Karuah East Quarry
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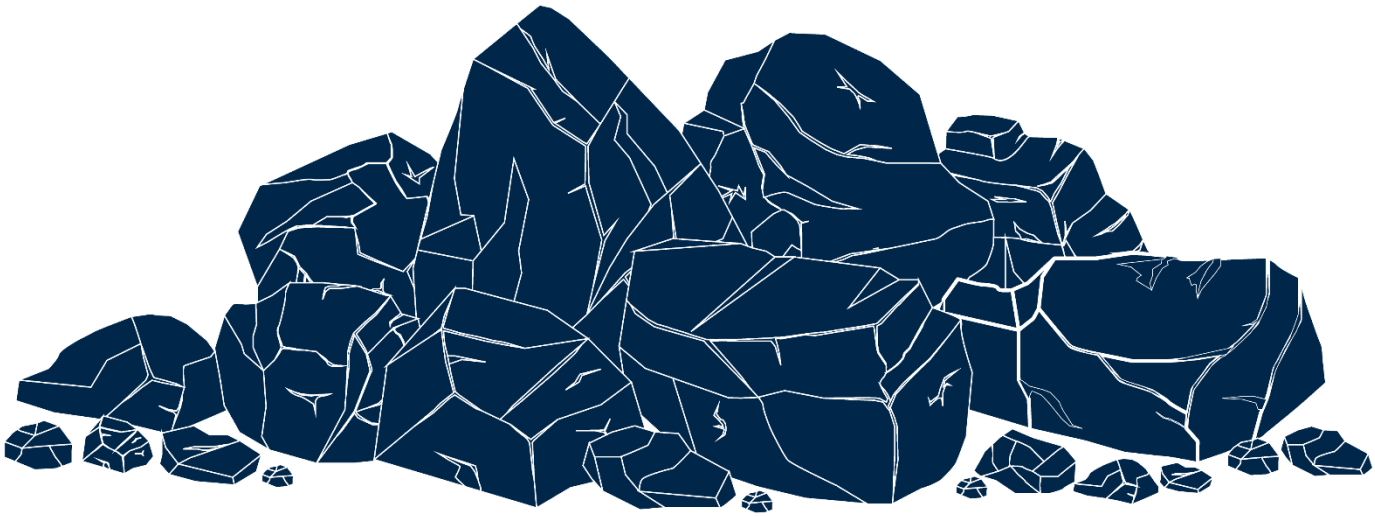
Karuah East Quarry

Annual Review

1 January to 31 December 2024



Annual Review Title Block

Table 1 Karuah East Quarry Annual Review 2024 Title Block.

Name of Operation:	Karuah East Quarry
Name of Operator:	Karuah East Quarry Pty Limited
Project Approval:	MP09_0175
Name of holder of Project Approval:	Karuah East Quarry Pty Limited
Mining Lease:	N/A
Water Licences:	None
MOP / RMP:	N/A
Annual Review Start Date:	01 January 2024
Annual Review End Date:	31 December 2024

I, **Scott Ellerton**, certify that this audit report is a true and accurate record of the compliance status of **Karuah East Quarry** for the period **01 January 2024** to **31 December 2043** and that I am authorised to make this statement on behalf of **Karuah East Quarry Pty Limited**.

Note.

A. *The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

B. *The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications / information / documents — maximum penalty 2 years imprisonment or $22,000, or both).*

Name of Authorised Reporting Officer:	Scott Ellerton
Title of Authorised Reporting Officer:	Environment & Development Manager
Signature of Authorised Reporting Officer:	S. Ell
Date:	23/03/2025

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Glossary

Abbreviation / Term	Meaning
AEMR	Annual Environmental Management Report
AHIMS	Aboriginal Heritage Information Management System
AQIA	Air Quality Impact Assessment
BAM	NSW Biodiversity Assessment Methodology
BOA	Biodiversity Offset Area
BOAMP	Biodiversity Offset Area Management Plan
BOS	NSW Biodiversity Offsets Scheme
CCC	Community Consultative Committee
DDG	Dust Deposition Gauge
DCCEEW	Department of Climate Change, Energy, the Environment & Water
EIS	Environmental Impact Statement
EPBC Act	Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*
EP&A Act	NSW *Environmental Planning & Assessment Act 1979*
EPL	NSW Environment Protection Licence
Ha	Hectare
HVAS	High Volume Air Sampler
HQPL	Hunter Quarries Pty Ltd
IEA	Independent Environmental Audit
KEQ	Karuah East Quarry
KEQPL	Karuah East Quarry Pty Limited
km	Kilometre
L	Litre
LALC	Local Aboriginal Land Council
L&RMP	Landscape & Rehabilitation Management Plan
LDP	Licenced Discharge Point
MNES	Commonwealth Matters of National Environmental Significance
MCC	MidCoast Council
MOD	Modification to the NSW Project Approval
NIA	Noise Impact Assessment
NSW Planning	NSW Department of Planning, Housing & Infrastructure
PM10	Particulates less than 10 µm in diameter
POEO Act	NSW *Protection of the Environment Operations Act 1997*
RAR	Response to Audit Recommendations
Tpa	tonnes per annum
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
WPC	Wedgetail Project Consulting

1.0 Statement of Compliance

The compliance status of the Karuah East Quarry (KEQ) site at the end of the 2024 Annual Review reporting period is summarised by **Table 2**, **Table 3**, and **Table 4** below, in reference to the site's Project Approval and Environment Protection Licence (EPL).

Table 2 Statement of Compliance.

Were all conditions of the relevant approval(s) complied with?	
Project Approval (MP09_0175)	No
Environment Protection Licence (EPL 20611)	No

Table 3 Compliance Status Key (NSW Planning Annual Review Guideline, October 2015).

