associated with the Proposal has assumed that operations are being performed at a steady rate across the year which is appropriate. In the assessment of maximum potential 24-hour impacts, it has been assumed that the day of maximum activity occurs on every day of the year. The

assessment is required to be performed in this way to ensure that potential worst-case meteorological conditions are assumed at the same time as potential worst-case emissions, although the resulting impacts should be viewed with that conservatism in mind. Importantly, the AQIA is provided to confirm that the Proposal can be operated to be compliant with the air quality criteria in Section 3.

A full description of the emission sources included in the assessment, and the emission factors and assumptions adopted are presented in Appendix D.

5.3. Emissions Controls

As discussed in Section 2.3, emissions controls are currently, and will continue to be employed at the Quarry Site. The application of these controls result in quantifiable reductions in the quantity of particulate matter being emitted as part of the Quarry operation.

A summary of the emissions reduction measures that would be adopted as part of the Quarry operations is presented in Table 12. These emission reductions are outlined in the NPI EETM for Mining (NPI, 2012) and relevant AP-42 documentation (US EPA, 1995).

Table 12 Summary of emission reduction methods adopted as part of Quarry operation

Emission control method	Control efficiency (%)
Water injection on drill rigs	96
Application of water on unsealed haulage routes (internal) $< 2 \text{ L} \cdot \text{m}^{-2} \cdot \text{hr}^{-1}$	50
Reduction in vehicle speeds below $40 \text{ km} \cdot \text{hr}^{-1}$ on unpaved roads	75
Reduction in vehicle speeds below $40 \text{ km} \cdot \text{hr}^{-1}$ on paved roads (offsite)	44
Application of water sprays on materials crushing operations	77.7
Application of water sprays on materials screening operations	91.2
Application of water during washing process	100
Retention of particulate matter within the pit, for activities occurring in the pit	50 (TSP) 5 (PM_{10} , $\text{PM}_{2.5}$)
Covering loads with a tarpaulin	Not quantified
Limit load sizes to ensure material is not above the level of truck sidewalls	Not quantified

Based on the foregoing, and the information provided in Appendix D, the distribution of controlled particulate emissions is presented in Figure 8 (annual emissions totals) and Figure 9 (peak daily emissions). Note that the total haulage emissions include transport of product from the Quarry Site entrance to Reids Flat Road.

Figure 8 Calculated uncontrolled & controlled annual particulate emissions

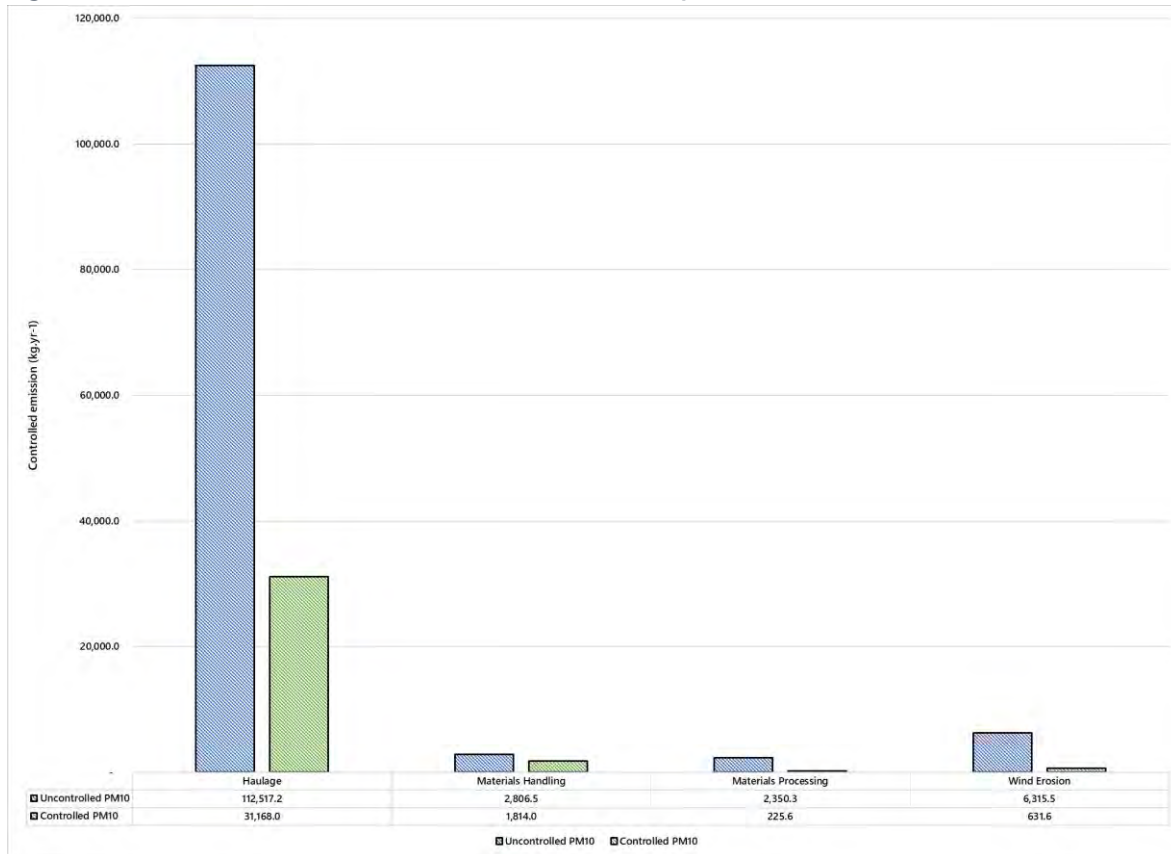
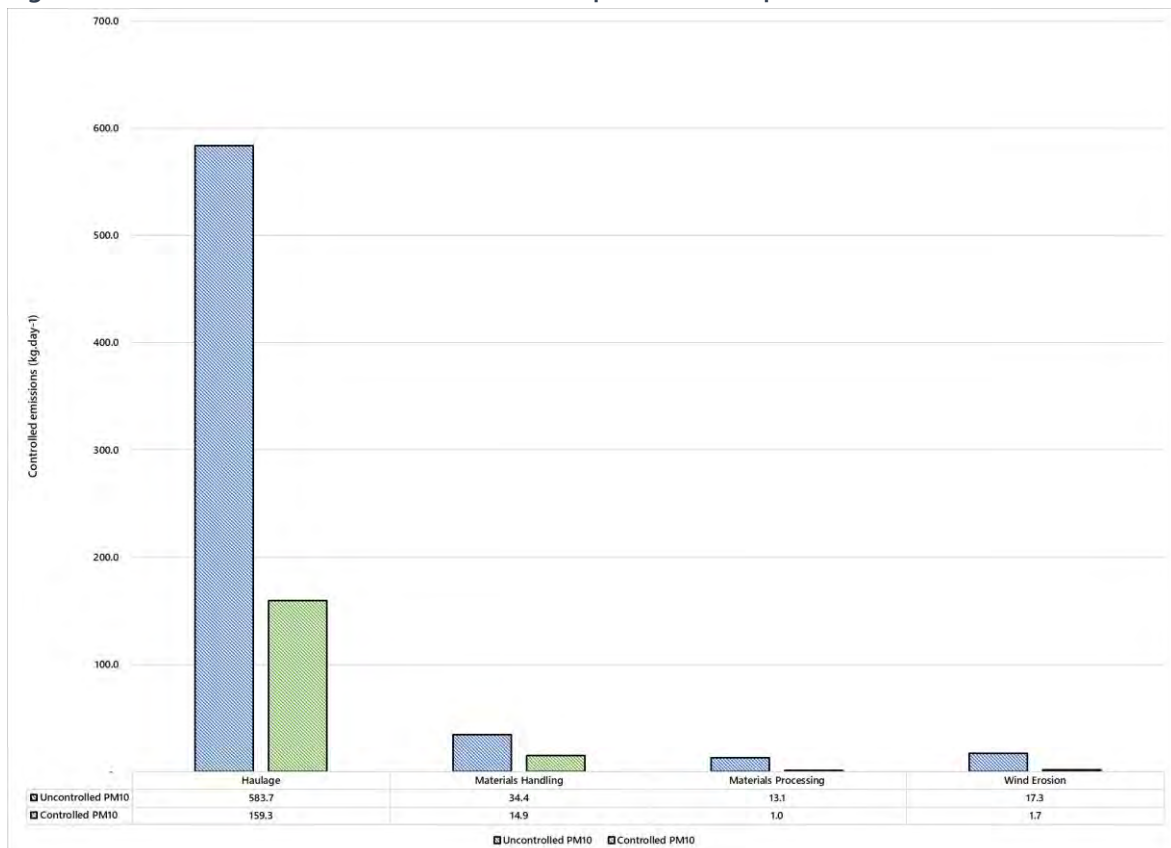


Figure 9 Calculated uncontrolled & controlled peak 24-hour particulate emissions



6. IMPACT ASSESSMENT

This section presents the results of the dispersion modelling assessment and uses the following terminology:

- Incremental impact – relates to the concentrations predicted as a result of the operation of the Quarry in isolation.
- Cumulative impact – relates to the incremental concentrations predicted as a result of the operation of the Quarry PLUS the background air quality concentrations discussed in Section 4.2.

The results are presented in this manner to allow examination of the likely impact of the Quarry in isolation and the contribution to air quality impacts in a broader sense.

In the presentation of results, the tables included shaded cells which represent the following:

Model prediction	Pollutant concentration / deposition rate less than the relevant criterion	Pollutant concentration / deposition rate equal to, or greater than the relevant criterion
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6.1. Particulate Matter – Annual Average PM₁₀ and PM_{2.5}

The predicted annual average particulate matter concentrations (as TSP, PM₁₀ and PM_{2.5}) resulting from the operation of the Quarry Site are presented in Table 13.

Table 13 Predicted annual average TSP, PM₁₀ and PM_{2.5} concentrations

Receptor	Annual Average Concentration (µg·m ⁻³)								
	TSP			PM ₁₀			PM _{2.5}		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
B	<0.1	25.4	25.4	<0.1	11.3	11.4	<0.1	6.8	6.9
C	<0.1	25.4	25.4	<0.1	11.3	11.4	<0.1	6.8	6.9
D	0.2	25.4	25.5	<0.1	11.3	11.4	<0.1	6.8	6.9
E	0.7	25.4	26.1	0.2	11.3	11.5	<0.1	6.8	6.9
F	0.1	25.4	25.5	<0.1	11.3	11.4	<0.1	6.8	6.9
G	0.1	25.4	25.5	<0.1	11.3	11.4	<0.1	6.8	6.9
H	<0.1	25.4	25.4	<0.1	11.3	11.4	<0.1	6.8	6.9
1	<0.1	25.4	25.4	<0.1	11.3	11.4	<0.1	6.8	6.9
2	<0.1	25.4	25.4	<0.1	11.3	11.4	<0.1	6.8	6.9
3	0.1	25.4	25.5	<0.1	11.3	11.4	<0.1	6.8	6.9
4	<0.1	25.4	25.4	<0.1	11.3	11.4	<0.1	6.8	6.9

Receptor	Annual Average Concentration ($\mu\text{g}\cdot\text{m}^{-3}$)								
	TSP			PM ₁₀			PM _{2.5}		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
5	0.2	25.4	25.6	<0.1	11.3	11.4	<0.1	6.8	6.9
Criterion	-	90		-	25		-	8	
Project related receptor									
A	5.6	25.4	31.0	1.7	11.3	13.0	0.2	6.8	7.0

No contour plots of annual average TSP, PM₁₀ or PM_{2.5} are presented, given the minor predicted contribution from the operations at the Quarry Site at the nearest relevant sensitive receptors.

6.2. Particulate Matter – Annual Average Dust Deposition Rates

Table 14 presents the annual average dust deposition rate predicted as a result of the operations at the Quarry.

An assumed background dust deposition rate of $2\text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ is presented in Table 14, although comparison of the incremental deposition rate with the incremental criterion of $2\text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ is also valid (as discussed within Section 3). In either case, the resulting conclusions drawn are identical. The Proposal is predicted to result in incremental increases of dust deposition of $< 0.1\text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ at all privately owned receptors.

No contour plots of annual average dust deposition are presented, given the minor predicted contribution from the operations at the Quarry at the nearest sensitive receptors.

Table 14 Predicted annual average dust deposition

Receptor	Annual Average Dust Deposition ($\text{g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$)		
	Incremental Impact	Background	Cumulative Impact
B	<0.1	2.0	<2.1
C	<0.1	2.0	<2.1
D	<0.1	2.0	<2.1
E	<0.1	2.0	<2.1
F	<0.1	2.0	<2.1
G	<0.1	2.0	<2.1
H	<0.1	2.0	<2.1
1	<0.1	2.0	<2.1
2	<0.1	2.0	<2.1
3	<0.1	2.0	<2.1
4	<0.1	2.0	<2.1
5	<0.1	2.0	<2.1
Criterion	2.0	-	4.0
Project related receptor			
A	0.3	2.0	2.3

6.3. Particulate Matter - Maximum 24-hour Average

Presented in Table 15 are the maximum 24-hour average PM_{10} and $\text{PM}_{2.5}$ concentrations predicted to occur at the nearest sensitive receptors as a result of the operations at the Quarry. No background concentrations are included within this table.

Table 15 Predicted maximum incremental 24-hour PM₁₀ and PM_{2.5} concentrations

Receptor	Maximum incremental 24-hour average concentration ($\mu\text{g}\cdot\text{m}^{-3}$)	
	PM ₁₀	PM _{2.5}
B	0.3	<0.1
C	0.9	0.1
D	2.2	0.3
E	1.6	0.4
F	0.4	<0.1
G	0.4	<0.1
H	0.2	<0.1
1	0.3	<0.1
2	0.7	0.1
3	0.8	0.1
4	0.6	<0.1
5	1.1	0.2
Criterion	50	25
Project related receptor		
A	13.1	1.9

Maximum incremental PM₁₀ and PM_{2.5} impacts at privately owned receptors are predicted to be 2.2 $\mu\text{g}\cdot\text{m}^{-3}$ at receptor D and 0.4 $\mu\text{g}\cdot\text{m}^{-3}$ at receptor E, respectively. These maximum incremental impacts represent 26.1 % and 7.7 % of the relevant criteria.

Table 16 and Table 17 present the predicted maximum 24-hour average PM₁₀ and PM_{2.5} concentrations resulting from the operation of the Proposal, with background included.

Results are presented for the privately owned receptor at which the highest incremental PM₁₀ and PM_{2.5} impacts have been predicted (receptor D for PM₁₀ and receptor E for PM_{2.5}) and also for the privately owned receptors at which the highest cumulative impacts (increment plus background) have been predicted, which are indicated within each table (receptor 5 for PM₁₀ and PM_{2.5}).

The left side of the tables show the predicted concentration on days with the highest cumulative impacts (typically driven by the days of the highest contemporaneous background), and the right side shows the total predicted cumulative impact on days with the highest predicted incremental concentrations.

Model results presented in Table 16 and Table 17 indicate that there are no predicted exceedances of the 24-hour average PM₁₀ and PM_{2.5} criteria at any surrounding receptors due to the proposed modification to the Quarry operations.

Although incremental impacts associated with all pollutants are predicted to be small at all surrounding receptor locations, to allow a visualisation of the extent of any impacts surrounding the Proposal site, a contour plot of the incremental contribution to the 24-hour average PM₁₀ concentration is presented in Figure 10.

Table 16 Summary of contemporaneous impact and background – PM₁₀

Date	24-hour average PM ₁₀ concentration (µg·m ⁻³) – Receptor 5			Date	24-hour average PM ₁₀ concentration (µg·m ⁻³) – Receptor D		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
27/06/24	0.7	39.7	40.4	27/05/24	2.2	23.8	26.0
28/06/24	0.7	35.5	36.2	23/05/24	1.9	17.3	19.2
23/07/24	0.7	35.1	35.8	28/05/24	1.8	23.9	25.7
09/08/24	0.3	31.9	32.2	23/06/24	1.7	8.7	10.4
19/06/24	0.8	30.3	31.1	04/06/24	1.6	9.0	10.6
29/05/24	0.8	28.5	29.3	22/05/24	1.6	17.8	19.4
24/02/24	<0.1	28.5	28.6	25/05/24	1.6	23.4	25.0
24/06/24	1.0	26.1	27.1	14/05/24	1.6	11.9	13.5
16/05/24	0.2	26.9	27.1	25/04/24	1.3	17.2	18.5
23/02/24	<0.1	26.7	26.8	24/05/24	1.3	21.1	22.4
These data represent the highest Cumulative Impact 24-hour PM ₁₀ predictions (outlined in red) as a result of the operation of the project.				These data represent the highest Incremental Impact 24-hour PM ₁₀ predictions (outlined in blue) as a result of the operation of the project.			

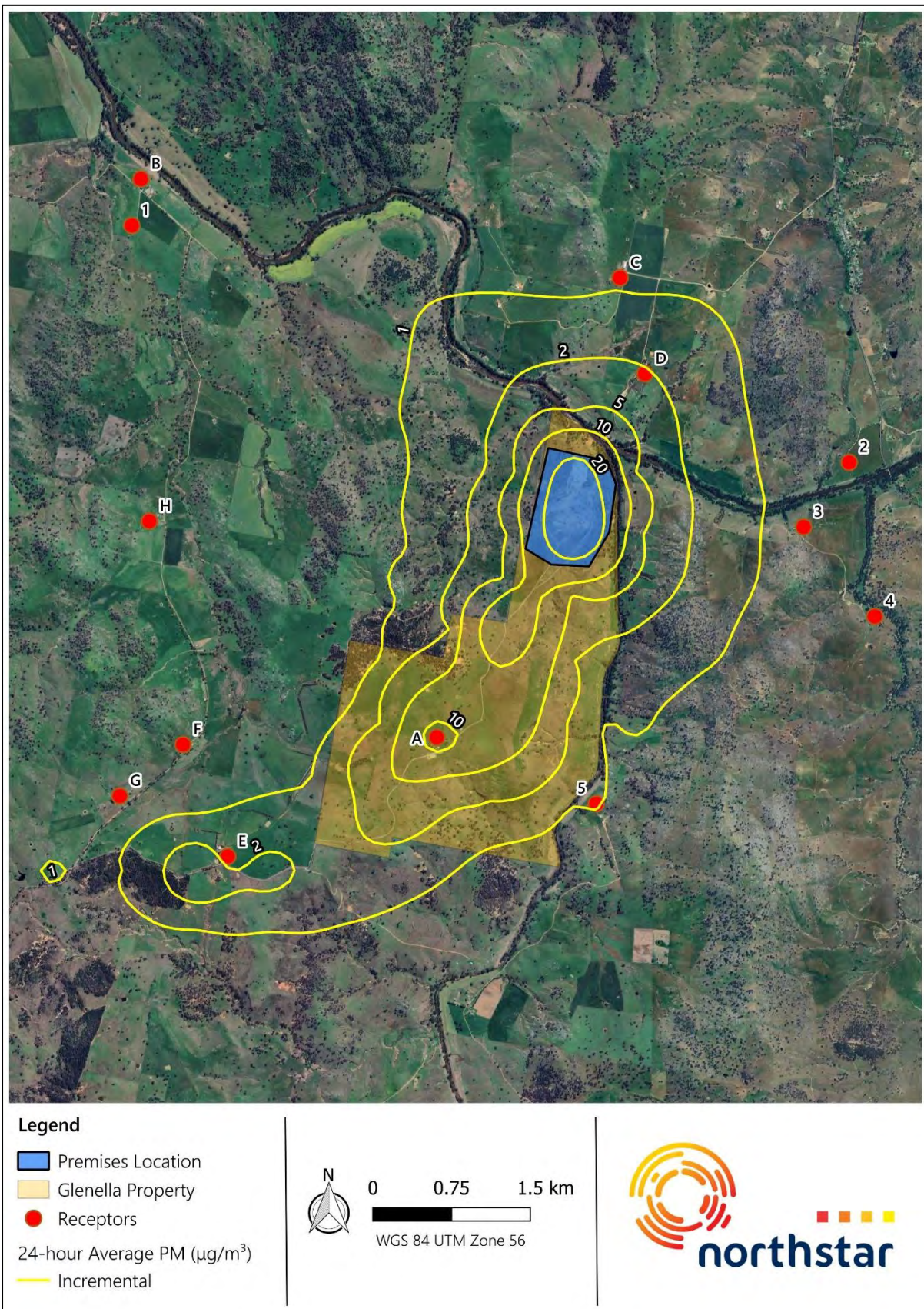
Note: Incr. = increment, Bkg. = background, Cumul. = cumulative