Risk Level	Colour Code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.
Medium	Non-compliant	Non-compliance with: ▪ potential for serious environmental consequences, but is unlikely to occur; or ▪ potential for moderate environmental consequences, but is likely to occur.
Low	Non-compliant	Non-compliance with: ▪ potential for moderate environmental consequences, but is unlikely to occur; or ▪ potential for low environmental consequences, but is likely to occur.
Administrative	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions).

Table 4 Summary of Non-Compliances.

Relevant Approval	Condition	Condition Aspect	Compliance Status	Description	Section
Project Approval	Schedule 3, Condition 3	Noise	Non-compliant	Minor exceedance of the instantaneous noise limit during the morning shoulder monitoring period on 23 May 2024.	**Section 6.4 and Section 11.0**
EPL	Condition L4.1				
Project Approval	Schedule 3, Condition 13	Air Quality	Non-compliant	Anomalous exceedance of depositional dust criteria at DDG4 during the October 2024 monitoring period.	**Section 6.2 and Section 11.0**
Project Approval	Schedule 3, Condition 19	Water	Non-compliant	Major rainfall events resulting in discharges of sediment-laden water from: ▪ 05 to 08 April 2024; ▪ 21 to 23 April 2024; and ▪ 02 to 04 June 2024.	**Section 7.2 and Section 11.0**
EPL	Condition L2.4		Non-compliant	Minor exceedances of pH criteria: ▪ 25 March 2024 (LDP2); and ▪ 29 March 2024 (LDP3).	

2.0 Introduction

This Annual Review covers the reporting period from the **1 January 2024** to **31 December 2024** for the Karuah East Quarry site.

Karuah East Quarry is a hard rock andesite quarry which contributes materials to the construction, civil infrastructure and land development industries in the Greater Newcastle, Hunter Valley, and Mid-North Coast regions. The site is located approximately 5 km to the north-east of the village of Karuah within the MidCoast Council LGA and is accessed via Blue Rock Close and Andersite Road adjacent to the northern Tarean Road interchange with the A1 Pacific Highway. The site is approved to cover approximately 40 Ha of land within Lot 12 and 13 of DP1024564.

Figure 1 and **Figure 2** illustrate the site within its broader regional context and site layouts respectively.

The approved development includes the following key elements:

- staged extraction of approximately 29 million tonnes of andesite over a 20 year timeframe;
- extraction of up to 1.5 million tonnes of andesite material per year;
- removal and stockpiling of an estimated 380,000 m^3 of overburden (approximately 750,000 tonnes) from the quarry extraction area. Removal of overburden is not included in the proposed annual extraction rate of 1.5 million tonnes of andesite;
- haulage of up to 1.5 million tonnes of andesite per year from the site to market by 12 to 38 tonne road trucks via the A1 Pacific Highway;
- implementation of erosion and sediment, and water management control works to ensure no loss of sediment, minimise dust generation and control discharges from the site to ensure that all discharges are within acceptable volumetric and water quality criteria;
- roadworks to secure access to the site including upgrade and extension of Blue Rock Close, realignment of Andersite Road and the Blue Rock Close intersection, and adjust road markings at The Branch Lane and Andersite Road intersection;
- employment of up to 28 onsite staff;
- construction of a new haul road and access through adjoining Transport for NSW (TfNSW) land;
- staged clearing;
- drilling and blasting activities;
- loading and hauling of extracted material;
- crushing and screening of extracted material;
- stockpiling of material onsite; and
- location of plant on Lot 13 comprised of office buildings, workshops, parking areas, crushing plant, wash plant, weighbridge and product storage areas.

2.1 Quarry Contacts

Key personnel who are responsible for environmental management of the operation are provided by **Table 5.**

Table 5 Key Quarry Contacts.

Position	Name	Contact	Contact Priority
Environment & Development Manager	Scott Ellerton	0447 044 646	Primary Contact
Quarry Manager	Darryn Bosch	0490 405 375	Secondary Contact
General Manager	Dylan Nagle	0438 380 701	–