Table 17 Summary of contemporaneous impact and background – PM_{2.5}

Date	24-hour average PM _{2.5} concentration (µg·m ⁻³) – Receptor 5			Date	24-hour average PM _{2.5} concentration (µg·m ⁻³) – Receptor E		
	Incr.	Bkg.	Cumul.		Incr.	Bkg.	Cumul.
27/06/24	0.1	33.0	33.1	05/08/24	0.4	16.8	17.2
28/06/24	0.1	29.4	29.5	07/08/24	0.3	14.7	15.0
09/08/24	<0.1	26.5	26.6	15/08/24	0.3	9.9	10.2
23/07/24	<0.1	26.4	26.5	12/03/24	0.3	5.9	6.2
19/06/24	0.1	26.0	26.1	18/08/24	0.3	4.1	4.4
24/06/24	0.1	22.3	22.4	20/06/24	0.3	19.9	20.2
16/05/24	<0.1	20.2	20.3	25/05/24	0.3	18.3	18.6
06/08/24	<0.1	20.2	20.3	17/04/24	0.3	11.2	11.5
20/06/24	<0.1	19.9	20.0	28/05/24	0.3	14.5	14.8
29/05/24	0.1	19.8	19.9	07/07/24	0.3	3.4	3.7
These data represent the highest Cumulative Impact 24-hour PM _{2.5} predictions (outlined in red) as a result of the operation of the Proposal.				These data represent the highest Incremental Impact 24-hour PM _{2.5} predictions (outlined in blue) as a result of the operation of the Proposal.			

Note: Incr. = increment, Bkg. = background, Cumul. = cumulative

Figure 10 Incremental 24-hour PM₁₀ concentrations



Note 1: Criterion = $50 \mu\text{g}\cdot\text{m}^{-3}$ (cumulative)

6.4. Summary

A dispersion modelling assessment was performed to examine the potential impacts of the Quarry during proposed operations.

The results of the air quality impact assessment indicate the following:

- Based on the material extraction, processing, handling, and haulage rates anticipated, all annual average particulate matter criteria are predicted to be satisfied at all residential locations surrounding the Quarry Site.
- Assuming maximum (worst-case) daily (24-hour) material extraction, processing, handling, and haulage rates, no additional exceedances of the maximum 24-hour average PM₁₀ or PM_{2.5} criteria are predicted.

7. MITIGATION AND MONITORING

7.1. Air Quality Mitigation

Based on the findings of the air quality impact assessment, it is considered that the particulate control measures currently implemented would be more than sufficient to ensure that air quality impacts at surrounding receptor locations are adequately controlled during proposed modified operations.

A number of mitigation measures are adopted as part of the Quarry operation and will continue to be implemented. Where defensible quantification of the control efficiencies afforded by these measures can be determined, these have been applied within the assessment.

The mitigation measures which will be used as part of the Quarry activities are summarised in Table 18.

Table 18 Summary of emission reduction methods adopted as part of Quarry operation

Emission control method	Control efficiency (%)
Water injection on drill rigs	96
Application of water on unsealed haulage routes (internal) $< 2 \text{ L} \cdot \text{m}^{-2} \cdot \text{hr}^{-1}$	50
Reduction in vehicle speeds below $40 \text{ km} \cdot \text{hr}^{-1}$ on unpaved roads	75
Reduction in vehicle speeds below $40 \text{ km} \cdot \text{hr}^{-1}$ on paved roads (offsite)	44
Application of water sprays on materials crushing operations	77.7
Application of water sprays on materials screening operations	91.2
Application of water during washing process	100
Retention of particulate matter within the pit, for activities occurring in the pit	50 (TSP) 5 (PM_{10} , $\text{PM}_{2.5}$)
Covering loads with a tarpaulin	Not quantified
Limit load sizes to ensure material is not above the level of truck sidewalls	Not quantified

The AQMP for the Quarry Site includes the measures identified above. The Quarry Manager will be responsible for ensuring that no operations are performed without the inclusion of the relevant controls.

7.2. Monitoring

The predictions presented in this AQIA indicate that there would be a low risk of any additional exceedances of the adopted air quality criteria as a result of the Quarry operation. However, the real-time air quality monitoring program, including the Trigger Action Response Plan as described in Section 2.3 would continue to be operated to ensure off-site impacts associated with the Quarry operation continue to be minimised. It is recommended that regular audits are performed to ensure that the Quarry is implementing the air quality control measures appropriately, as outlined within this report.

8. CONCLUSION

The Proponent has engaged Northstar to perform an AQIA for a proposed increase in annual extraction rate to 499 000 t·yr⁻¹ at Glenella Quarry.

This AQIA forms part of the modification report prepared to accompany the Section 4.55(2) modification application for the Quarry under Part 4 of the *Environmental Planning and Assessment Act 1979*.

The AQIA has been performed in accordance with the NSW EPA Approved Methods document and includes a detailed description of the operations to be performed as part of the Proposal and includes a description of the management measures that would be employed to minimise particulate generation. The locations of surrounding sensitive receptor locations, a description of existing air quality and meteorology, and a description of the method used to assess potential impacts are also provided.

The results of the AQIA indicate that the incremental impacts of the Proposal are predicted to be small at all surrounding receptor locations.

In relation to annual average criteria (TSP, PM₁₀, PM_{2.5}, and dust deposition) the addition of those minor incremental impacts to existing background air quality results in compliance with NSW EPA air quality criteria.

The Proposal is predicted to result in no additional exceedances of the 24-hour maximum PM₁₀ or PM_{2.5} criteria.

A range of management measures, including an air quality management plan, real-time air quality monitoring, and a trigger action response plan are currently adopted as part of the Quarry operation, which are considered to represent best practice air quality management, and these would continue to be adopted as part of the Proposal.

It is respectfully considered that the Proposal should not be rejected on the grounds of air quality.

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APPENDIX A

Report Units and Common Abbreviations

Units Used in the Report

Units presented in the report follow the International System of Units (SI) conventions, unless derived from references using non-SI units.

Commonly used SI units

The following units are commonly used in Northstar reports.

Symbol	Name	Quantity
SI base units		
K	Kelvin	thermodynamic temperature
kg	kilogram	mass
m	metre	length
mol	mole	amount of substance
s	seconds	time
Non-SI units mentioned in the SI or accepted for use		
°	degree	plane angle
d	day	time
h	hour	time
ha	hectare	area
J	joule	energy
L	litre	volume
min	minute	time
N	newton	force or weight
t	tonne	mass
V	volt	electrical potential
W	watt	power

Multiples of SI and non-SI units

The following prefixes are added to unit names to produce multiples and sub-multiples of units:

Prefix	Symbol	Factor		Prefix	Symbol	Factor
T	tera-	10^{12}		p	pico-	10^{-12}
G	giga-	10^9		n	nano-	10^{-9}
M	mega-	10^6		μ	micro-	10^{-6}
k	kilo-	10^3		m	milli-	10^{-3}
h	hecto-	10^2		c	centi-	10^{-2}
da	deca-	10^1		d	deci-	10^{-1}

In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol. For example:

- 50 micrograms per cubic metre would be presented as $50 \mu\text{g}\cdot\text{m}^{-3}$ and not $50 \mu\text{g}/\text{m}^3$; and,

- 0.2 kilograms per hectare per hour would be presented as $0.2 \text{ kg}\cdot\text{ha}^{-1}\cdot\text{hr}^{-1}$ and not 0.2 kg/ha/hr .

Commonly used SI-derived and non-SI units

$\text{g}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$	gram per square metre per second	rate of mass deposition per unit area
$\text{g}\cdot\text{s}^{-1}$	gram per second	rate of mass emission
$\text{kg}\cdot\text{ha}^{-1}\cdot\text{hr}^{-1}$	kilogram per hectare per hour	rate of mass deposition per unit area
$\text{kg}\cdot\text{m}^{-3}$	kilogram per cubic metre	density
$\text{L}\cdot\text{s}^{-1}$	litres per second	volumetric rate
m^2	square metre	area
m^3	cubic metre	volume
$\text{m}\cdot\text{s}^{-1}$	metre per second	speed and velocity
$\text{mg}\cdot\text{m}^{-3}$	milligram per cubic metre	mass concentration per unit volume
$\text{mg}\cdot\text{Nm}^{-3}$	milligram per normalised cubic metre (of air)	mass concentration per unit volume
$\mu\text{g}\cdot\text{m}^{-3}$	microgram per cubic metre	mass concentration per unit volume
$\text{mg}\cdot\text{m}^{-3}$	milligram per cubic metre	mass concentration per unit volume
Pa	pascal	pressure
ppb	parts per billion (1×10^{-9})	volumetric concentration
pphm	parts per hundred million (1×10^{-5})	volumetric concentration
ppm	parts per million (1×10^{-6})	volumetric concentration

Commonly used abbreviations

Abbreviation	Term
ABS	Australian Bureau of Statistics
ACT	Australian Commonwealth Territory
AGL	above ground level
AHD	Australian height datum
APC	air pollution control
AQI	air quality index
AQIA	air quality impact assessment
AQMS	air quality monitoring station
AQRA	air quality risk assessment
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS/NZS	Australian Standard / New Zealand Standard
AWS	automatic weather station
BCA	Building Code of Australia
BGL	below ground level
BOM	Bureau of Meteorology
CEMP	construction environment management plan
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation

Abbreviation	Term
DEM	digital elevation model
EETM	emission estimation technique manual
EPA VIC	Environmental Protection Authority Victoria
EPBC	Environment Protection and Biodiversity Conservation Act
FIBC	flexible intermediate bulk container
GIS	geographical information system
IAQM	UK Institute of Air Quality Management
IBC	intermediate bulk container
ID	internal diameter
LLV	low level waste
LoM	life of mine
MSDS	Material Safety Data Sheet
NCAA	National Clean Air Agreement
NEPM	National Environment Protection Measure
NH ₃	ammonia
NO	nitric oxide
NO _x	oxides of nitrogen
NO ₂	nitrogen dioxide
NORM	naturally occurring radioactive material
NSW	New South Wales
NSW DCCEEW	New South Wales Department of Climate Change, Energy, the Environment and Water
NSW EPA	New South Wales Environment Protection Authority
NT	Northern Territory
OEMP	operational environmental management plan
O ₃	ozone
OU	odour unit
OU·m ³ ·s ⁻¹	odour units times metres cubed per second
OU·s ⁻¹	odour units per second
Pb	lead
PM	particulate matter
PM ₁₀	particulate matter with an aerodynamic diameter of 10 µm or less
PM _{2.5}	particulate matter with an aerodynamic diameter of 2.5 µm or less
ROM	run of mine
SA	South Australia
SEPP	State Environmental Protection Policy
SO _x	oxides of sulphur
SO ₂	sulphur dioxide
SRTM3	Shuttle Radar Topography Mission
SVOC	semi-volatile organic compound
TAPM	The Air Pollution Model
TAS	Tasmania

Abbreviation	Term
TEU	twenty-foot equivalent unit
TSP	total suspended particulates
TVOC	total volatile organic compounds
TWA	time weighted average
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VIC	Victoria
VLLW	very low level waste
VOC	volatile organic compound

APPENDIX B

Meteorology

Meteorological Stations

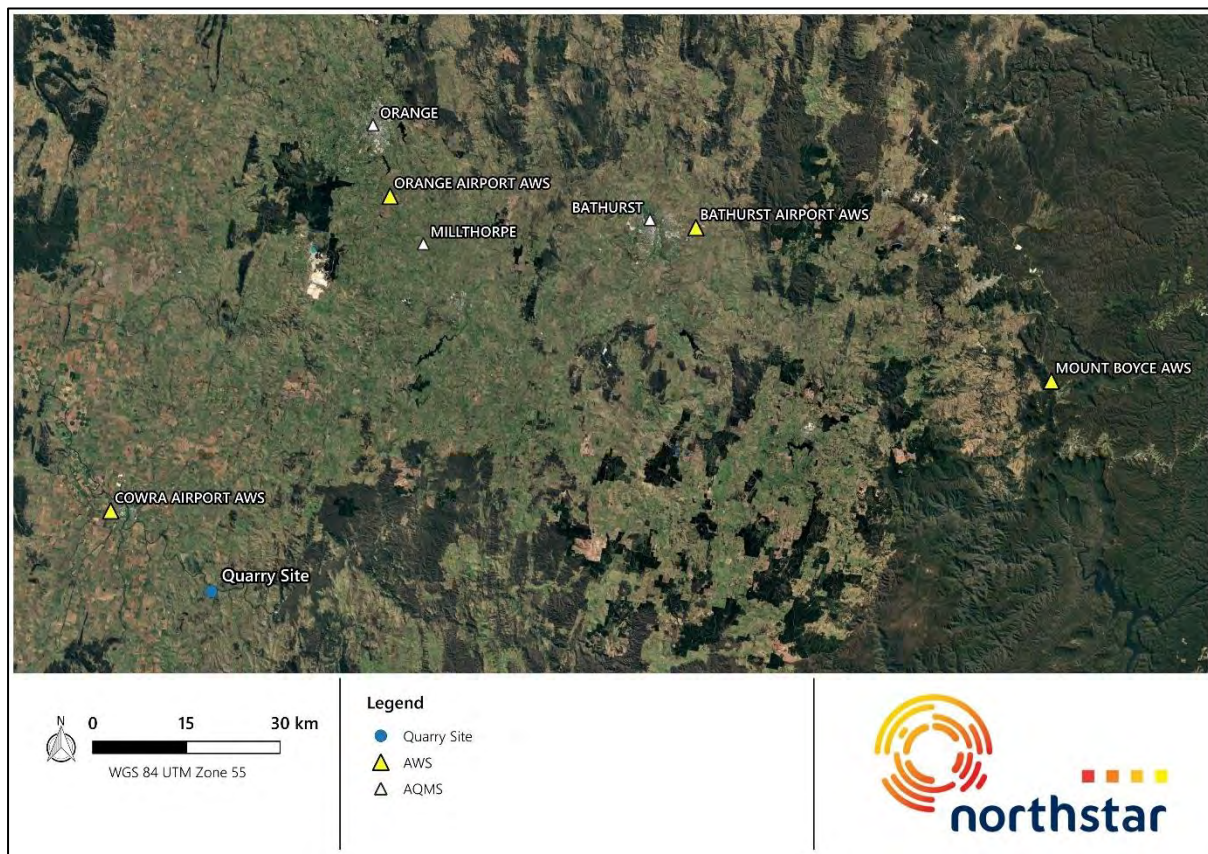
As discussed in Section 4.2 a meteorological modelling exercise has been performed to characterise the meteorology of the Quarry Site in the absence of site-specific measurements. The meteorological modelling has been based on measurements taken at a number of surrounding automatic weather stations (AWS) operated by the Australian Government Bureau of Meteorology (BoM).

A summary of the relevant AWS is provided in Table B1 and also displayed in Figure B1.

Table B1 Details of the meteorological monitoring surrounding the Quarry site

Site Name	Source	Approximate Location (UTM)		Approximate Distance
		mE	mS	km
Cowra Airport AWS #065111	BoM	653 040	6 254 553	20.5
Orange Airport AWS #063303	BoM	697 799	6 304 919	69.2
Bathurst Airport AWS #063291	BoM	746 802	6 299 899	96.7
Mount Boyce AWS #094743	BoM	247 112.	6 276 810	136.5

Figure B1 Meteorological and air quality monitoring surrounding the Quarry Site



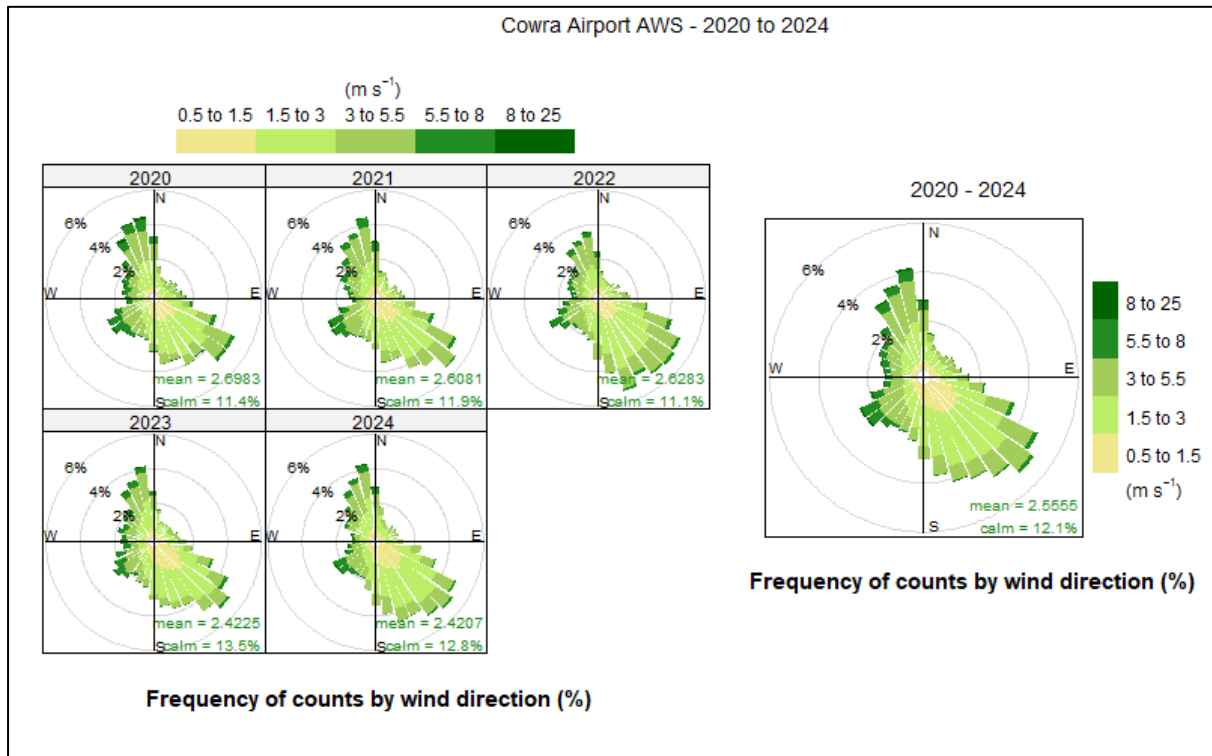
Meteorological conditions at Cowra Airport AWS have been examined to determine a 'typical' or representative dataset for use in dispersion modelling. Annual wind roses for the most recent years of data (2020 to 2024) are presented in Figure B2. The annual wind speed frequency distribution for the five-year period is presented in Figure B3.

The correlation coefficient between each year and the five-year period for the distribution of wind speed, wind direction, PM_{10} and $PM_{2.5}$ are summarised in Table B2. The correlation coefficients were ranked and aggregated to select the representative year for meteorological modelling.

The wind roses indicate that from 2020 to 2024, winds at Cowra Airport AWS show a predominant east south-easterly and north-westerly component to the wind direction.