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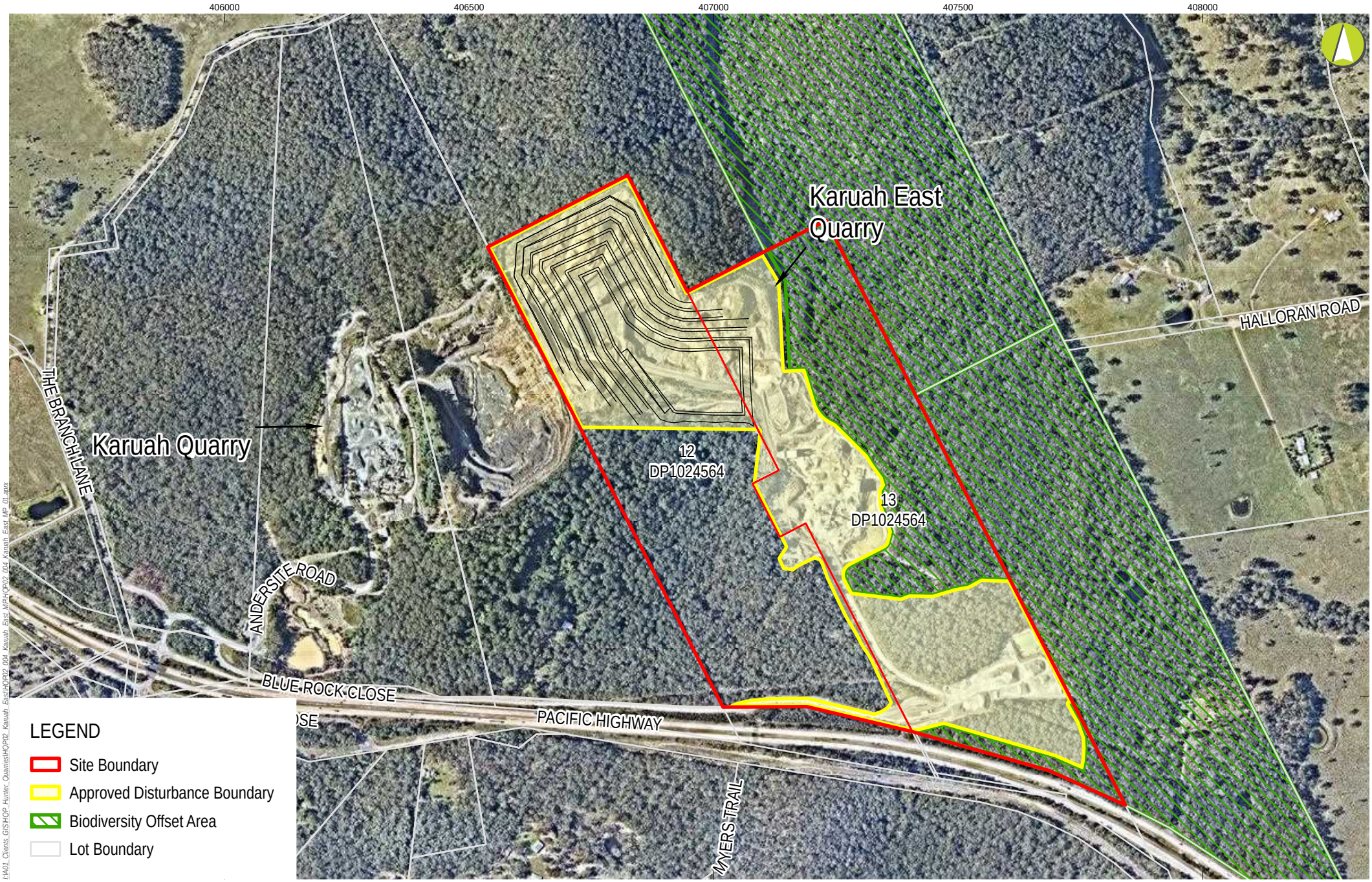
Karuah East Quarry

Annual Review 2024

FIGURE 1 - Regional and Local Context Plan



LEGEND

- Site Boundary
- Approved Disturbance Boundary
- Biodiversity Offset Area
- Lot Boundary

0 70 140 210 280 m

Scale: 1:10,000

Sheet Size : A4

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GDA 1994 MGA Zone 56

8/03/2024

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Karuah East Quarry

Annual Review 2024

FIGURE 2 - Locality Plan

3.0 Approvals

A summary of the approvals benefiting the Karuah East Quarry are provided in **Table 6** with further details of each NSW and Commonwealth approval provided in the subsequent sub-sections.

Table 6 Project Approvals associated with the Karuah East Quarry.

Instrument	Grant Date	Expiry Date	Comments
Project Approval (MP09_0175)	17/06/2014	31/12/2034	Primary statutory approval for the site under NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).
Environment Protection Licence (EPL 20611)	26/08/2015	–	Primary statutory licence for the site under NSW *Protection of the Environment Operations Act 1997* (POEO Act).
Commonwealth Approval (EPBC 2014/7278)	20/03/2015	30/03/2045	Commonwealth statutory approval for the original project under Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).
Commonwealth Approval (EPBC 2022/9164)	Pending Approval		Commonwealth statutory approval for the KEQ MOD10 Project under Commonwealth EPBC Act.

3.1 Project Approval (MP09_0175)

The Project Approval has been subject to five Modifications as summarised by **Table 7**.

Table 7 Modifications to the Project Approval for the Karuah East Quarry.

MOD	Approval Date	Description
MOD1	27/04/2018	Modification 1 (MOD1) was approved on 27 April 2018 under the provisions of section 75W of the EP&A Act. The modification approved a nominal expansion to the approved area of disturbance by 2,500 m² to allow for improved vehicle manoeuvring in proximity of the crushing plant and processing area.
MOD2	19/12/2018	Modification 2 (MOD2) was approved on 19 December 2018 under the provisions of section 75W of the EP&A Act. The modification approved a 1.133 Ha increase to the site disturbance area to allow for improved environmental management and improved operational safety (for quarry vehicles).
MOD3 to MOD7		Withdrawn
MOD8	22/12/2020	Modification 8 (MOD8) was approved on 22 December 2020 under the provisions of section 4.55(1A) of the EP&A Act. The modification approved revised operational acoustic criteria in line with the NSW Noise Policy for Industry 2017; and formalised a number of industry best practice acoustic mitigation measures that have been installed at the quarry.
MOD9	02/12/2021	Modification 9 (MOD9) was approved 02 December 2021 under the provisions of section 4.55(1A) of the EP&A Act. The modification approved extended operating hours of the KEQ site.
MOD10	18/05/2023	Modification 10 (MOD10) was approved on 18 May 2023 under the provisions of section 4.55(2) of the EP&A Act. The modification approved a 7.17 Ha increase in the disturbance area to a total of 40.18 Ha to allow for additional product stockpiling areas, facilitate improved surface water management, construct a new administration building and expand vehicle manoeuvring and parking at site.

3.2 Environment Protection Licence (EPL 20611)

The Environment Protection Licence (EPL) was originally granted on 26 August 2015 and has been subject to eight licence variations as summarised by **Table 8**.

In 2024, one variation application was submitted to undertake minor adjustments to the locations of the site's Depositional Dust Gauges (DDG).

Table 8 Variations to the Environment Protection Licence for the Karuah East Quarry.