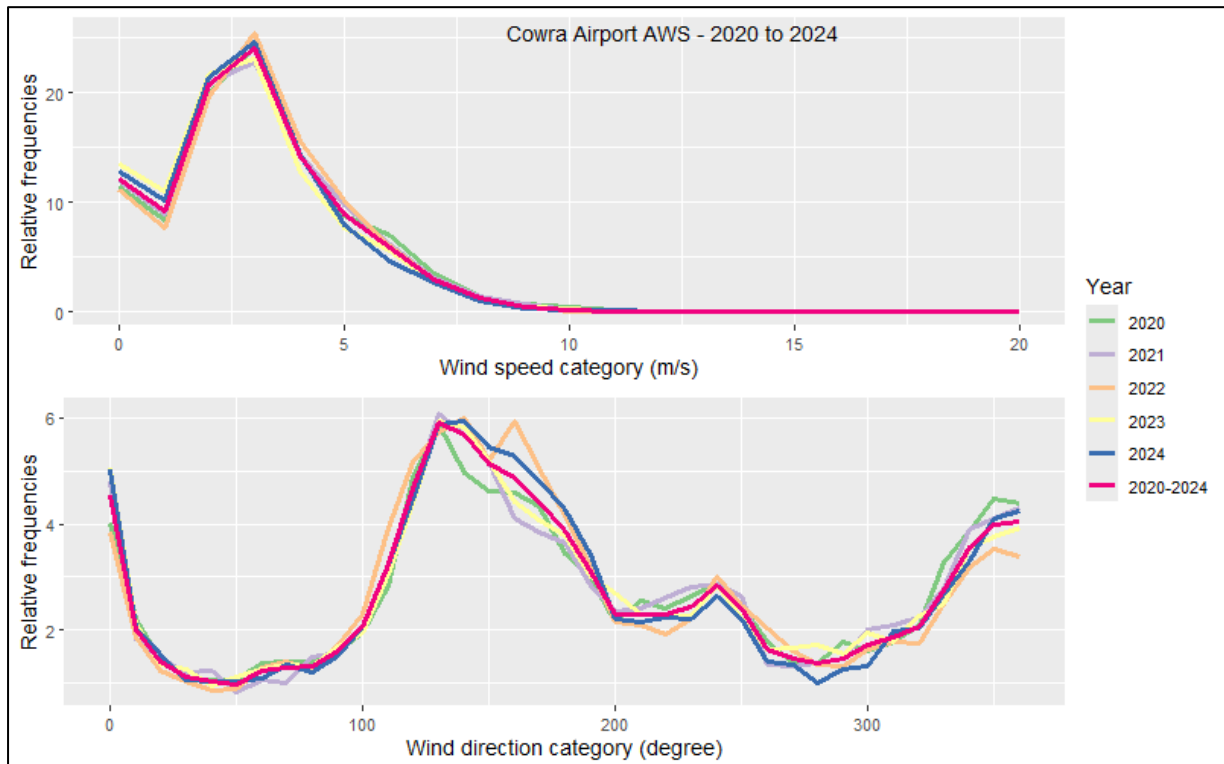
The majority of wind speeds experienced at Cowra Airport AWS over the 5-year period, 2020 to 2024 are generally in the range <3 metres per second ($m \cdot s^{-1}$) to $5.5 m \cdot s^{-1}$ with the highest wind speeds (greater than $8 m \cdot s^{-1}$) occurring from a south-westerly or north-westerly direction. Winds of this speed are not frequent, occurring during approximately 0.9 % of the observed hours over the 5-year period at Cowra Airport AWS. Calm winds ($<0.5 m \cdot s^{-1}$) occur during 12.1 % of hours on average across the 5-year period.

Figure B2 Annual wind roses – Cowra Airport AWS (2020 to 2024)



Source: Northstar

Figure B3 Annual wind direction and speed distribution – Cowra Airport AWS (2020 to 2024)



Source: Northstar

Table B2 Correlation coefficient analysis – Cowra Airport AWS and Orange AQMS (2020 – 2024)

Parameter	Wind speed		Wind direction		PM ₁₀		PM _{2.5}		Aggregated rank
	Corr.	Rank	Corr.	Rank	Corr.	Rank	Corr.	Rank	
2020	0.9986	2	0.9827	4	0.9651	4	0.9791	4	4
2021	0.9991	1	0.9847	3	0.9968	1	0.9931	2	=1
2022	0.9955	4	0.9730	5	0.9488	5	0.9709	5	5
2023	0.9953	5	0.9903	2	0.9861	3	0.9794	3	3
2024	0.9984	3	0.9924	1	0.9960	2	0.9956	1	=1
2020-2024	1	-	1	-	1	-	1	-	-

Note: Corr. = correlation

Wind speed observations for each year correlated well against the wind speed over the five-year period, with each year having a correlation coefficient greater than 0.99. The year 2021 is the highest ranked for correlation against the wind speed over the five-year period.

Wind direction observations for each year are reasonably well correlated against the wind direction over the five-year period, with each year having a correlation coefficient greater than of 0.97. The year 2024 is the highest ranked for correlation against the wind direction over the five-year period.

Particulate matter concentrations for each year are also well correlated against particulate matter concentrations over the five-year period. Each year resulted in having a correlation coefficient greater than 0.94. The year 2021 is the highest rank for PM₁₀ while 2024 was the highest ranked year for PM_{2.5}.

The correlation coefficient analysis indicates that both 2021 and 2024 are equally representative years for meteorological modelling. Correspondingly, the most recent year 2024 has been selected as most representative for meteorological modelling.

Meteorological Processing

The BoM data adequately covers the issues of data quality assurance, however it is limited by its location compared to the Quarry Site. To address these uncertainties, a multi-phased assessment of the meteorological data has been performed.

In absence of any measured onsite meteorological data, site representative meteorological data for this Quarry was generated using the CALMET meteorological model in a format suitable for using in the CALPUFF dispersion model (refer Section 5.1).

CALMET is a meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are

applied to the winds at each grid point to develop a final wind field and thus the final wind field reflects the influences of local topography and current land uses.

In this study, CALMET has been run in no-observations (no-obs) mode using gridded prognostic data generated by The Air Pollution Model (TAPM, v 4.0.5), developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

TAPM is a prognostic model which predicts wind speed and direction, temperature, pressure, water vapour, cloud, rainwater and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations at user-defined levels within the atmosphere.

It is noted that the initial TAPM modelling run provided wind roses which did validate well against observations at Cowra Airport AWS, and correspondingly this has been considered sufficient to represent meteorological parameters at the Quarry Site for use in CALMET.

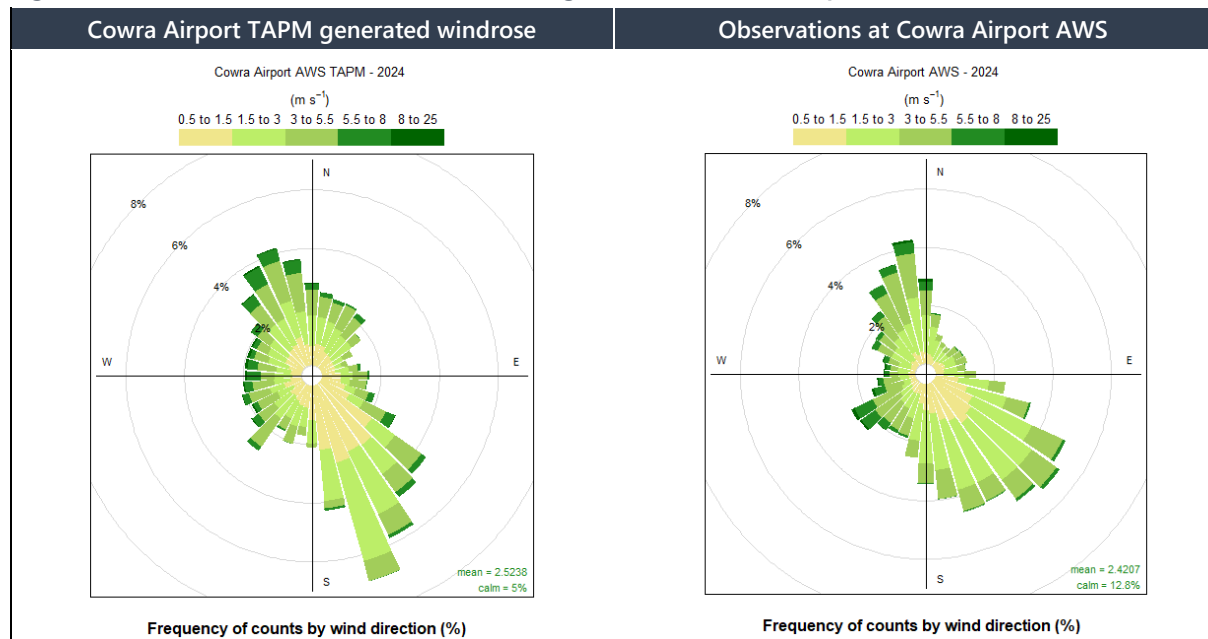
A comparison of the TAPM generated meteorological data, and that observed at the Cowra Airport AWS are presented in Figure B4. These data generally compare well which provides confidence that the meteorological conditions modelled as part of this assessment are appropriate.

The parameters used in TAPM and CALMET modelling are presented in Table B3.