No.	Approval Date	Description
–	26/08/2015	Original EPL granted for the site under NSW Protection of the Environment Operations Act 1997.
1	21/09/2015	Relocation of the blast monitoring location (EPL Monitoring Point 11).
2	06/12/2016	Relocation of Deposited Dust Gauge 5 (EPL Monitoring Point 8) and the High-Volume Air Sampler (EPL Monitoring Point 9).
3	16/01/2019	Inclusion of a Pollution Reduction Study following noise-related non-compliances.
4	25/06/2019	Amended noise monitoring frequency from annual to quarterly monitoring.
5	18/07/2019	Revised Scheduled Activity in accordance with the EPA's updated definitions.
6	02/09/2022	Update for MOD9 extended operating hours and correction of administrative items.
7	07/11/2022	Removal of noise monitoring at Location I.
8	17/02/2025	Minor adjustment of DDG locations.

3.3 Commonwealth EPBC Approval (EPBC 2014/7282 & 2022/9164)

EPBC 2014/7282

KEQPL received EPBC approval (2014/7282) on 20 March 2015.

EPBC 2014/7282 has been subject to one variation to date, which was granted on 4 October 2018. This variation was required as a result of MOD1 to the NSW Project Approval.

At the time of writing, EPBC 2014/7282 is subject to a second variation application which is currently being processed by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW). The variation application was lodged on 19 December 2023 as a result of MOD10 to the NSW Project Approval, with draft conditions received on 25 February 2025.

No other modification approvals to the NSW Project Approval (i.e. MOD2, MOD8 or MOD9) have necessitated an amendment to EPBC 2014/7282. A summary of these matters is provided by **Table 9**.

Table 9 Variations to the Commonwealth EPBC Approval for the Karuah East Quarry.

No.	Approval Date	Description
–	20/03/2015	Original approval granted for the site under Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
1	04/10/2018	Variation 1 was required as a result of MOD1 to the NSW Project Approval which impacted upon 0.25 Ha of native vegetation.
NOTE: MOD2, MOD8 and MOD9 to the NSW Project Approval did not necessitate a variation due to: ▪ MOD2 did not disturb any Matters of National Environmental Significance (MNES); ▪ MOD8 and MOD9 did not change the KEQ disturbance footprint.		
2	Pending Approval	Variation 2 was lodged on 19 December 2023 for the KEQ MOD10 Project for impacts to 7.17 Ha of native vegetation.

EPBC 2022/9164

MOD10 to the NSW Project Approval is being progressed under the Bilateral Assessment process between NSW Planning and the Commonwealth DCCEEW following confirmation that the project was a Controlled Action on 13 May 2022.

As noted above, MOD10 includes an extension to the KEQ disturbance footprint of 7.17 Ha which also extends into part of the approved Biodiversity Offset Area (BOA) on Lot 13 DP1024564.

MOD10 was approved by NSW Planning on 18 May 2023. Following NSW approval, the matter was referred to the Commonwealth DCCEEW to process the approval for EPBC 2022/9164. Prior to issuing approval for EPBC 2022/9164, Commonwealth DCCEEW staff have advised that variation to EPBC 2014/7282 is needed in the first instance. As noted above, the variation application was lodged on 19 December 2023 and this matter is continuing to be progressed.

3.4 Statutory Requirements of this Annual Review

Requirements of the Annual Review are summarised in **Table 10**.

Table 10 Summary of Statutory Requirements of the Annual Review.

No.	Requirement	Section
Schedule 2 – Administrative Conditions		
Condition 14	***Production Data*** *The Applicant must:* *a) provide annual quarry production data to MEG using the standard form for that purpose; and* *b) report this data in the Annual Review (see condition 4 of Schedule 5).*	**Section 4.1**
Schedule 3 – Environmental Performance Conditions		
Condition 23	***Monitoring of Product Transport*** *The Applicant must keep accurate records of all laden truck movements to and from the site (including arrival and dispatch) and publish a summary of records on its website every 6 months and in the Annual Review.*	**Section 4.6 and Appendix 2**
Schedule 5 – Environmental Management, Reporting and Auditing		
Condition 4	***Annual Review*** *By the end of March each year, the Applicant must review the environmental performance of the development to the satisfaction of the Planning Secretary. This review must:* *a) describe the development (including rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;*	**Section 4.0 and Section 8.0**
	b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against: • *the relevant statutory requirements, limits or performance measures/criteria;* • *the monitoring results of previous years; and* • *the relevant predictions in the documents referred to in condition 2(d) of Schedule 2 of this consent;*	**Section 6.0 and Section 7.0**
	c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;	**Section 6.2 and Section 11.0**
	d) identify any trends in the monitoring data over the life of the development;	**Section 6.0 and Section 7.0**
	e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and	**Section 6.0 and Section 7.0**
	f) describe the measures that would be implemented over the current calendar year to improve the environmental performance of the development.	**Section 12.0**

3.5 Summary of Environmental Management Plans

A summary of the site's Environmental Management Plans is provided in **Table 11**.

Table 11 Summary of Statutory Environmental Management Plans.

Environmental Management Plan	Status	2025 Action
Environmental Management Strategy	Comprehensive review completed by KEQPL in May 2024 and approved by NSW Planning on 19 August 2024.	Continue to review and update as required.
Air Quality Management Plan	Comprehensive review completed by IEMA in February 2024 and approved by NSW Planning on 18 June 2024.	Continue to review and update as required.
Biodiversity Offset Area Management Plan	Comprehensive review completed by Wedgetail Project Consulting (WPC) in May 2024. Development of the final revised document is subject to Commonwealth Approval for MOD10.	Final update pending Commonwealth Approval for MOD10.
Biodiversity Offset Strategy	Originally approved in 2015.	Update pending Commonwealth Approval for MOD10.
Blast Management Plan	Comprehensive review completed by IEMA in March 2024 and approved by NSW Planning on 29 April 2024.	Continue to review and update as required.
Heritage Management Plan	Comprehensive review completed by Heritage Now in August 2023 and approved by NSW Planning on 12 January 2024.	Continue to review and update as required.
Landscape and Rehabilitation Management Plan	Comprehensive review completed by IEMA and WPC in October 2024 and approved by NSW Planning on 11 February 2025.	Continue to review and update as required.
Noise Management Plan	Comprehensive review completed by EMM in February 2024 and approved by NSW Planning on 11 July 2024.	Continue to review and update as required.
Transport Management Plan	Comprehensive review completed by ADW Johnson in May 2024 and approved by NSW Planning on 26 November 2024.	Continue to review and update as required.
Tetratheca juncea Translocation Plan	Program ceased in 2020.	–
Water Management Plan	Comprehensive review completed by ADW Johnson in May 2024 and is currently pending approval by NSW Planning.	Continue to review and update as required.

4.0 Operations Summary

The KEQ site operated during the 2024 reporting period as outlined below.

4.1 Quarry Production Summary

The monthly production summary during the reporting period is included in **Table 12**.

Table 12 Monthly Quarry Production Data.

Month	Production (t)	Truck Loads (#)
Jan-24	109,693	3,559
Feb-24	82,999	2,649
Mar-24	92,042	3,003
Apr-24	91,145	2,988
May-24	97,554	3,113
Jun-24	91,148	3,058
Jul-24	93,576	3,148
Aug-24	100,141	3,410
Sep-24	97,268	3,310
Oct-24	93,705	3,123
Nov-24	84,997	2,861
Dec-24	81,260	2,687
2024 TOTAL:	**1,115,528**	**36,909**
2025 FORECAST:	**1,200,000**	**40,000**

4.2 Land Preparation

No land clearing was completed during the 2024 reporting period.

4.3 Construction & Demolition Activities

No construction activities were completed during the 2024 reporting period.

However, the original residential dwelling located on Lot 12 was demolished in November 2024 by a licenced demolition contractor.

4.4 Operating Hours

During the 2024 reporting period the KEQ site was operated within the operating hours provided by Schedule 2, Condition 7 of the Project Approval as outlined by **Figure 3**.

No temporary extensions to operating hours were sought from the Planning Secretary and no directions from statutory authorities were received during 2024.

Hours of Operation

7. The Applicant must comply with the operating hours in Table 1.

Table 1: Operating hours

Activity	*Operating Hours*
Quarrying Operations	7:00 am to 9:00 pm, Monday to Friday 7:00 am to 10:00 pm Monday to Friday on 50 calendar days per year; and 7:00 am to 6:00 pm, Saturday. No drilling 6:00 pm to 10:00 pm Monday to Friday or 1:00 pm to 6:00 pm Saturday No quarrying operations on Sundays or Public Holidays.
Product loading and dispatch	5:00 am to 9:00 pm Monday to Friday 5:00 am to 10:00 pm Monday to Friday on 50 calendar days per year 6:00 am to 6:00 pm Saturday No product loading and dispatch on Sundays or Public Holidays
Construction activities	7.00 am to 6.00 pm, Monday to Friday; and 8.00 am to 1.00 pm, Saturdays, unless noise from these activities does not exceed 40 dB(A) $L_{Aeq(15\ min)}$ at any privately-owned residence.
Maintenance activities	24 hours a day, 7 days per week, providing maintenance activities are inaudible at any privately-owned residence

Note: This condition does not apply in the event of a direction from police or other relevant authority for safety or emergency reasons regarding works which may need to be undertaken to avoid loss of life, property loss and/or to prevent environmental harm.

Figure 3 Operating Hours as specified in the Project Approval.

4.5 Operating Equipment

During the Reporting Period the following equipment was available for use during operational periods:

- 3x Excavators,
- 5x Front End Loaders,
- 2x Rigid Haul Trucks,
- 4x Articulated Haul Trucks,
- 1x Mini Digger,
- 1x Posi-track,
- 1 x Mobile Screen,
- 1 x Mobile Jaw,
- 1 x Mobile Grizzly,
- 1 x 40,000 litre Water Cart,
- 1 x 30,000 litre Water Cart,
- 1 x Trommel,
- 1 x Pugmill, and
- 1 x Elevated Work Platform.

4.6 Transport Rates

Transport rate monitoring is conducted in accordance with Schedule 3, Condition 23 of the Project Approval, outlined by **Figure 4**. Monthly truck movements are summarised by **Table 12** with detailed reports provided by **Appendix 2** and published on the Hunter Quarries website.

Monitoring of Product Transport

23. The Applicant must keep accurate records of all laden truck movements to and from the site (including time of arrival and dispatch) and publish a summary of records on its website every 6 months and in the Annual Review.

Figure 4 Product Transport Monitoring Requirements from the Project Approval.

4.7 Next Reporting Period

Forecast operations for the next 2025 reporting period are summarised by **Table 13**.

Table 13 Forecast Operations for the Next 2025 Reporting Period.

Aspect	Forecast Operations for the Next 2025 Reporting Period
Quarrying Operations	Continuation of quarrying activities within the approved extraction pit.
Infrastructure Upgrades	Expanded operational and ancillary infrastructure in accordance with the KEQ MOD10 Project, including increased stockpile areas, additional administration buildings and upgraded sedimentation dams. Routine maintenance to structural assets will continue to be completed subject to economic business cases and in accordance with operational requirements and the expected life of fixed plant.
Equipment Upgrades	No major equipment upgrades are planned; however, routine replacement of equipment will continue to be completed subject to economic business cases and in accordance with operational requirements and the expected life of plant and equipment.

5.0 Actions Required from Previous Annual Reviews

KEQPL received correspondence from NSW Planning on 04 October 2024 regarding the 2023 Annual Review and found it to generally satisfy the reporting requirements of the Project Approval and the NSW Planning Annual Review Guideline (October, 2015).