Table B3 Meteorological parameters used for this study

TAPM v 4.0.5	
Modelling period	1 January 2024 to 1 January 2025
Centre of analysis	667 874 mE, 6 241 901 mS (UTM Coordinates)
Number of grid points	40 x 40 x 25
Number of grids (spacing)	5 (30 km, 10 km, 3 km, 1 km, 300 m)
Terrain	AUSLIG 9 second DEM
Data assimilation	None
CALMET	
Modelling period	1 January 2024 to 1 January 2025
South-West corner of analysis	662 374 mS, 6 236 401 mS (UTM Coordinates)
Meteorological grid domain (resolution)	11 km x 11 km (0.1 km)
Vertical resolution (cell heights)	10 (0 m, 20 m, 40 m, 80 m, 160 m, 320 m, 640 m, 1200 m, 2000 m, 3000 m, 4000 m)
Data assimilation	No-obs approach using TAPM – 3D.DAT file

Figure B4 Modelled and observed meteorological data – Cowra Airport AWS, 2024

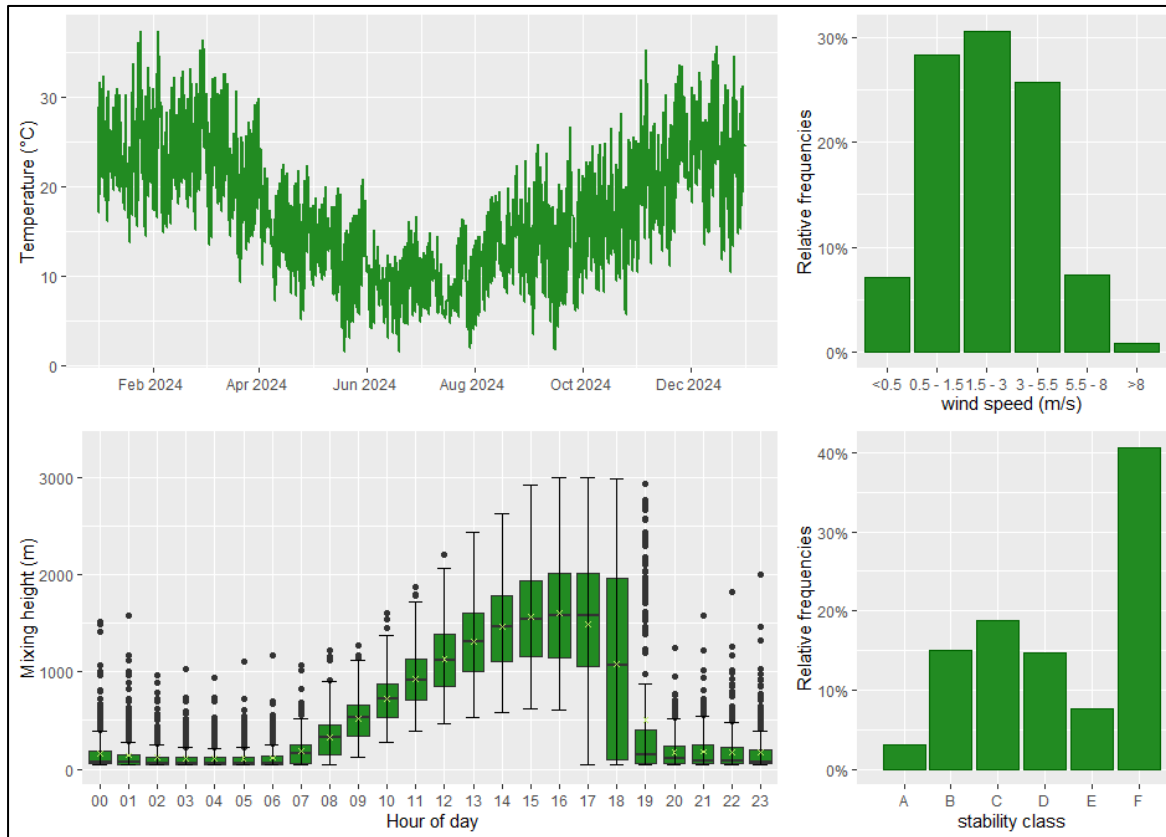


Source: Northstar

As generally required by the NSW EPA the following provides a summary of the modelled meteorological dataset. Given the nature of the pollutant emission sources at the Quarry Site, detailed discussion of the humidity, evaporation, cloud cover, katabatic air drainage and air recirculation potential of the Quarry Site has not been provided. Details of the CALMET predictions of wind speed and direction, mixing height, temperature and stability class at the Quarry Site are provided in Figure B5.

Diurnal variations in maximum and average mixing heights during the 2024 period shows that, as expected, an increase in mixing height during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and growth of the convective mixing layer.

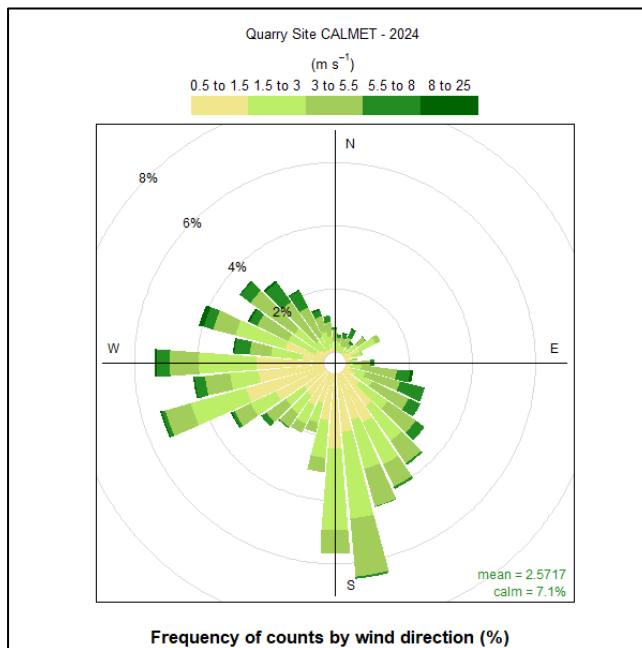
Figure B5 Predicted temperature, mixing height and wind speed frequency at the Quarry Site (2024)



Source: Northstar

The modelled wind speed and direction at the Quarry Site during 2024 are presented in Figure B6.

Figure B6 Predicted wind speed and direction at the Quarry Site (2024)



APPENDIX C

Background Air Quality Data

Air quality is not monitored at the Quarry Site in a manner suitable for air quality assessment purposes, and therefore air quality monitoring data measured at a representative location has been adopted for the purposes of this assessment. Determination of data to be used as a location representative of the Quarry Site and during a representative year can be complicated by factors which include:

- the sources of air pollutant emissions around the Quarry Site and representative air quality monitoring station(s); and
- the variability of particulate matter concentrations (often impacted by natural climate variability).

Air quality monitoring is performed by the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) at four air quality monitoring station (AQMS) within a 120 km radius of the Quarry Site. Details of the monitoring performed at these AQMS is presented in Table C1 and Figure B1. As discussed in Section 4.2 and Section 4.3, the year 2024 was selected for assessment based upon an analysis of meteorological and background air quality data.

Table C1 Details of closest AQMS surrounding the Quarry

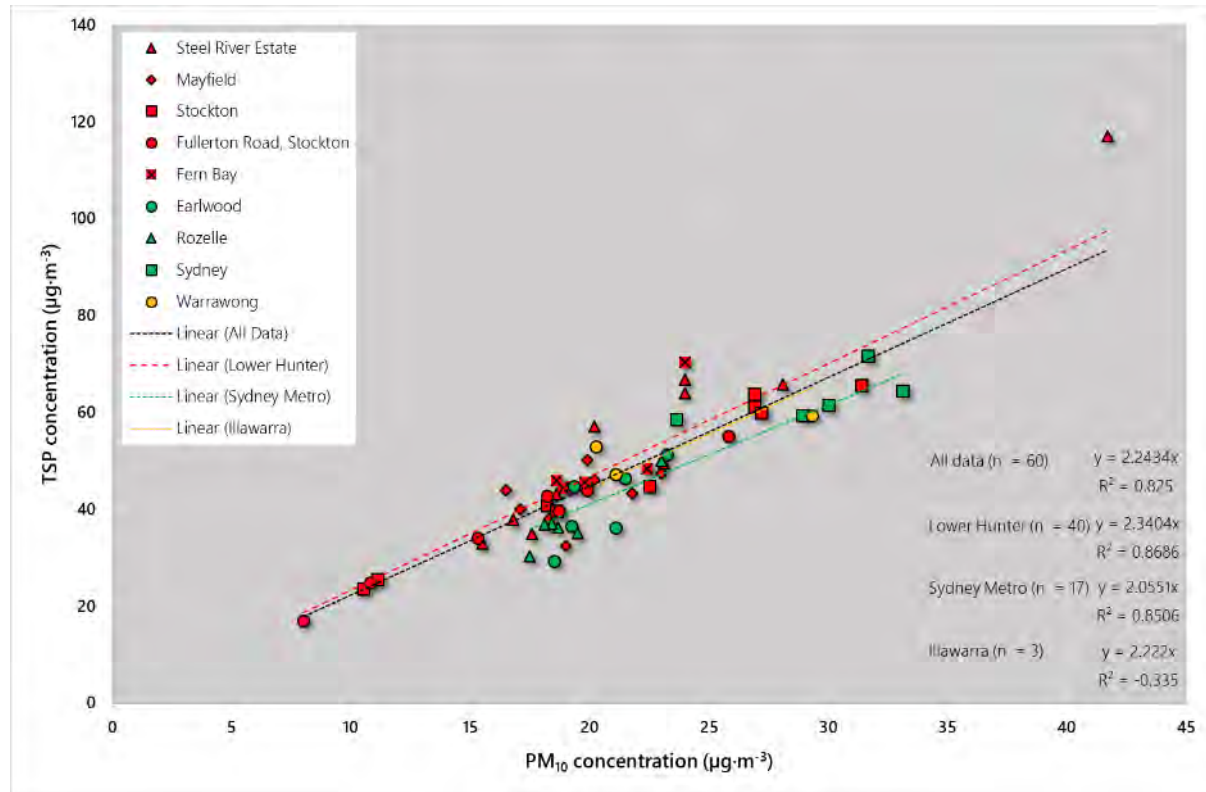
AQMS Location	Approximate distance to Quarry (km)	Screening Parameters			
		2024 Data	Measurements		
			PM ₁₀	PM _{2.5}	TSP
Millthorpe	65	✓	✓	✓	✗
Orange	78	✓	✓	✓	✗
Bathurst	91	✓	✓	✓	✗
Goulburn	119	✓	✓	✓	✗

As outlined in Section 4.3, the closest representative AQMS with PM₁₀ and PM_{2.5} data available for the assessment year of 2024 is noted to be located at Orange and is considered to be the monitoring location most reflective of the conditions at the Quarry Site. It is noted that whilst Millthorpe AQMS is more proximate to the Quarry site, it is not considered representative of PM measurements at the Quarry Site due to its proximity to the Cadia mine. The Millthorpe AQMS was temporarily commissioned in July 2023 specifically to monitor PM levels near the Cadia mine, and as a result, records higher levels of PM compared to Orange and Bathurst AQMS. Given that the Quarry Site is located more than 50 km from the Cadia mine, it is unlikely to be significantly affected by emissions from the mine. Therefore, PM data from Orange AQMS is considered more representative of air quality conditions at the Quarry site. Refer to Section 4.3 and Table 10 for more information.