The actions required as an outcome of the previous Annual Reviews are summarised in **Table 14**.

Table 14 Summary of Previous Actions.

Action ID	Action Required	Status	Section
KEQ Findings – 2023 Annual Review			
2023-1	KEQ MOD10 Project: Submit EPL Variation for updated activities for the KEQ MOD10 Project.	**Continuing** Variation application pending NSW Planning approval of the Water Management Plan.	**Section 3.5** **Section 7.0**
2023-2	Undertake comprehensive review and update of the following Management Plans for the KEQ MOD10 Project and 2023 KEQ IEA.	Management Plan approvals required prior to the commencement of construction for the KEQ MOD10 Project.	
	A. Environmental Management Strategy.	**Complete** Approved 19 August 2024.	**Section 3.5**
	B. Air Quality Management Plan.	**Complete** Approved 1 June 2024.	**Section 3.5**
	C. Biodiversity Offset Area Management Plan.	**Continuing** Pending Commonwealth EPBC Approval of MOD10.	**Section 3.5**
	D. Biodiversity Offset Strategy.	**Continuing** Pending Commonwealth EPBC Approval of MOD10.	**Section 3.5**
	E. Blast Management Plan.	**Complete** Approved 29 April 2024.	**Section 3.5**
	F. Landscape & Rehabilitation Management Plan.	**Complete** Approved 11 February 2025.	**Section 3.5**
	G. Noise Management Plan.	**Complete** Approved 11 July 2024.	**Section 3.5**
	H. Transport Management Plan.	**Complete** Approved 26 November 2024.	**Section 3.5**
	I. Water Management Plan (including effectiveness of WMP and TARP for surface water management to minimise exceedances of discharge limits).	**Continuing** Pending NSW Planning Approval.	**Section 3.5**
2023-3	Air Quality: Submit EPL Variation (in conjunction with HQPL) to undertake minor relocation of three depositional dust gauges to minimise risk of contamination with organic as far as reasonably practicable.	**Continuing** The EPL Variation was approved on 17 February 2025 and at the time of writing, the relocation works are currently being scheduled.	**Section 6.2**

Action ID	Action Required	Status	Section
2023-4	Surface Water Management: Progress with detailed design of surface water improvement opportunities identified by VGT (2023); and review appropriate approval pathways.	**Continuing** KEQPL will progress securing necessary approvals in 2025.	**Section 7.2**
2023-5	Groundwater Management: Install replacement piezometer and rehabilitate existing piezometer, BH207.	**Complete** Replacement borehole drilled in August 2024.	**Section 7.3**
2023-6	Fencing: **A.** Install fencing around Lot 5 dwelling APZ. **B.** Restring fencing along northern boundary of Lot 5. **C.** Install fauna fencing along the western boundary of Lot 13 adjoining the KEQ site.	**A. Completed** **B. Completed** **C. Quoted**	**Section 6.6**
2023-7	Erosion and Sediment Control: Repair sites of surface erosion along the eastern interface of the approved KEQ disturbance boundary and Lot 13.	**Continuing** KEQPL will progress securing necessary approvals in 2025 to facilitate works / site access.	**Section 6.6**
2023-8	Weed Control: Determine appropriate lantana control programme.	**Continuing** KEQPL are continuing to review appropriate resourcing to undertake.	**Section 6.6**
2023-9	Pest Control: Undertake 2-yearly vertebrate post monitoring.	**Continuing** KEQPL will progress securing necessary approvals in 2025.	**Section 6.6**
2023-10	Fire Management: Develop and implement a Fire Management Strategy for the BOA.	**Complete** Fire Management Strategy developed by Coolburn in October 2024.	**Section 6.6**
2023-11	Include laden truck movement data in the Annual Review for all future submissions.	Completed in 2023.	**Appendix 4**
2023-12	Review repair options to the hazardous materials storage container.	**Complete** Container removed from site in early 2024.	**Appendix 4**
2023-13	Update Hazardous Substances Register to include diesel ASTs.	Completed in 2023.	**Appendix 4**
2023-14	Implement document management system to ensure the review, revision and re-approval of statutory management plans are completed.	Completed in 2023.	**Appendix 4**

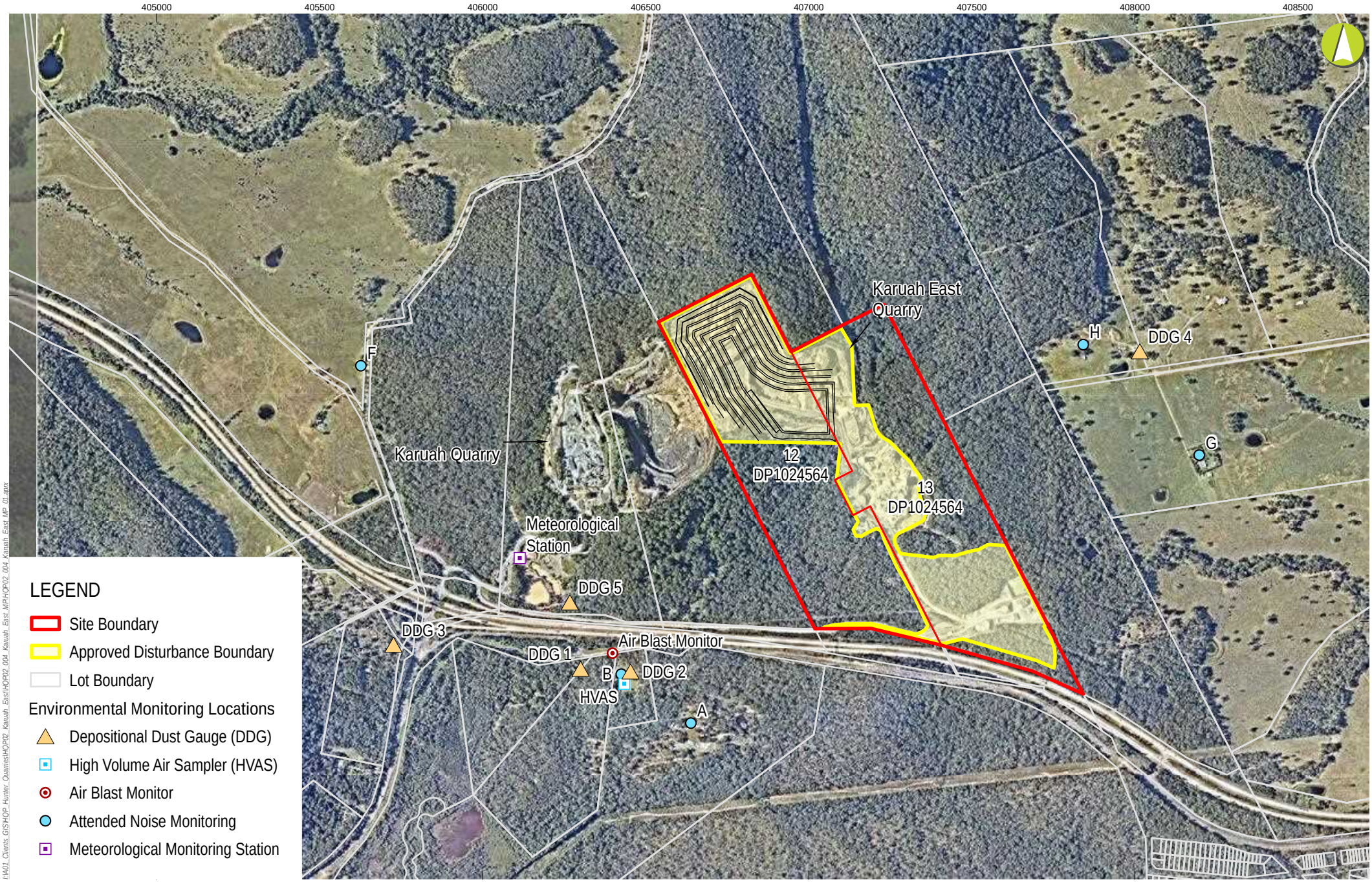
6.0 Environmental Performance

KEQPL undertakes environmental monitoring in accordance with the Project Approval and EPL. Key monitoring locations are illustrated by **Figure 5**.

Table 15 provides a summary of the environmental performance at the site for the 2024 reporting period.

Table 15 Summary of Environmental Performance During the 2024 Reporting Period.

Aspect	Approval Criteria OR EIS Prediction	Performance During the Operating Period	Trend OR Key Management Implications	Implemented OR Proposed Management Actions
Air Quality	Project Approval – Schedule 3, Condition 13	1x Depositional Dust exceedance	Exceedance at DDG 4 during the October 2024 monitoring period considered to be an anomalous result.	Minor relocation of 3x DDG's to minimise risks of inaccurate results as far as reasonably possible.
Blasting	Project Approval – Schedule 3, Condition 8	Compliant	Within criteria	Continued monitoring
Noise	Project Approval – Schedule 3, Condition 3	1x $LA_{1,1}$ exceedance during the morning shoulder.	Exceedance associated with the impact of truck tailgate over potholed roadway.	Implementation of improved continuous road repairs following wet-weather events.
Heritage	Project Approval – Schedule 3, Condition 36	Compliant	No specific criteria	Continued monitoring
Biodiversity	Project Approval – Schedule 3, Condition 33	Compliant	Within criteria for BOAMP	Implement actions from Biodiversity Offset Area Monitoring Report.
Waste	Project Approval – Schedule 3, Condition 42	Compliant	Increased waste associated within improved housekeeping processes.	Continued monitoring
Water	Project Approval – Schedule 3, Condition 19	Non-Compliant	Discharges of sediment-laden water following major rainfall events.	Continued monitoring
			Minor pH exceedances during controlled discharges.	Implementation of improved processes, including fieldsheets and checklists.



Karuah East Quarry

Annual Review 2024

FIGURE 5 - Environmental Monitoring Locations

6.1 Meteorological Monitoring

For the 2024 reporting period the KEQ site operated a meteorological monitoring station in accordance with Schedule 3, Condition 17 of the Project Approval as illustrated by **Figure 6**.

METEOROLOGICAL MONITORING

17. For the life of the development, the Applicant must ensure that there is a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline.

Figure 6 Meteorological Monitoring Requirements from the Project Approval.

The meteorological monitoring station was installed in August 2016 adjacent to the weighbridge of the Karuah Hard Rock Quarry (DA 265-10-2004) as illustrated by **Figure 5** and currently services both quarries at the Karuah Quarry Complex. On 26 March 2024 the station was serviced and subject to the required annual field calibration.

Table 16 presents a summary of the meteorological data collected by the meteorological station during the Reporting Period.

Table 16 Recorded 2024 Meteorological Data.