Concentrations of TSP are not measured at any AQMS surrounding the Quarry Site. An analysis of co-located measurements of TSP and PM₁₀ in the Lower Hunter (1999 to 2011), Illawarra (2002 to 2004), and Sydney Metropolitan (1999 to 2004) regions is presented in Figure C1. The analysis concludes that, on the basis of the measurements collected in all regions between 1999 to 2011, the derivation of a broad TSP:PM₁₀ ratio of 2.2434 : 1 (i.e. PM₁₀ represents ~45 % of TSP) from the average of all regions is appropriate, and the most

conservative of all the relationships assessed. In the absence of any more specific information, this ratio has been adopted within this AQIA, resulting in a background annual average TSP concentration of $25.4 \mu\text{g}\cdot\text{m}^{-3}$ being adopted.

Figure C1 Co-located TSP and PM₁₀ Measurements, Lower Hunter, Sydney Metro and Illawarra



Similarly, no dust deposition data is available for the area surrounding the Quarry. The incremental impact criterion of $2 \text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ as outlined within the Approved Methods has been adopted which effectively provides a background deposition level of $2 \text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$ (the total allowable deposition being $4 \text{ g}\cdot\text{m}^{-2}\cdot\text{month}^{-1}$).

Summary statistics for the selected data monitor at Orange and Millthorpe AQMS are presented in Table C2.

Graphs presenting the daily varying PM₁₀ and PM_{2.5} data recorded at Orange AQMS in 2024 are presented in Figure C2 and Figure C3, respectively.

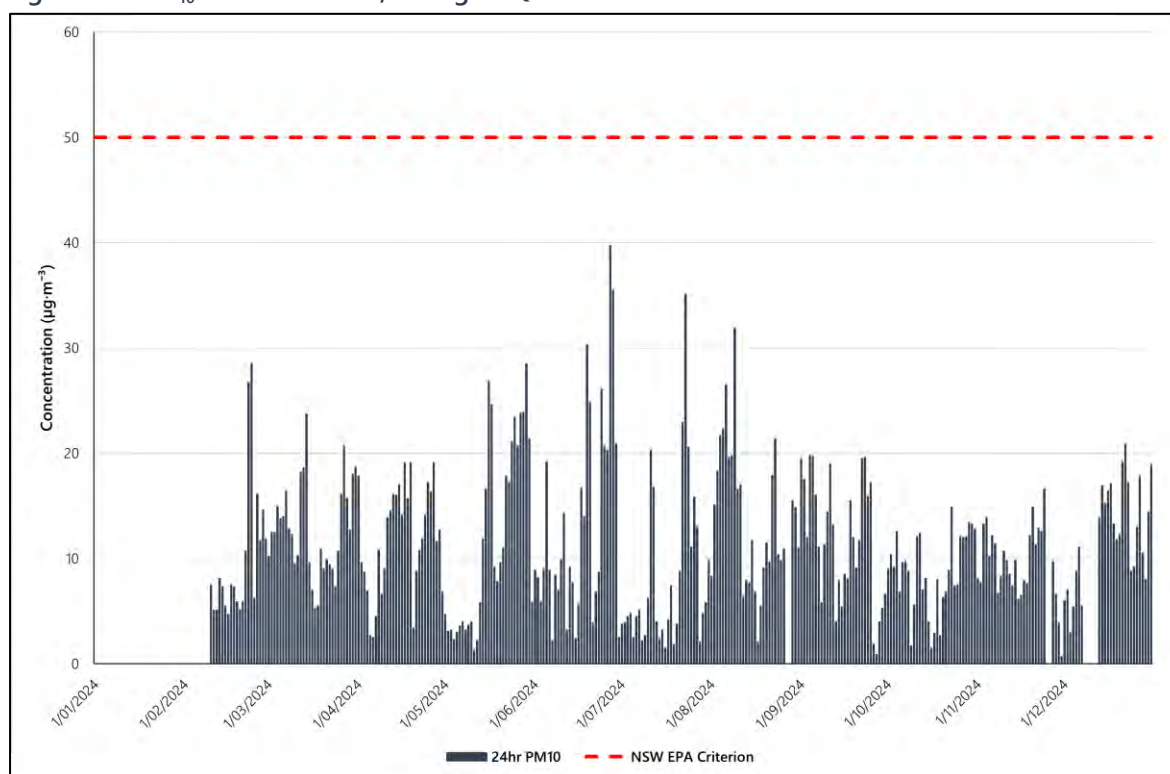
Table C2 Background air quality statistics – Orange AQMS (2024)

Pollutant	Orange AQMS		
	TSP	PM ₁₀	PM _{2.5}
Averaging period	Annual	24-hour	24-hour
Units	µg·m ⁻³	µg·m ⁻³	µg·m ⁻³
Data points (number)	317	317	317
Mean	25.4	11.3	6.8
Standard deviation	-	6.7	5.3
Skew ¹	-	1.0	1.7
Kurtosis ²	-	1.3	3.7
Minimum	-	0.7	-0.5
25 th	-	6.5	3.2
50 th	-	9.9	5.4
75 th	-	15.7	8.6
90 th	-	19.8	14.0
95 th	-	23.5	17.3
97 th	-	26.3	19.8
98 th	-	28.0	20.2
99 th	-	31.6	26.3
Maximum	-	39.7	33.0
Data Capture (%)	86.6	86.6	86.6

Notes: 1: Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.

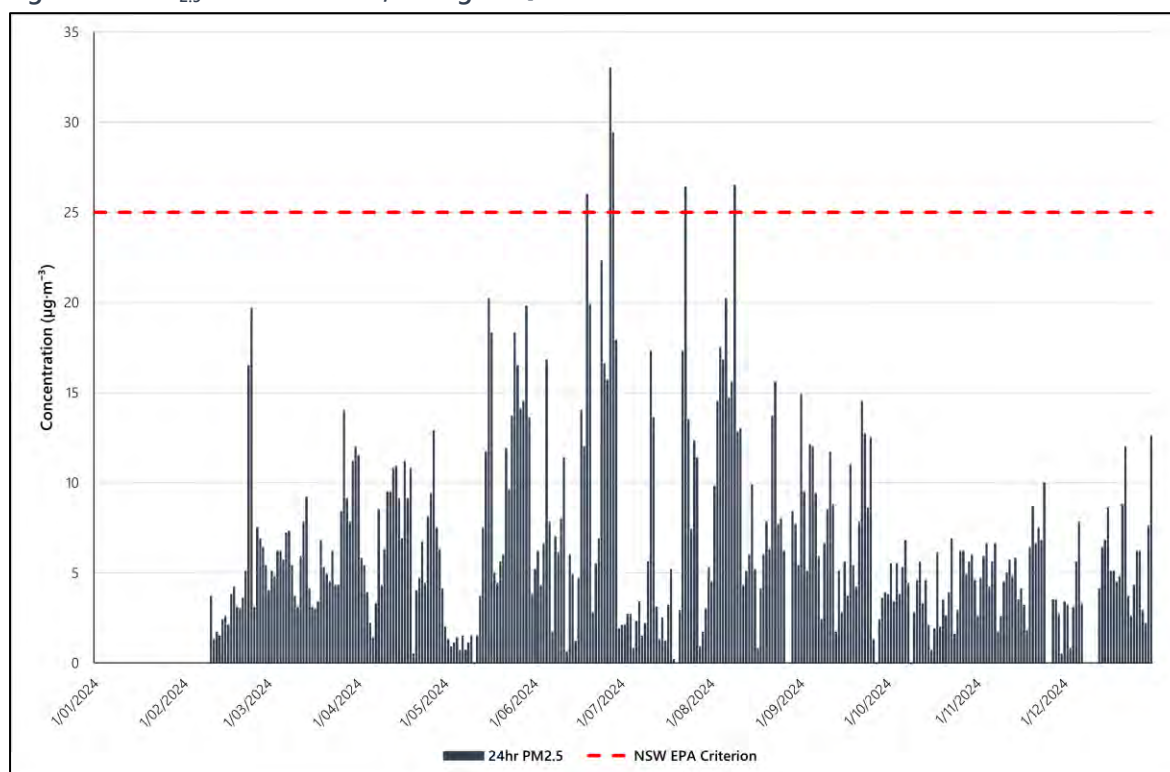
2: Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive kurtosis represents a more peaked distribution, and negative kurtosis represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

Figure C2 PM₁₀ Measurements, Orange AQMS 2024



Source: Northstar

Figure C3 PM_{2.5} Measurements, Orange AQMS 2024



Source: Northstar

It is noted that in 2024 Orange AQMS recorded five exceedances of the 24-hour average PM_{2.5} criterion due to winter wood heater smoke between June and August (NSW OEH, 2025).

APPENDIX D

Emissions Inventory

As outlined in Section 2.2, a number of operations to be performed as part of the Quarry operation have the potential to result in emissions of particulate matter. A detailed outline of the emission estimation techniques adopted to derive total emissions from the sources identified are presented below.

A detailed summary and justification of all parameters adopted within the emissions estimation calculations is provided. Emission factors are presented in alphabetical order.

The silt and moisture content of all materials has been taken to be 2 % which is considered to represent a conservative assumption.

Blasting

The emissions of particulate matter from blasting operations have been estimated using emission factors presented in Section 11.9-2 of AP-42 (Western Surface Coal Mine) (USEPA, 1998). The emission factors are:

$$EF_{TSP} (kg.blast^{-1}) = 0.00022 \times (A)^{1.5}$$

$$EF_{PM_{10}} (kg.blast^{-1}) = 0.52 \times (EF_{TSP})$$

$$EF_{PM_{2.5}} (kg.blast^{-1}) = 0.03 \times (EF_{TSP})$$

where:

$EF_{(kg.blast^{-1})}$ = emission factor for particulate matter

A = horizontal area (m^2), with blasting depth ≤ 21 m.

The quality rating for this emission factor is rated C for TSP, D for PM_{10} , and D for $PM_{2.5}$.

Crushing

Emissions of particulate matter resulting from the processing of materials (crushing) have been estimated using the emission factors presented in Section 11.19.2 of AP-42 (Crushed Stone Processing and Pulverised Mineral Processing) (US EPA, 2004).

The emission factors within table 11.19.2-1 have been adopted for the operations outlined above. No emission factors associated with primary or secondary crushing are available within AP-42 although emission factors for tertiary crushers can be used as an upper limit for primary or secondary crushing (US EPA, 2004). The control efficiency used for tertiary crushing is 77.7 % as calculated in AP-42 (USEPA, 2006c).

$PM_{2.5}$ emission factors are not available for uncontrolled crushing sources in AP-42 although have been taken to be 18% of PM_{10} as per controlled tertiary crushing in table 11.19.2-1 (USEPA, 2006c).

For uncontrolled tertiary crushing (and uncontrolled primary and secondary crushing):

$$EF_{TSP} (kg.tonne^{-1}) = 0.0027$$

$$EF_{PM_{10}} (kg.tonne^{-1}) = 0.0012$$

$$EF_{PM_{2.5}} (kg.tonne^{-1}) = 0.00012$$

For controlled tertiary crushing (and controlled primary and secondary crushing):

$$EF_{TSP} (kg.tonne^{-1}) = 0.0006$$

$$EF_{PM_{10}} (kg.tonne^{-1}) = 0.00027$$

$$EF_{PM_{2.5}} (kg.tonne^{-1}) = 0.00005$$

The quality rating for these emission factors is: Tertiary Crushing (uncontrolled) = E & C (TSP & PM₁₀ respectively), and Tertiary Crushing (controlled) = E, C & E (TSP, PM₁₀ & PM_{2.5} respectively). All other crushing emission factors calculated have a quality rating of U (no rating).

Drilling

Emissions of particulate matter resulting from drilling operations have been estimated using the emission factors presented in Section 11.9-4 of AP-42 (Western Surface Coal Mining) (USEPA, 1998).

The emission factors within table 11.9-4 have been adopted for the operations outlined above. The emission factor is:

$$EF_{TSP} (kg.hole^{-1}) = 0.59$$

where:

EF_{TSP} = emission factor for total suspended particulate matter (kg per hole)

PM₁₀ & PM_{2.5} emission factors are not available in AP-42 although have been taken to be 52 % of TSP for PM₁₀ and, 3 % of TSP for PM_{2.5} as per AP-42 blasting (Table 11.9-2) (USEPA, 1998).

The quality rating for this emission factor is C.

Excavators/Frontend Loaders

Emissions associated with all loading and unloading operations have been characterised using the factor outlined in AP-42 for Batch Drop processes (Section 13.2.4.3) (USEPA, 2006a). This equation is consistent with that associated with the use of excavators, shovels and front-end loaders outlined in the NPI EETM for Mining (NPI, 2012):

$$EF (kg \cdot tonne^{-1}) = k(0.0016) \frac{\left(\frac{U (m \cdot s^{-1})}{2.2}\right)^{1.3}}{\left(\frac{M (\%)}{2}\right)^{1.4}}$$

where:

$EF_{TSP} (kg \cdot tonne^{-1})$ = emission factor for total suspended particles

$EF_{PM_{10}} (kg \cdot tonne^{-1})$ = emission factor for total suspended particles

k_{TSP} = 0.74 for particles less than 30 micrometres aerodynamic diameter

$k_{PM_{10}}$ = 0.35 for particles less than 10 micrometres aerodynamic diameter

$k_{PM_{2.5}}$ = 0.053 for particles less than 2.5 micrometres aerodynamic diameter

U = mean wind speed ($m \cdot s^{-1}$)

M = material moisture content (% by weight)

The quality rating for this application is rated U (no rating).

Screening

Emissions of particulate matter resulting from the screening of material have been estimated using the emission factors presented in Section 11.19.2 of AP-42 (Crushed Stone Processing and Pulverised Mineral Processing) (US EPA, 2004).

The emission factors within table 11.19.2-1 have been adopted for the operations outlined above. $PM_{2.5}$ emission factors are not available for uncontrolled screening sources in AP-42 although have been taken to be 7 % of PM_{10} as per controlled screening activities in table 11.19.2-1 (US EPA, 2004). The control efficiency used for screening is 91.2 % as calculated in AP-42 (USEPA, 2006c).

For uncontrolled screening:

$$EF_{TSP} (kg \cdot tonne^{-1}) = 0.0125$$

$$EF_{PM_{10}} (kg \cdot tonne^{-1}) = 0.0043$$

$$EF_{PM_{2.5}} (kg \cdot tonne^{-1}) = 0.00030$$

For controlled screening:

$$EF_{TSP} (kg \cdot tonne^{-1}) = 0.0011$$

$$EF_{PM_{10}} (kg \cdot tonne^{-1}) = 0.00037$$

$$EF_{PM_{2.5}} (kg.tonne^{-1}) = 0.000025$$

The quality rating for these emission factors is: screening (uncontrolled) = E & C (TSP & PM₁₀ respectively), and screening (controlled) = E, C & E (TSP, PM₁₀ & PM_{2.5} respectively). All other screening emission factors calculated have a quality rating of U (no rating).

Paved Roads

Emissions of particulate matter resulting from the movement of materials on paved roads have been estimated using the emission factors presented in 13.2.1 (Paved Roads) of AP-42, (US EPA, 2011).

The emission factor on page 13.2.1.3 of (US EPA, 2011) has been adopted for the operations of vehicles on paved roads:

$$EF_{(g.VKT^{-1})} = k(sL)^{0.91}(W \times 0.907185)^{1.02}$$

where:

$EF_{(g.VKT^{-1})}$ = emission factor (g per vehicle kilometre travelled)

k = particle size multiplier (dimensionless)

sL = road surface silt loading (g·m⁻²)

W = average weight (tons) of vehicles travelling the road multiplied by 0.907185 to convert to metric tonnes

The particle size multipliers for TSP, PM₁₀ and PM_{2.5} (k) are provided in (US EPA, 2011) as 3.23, 0.62 and 0.15, respectively.

The quality rating for this emission factors are A for TSP, A for PM₁₀, D for PM_{2.5}.

The road surface silt loading of the paved road between the Property entrance and Reids Flat Road Site has been taken to be 8.2 g·m⁻². This value is considered to represent a potential worst-case (refer Section 6.4).

Unpaved Roads

Emissions of particulate matter resulting from the movement of materials on unpaved roads have been estimated using the emission factors presented in Section 13.2.2 (Unpaved Roads) of AP-42 (USEPA, 2006c).

The emission factor in section 13.2.2 of (USEPA, 2006c) has been adopted for the operations of vehicles on unpaved roads:

$$EF_{(kg.VKT^{-1})} = 0.2819 \times k \times \left(\frac{s}{12}\right)^a \times \left(\frac{W \times 0.907185}{3}\right)^b$$

where:

$EF_{(kg.VKT^{-1})}$ = emission factor (kg per vehicle kilometre travelled) multiplied by 0.2819 to convert from lb per vehicle mile travelled

k = particle size multiplier (dimensionless)

s = surface material silt content (%)

W = mean vehicle weight (tons) multiplied by 0.907185 to convert from metric tonnes

The particle size multipliers for TSP, PM₁₀ and PM_{2.5} (k) are provided in (US EPA, 2006a) as 4.9, 1.5 and 0.15, respectively.

The quality rating for this application is rated B for TSP, B for PM₁₀ and B for PM_{2.5}.

The silt content of unpaved haul roads at the Quarry Site has been taken to be 8.3 % which is consistent with haul roads at stone quarrying and processing sites (Table 13.2.2-1 of (US EPA, 2006a)).

The mean weight of vehicles used on site has been calculated based on the use of the equipment identified in Table 1. Delivery vehicles (truck and dog) have been assumed to be used to transport product from the Quarry Site. The assumptions adopted in relation to vehicle weights and capacities is presented in Table D1.

Table D1 Assumptions adopted in relation to vehicle traffic

Activity	Length (km)	1 Way/2 Way	Vehicle	Tare (t)	Loaded (t)	Capacity (t)	Average (t)
Glenella gate to weighbridge (paved)	2.0	2 Way	Truck and Dog	13.0	55.0	42.0	34.0
Weighbridge to one way loop (unpaved)	1.9	2 Way	Truck and Dog	13.0	55.0	42.0	34.0
One way loop to sealed exit by loadout (unpaved)	1.6	1 Way	Truck and Dog	13.0	55.0	42.0	34.0
One way to two way exit (paved)	0.8	1 Way	Truck and Dog	13.0	55.0	42.0	34.0
Dump truck - rock (unpaved)	0.4	2 Way	Terex TA 400	31.4	69.4	38.0	50.4
FEL moving crushed material to stockpiles (unpaved)	0.3	2 Way	Hyundai 770-9	23.1	31.5	8.4	27.3
Dump truck -overburden (unpaved)	0.6	2 Way	Terex TA 400	31.4	69.4	38.0	50.4
FEL moving washed material to stockpiles (unpaved)	0.2	2 Way	Hyundai 770-9	23.1	31.5	8.4	27.3
Glenella gate to Reids Flat Road (paved)	4.8	2 Way	Truck and Dog	13.0	55.0	42.0	34.0

Wind Erosion (Exposed Areas)

Emissions of particulate matter resulting from the wind erosion of exposed areas have been estimated using the emission factors presented in Section 11.9-4 of AP-42 (Western Surface Coal Mining) (USEPA, 1998).

The emission factors within table 11.9-4 have been adopted for the operations outlined above. The emission factor applies to the materials: seeded land, stripped overburden and graded overburden. The emission factor is:

$$EF_{TSP} (\text{tonne} \cdot (\text{hectare} \cdot \text{year})^{-1}) = 0.85$$

where:

$EF_{TSP} (\text{tonne} \cdot (\text{hectare} \cdot \text{year})^{-1})$ = emission factor for total suspended particulate matter

PM₁₀ and PM_{2.5} emission factors are not available in AP-42 although have been taken to be 50 % of TSP for PM₁₀ and, 7.5 % of TSP for PM_{2.5} as per AP-42 section (13.2.5) for industrial wind erosion (USEPA, 1998).

The quality rating for this emission factors is C.

and subject to change

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