Month	Temperature (°C)			Rainfall (mm)		Wet Days (No. >1 mm)	Wind [Max Gust] (km/h)
	Min	Ave	Max	Total	Max Daily		
Jan-24	14.7	24.6	45.1	36.2	12.2	8	45.0
Feb-24	15.6	23.9	39.2	107.4	42.8	9	52.1
Mar-24	12.3	21.7	40.0	71.6	15.8	9	56.8
Apr-24	9.4	18.1	30.4	308.4	117.6	9	46.1
May-24	4.2	14.2	23.2	285.2	40.2	14	47.3
Jun-24	2.7	11.7	22.6	192.4	54.6	8	42.6
Jul-24	2.1	11.5	23.3	65.4	10.4	11	65.1
Aug-24	3.6	14.1	30.9	85.2	16.2	10	65.1
Sep-24	3.7	15.4	29.3	147.0	52.6	10	61.5
Oct-24	7.2	17.5	32.6	79.4	18.8	9	45.0
Nov-24	12.0	21.8	39.3	56.4	16.8	10	50.9
Dec-24	11.7	23.6	39.3	64.4	29.8	7	49.7

Average monthly temperatures during 2024 ranged from 11.5 to 24.6 °C, with a maximum temperature of 45.1 °C recorded in January 2024. Total monthly rainfall ranged from 36.2 mm (January) to 308.4 mm (April), with the maximum daily rainfall recorded at 117.6 mm on 06 April 2024. The maximum wind gust was recorded at 65.1 km/h on both 21 July 2024 and 29 August 2024.

The total rainfall for 2024 was 1,504 mm which can be compared to 931 mm in 2023.

6.2 Air Quality

EIS Predictions

The revised Air Quality Impact Assessment (AQIA) (updated for the Preferred Project Report) indicates that Karuah East Quarry may operate without significant impact on the surrounding environment. In particular, the updated AQIA has confirmed that potential cumulative impacts of Karuah East Quarry and existing Karuah Hard Rock Quarry are well below acceptable criteria levels and will not impose adverse impacts. Overall, it has been demonstrated that the AQIA for Karuah East Quarry is acceptable in terms of air quality considerations for both the construction and operational phases.

Approval Criteria

Air quality criteria is provided in Schedule 3, Condition 13 of the Project Approval as outlined by **Figure 7**. All reasonable and feasible avoidance and mitigation measures are to be employed so that particulate matter emissions generated do not exceed the criteria at any residence on privately owned land.

No specific limits are specified for air quality emissions by the EPL, however, the EPA does mandate the use of Approved Methods as outlined by their guidance document – *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2022).

Air Quality Criteria

13. The Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not exceed the criteria in Tables 7 to 9 at any residence on privately-owned land.

Table 7: Long-term impact assessment criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
Total suspended particulates (TSP)	Annual	[a] 90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 8: Short-term impact assessment criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	[a] 50 µg/m^3

Table 9: Long-term Impact Assessment Criteria for Deposited Dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c] Deposited dust	Annual	[b] 2 g/m^2 /month	[a] 4 g/m^2 /month

Notes to Tables 7-9:

- *[a] Total impact (ie incremental increase in concentrations due to the development plus background concentrations due to all other sources);*
- *[b] Incremental impact (ie incremental increase in concentrations due to the development on its own);*
- *[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.*
- *[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Planning Secretary in consultation with EPA.*

Figure 7 Air Quality Criteria Provided by the Project Approval.

The main source of air pollution at the quarry is in the form of airborne dust, which arises from activities such as quarry operations, product processing and vehicle movements. Air quality monitoring has been performed to meet the EPA's Approved Methods (EPA, 2022) using five (5x) Depositional Dust Gauges and one (1x) High-Volume Air Sampler. The location of these monitoring locations is illustrated by **Figure 5**.

Environmental Performance Results (Deposited Dust)

Depositional dust results are outlined within **Table 17**. The monitoring results indicated that the maximum deposited dust levels measured at DDG 1 to DDG 5 were generally all less than the long-term impact assessment criteria for depositional dust (maximum deposited dust level of 4 g/m^2/month) over the 2024 reporting period.

Table 17 Summary of Depositional Dust Gauge Results During the 2024 Reporting Period.

Monitoring Details				*Deposited Dust (g/m^2/month)*				
Reporting Period	**Start Date**	**End Date**	**Days**	**DDG 1 EPL ID 4**	**DDG 2 EPL ID 5**	**DDG 3 EPL ID 6**	**DDG 4 EPL ID 7**	**DDG 5 EPL ID 8**
Jan-24	28/12/2023	25/01/2024	28	1.4	1.2	1.0	1.2	1.7
Feb-24	25/01/2024	26/02/2024	32	1.1	0.8	1.3	1.3	1.3
Mar-24	26/02/2024	28/03/2024	31	0.8	0.9	1.8	0.6	1.8
Apr-24	28/03/2024	29/04/2024	32	0.9	0.4	0.5	0.8	0.5
May-24	29/04/2024	29/05/2024	30	0.5	0.3	0.2	0.4	0.4
Jun-24	29/05/2024	28/06/2024	30	0.7	0.5	0.5	0.7	0.4
Jul-24	28/06/2024	30/07/2024	32	1.1	0.8	0.6	0.9	0.7
Aug-24	30/07/2024	30/08/2024	31	0.7	0.5	0.7	0.9	0.6
Sep-24	30/08/2024	30/09/2024	31	2.2	1.2	1.3	1.2	0.9
Oct-24	30/09/2024	31/10/2024	31	1.0	0.7	0.7	5.1*	0.4
Nov-24	31/10/2024	29/11/2024	29	1.4	1.1	1.1	1.7	0.9
Dec-24	29/11/2024	30/12/2024	29	0.6	1.4	1.3	3.1	1.1
2023 Annual Average:				**0.8**	**1.2**	**1.0**	**0.8**	**0.9**
2023 Minimum:				**0.2**	**0.3**	**0.2**	**0.1**	**0.4**
2023 Maximum:				**1.6**	**2.5**	**2.2**	**1.6**	**1.8**

However, it should be noted that an anomalous exceedance was recorded at DDG4 during the October 2024 monitoring period which was subsequently reported to NSW Planning, the NSW EPA and surrounding landholders in accordance with the relevant conditions of the Project Approval and EPL. NSW Planning subsequently determined to record a breach of the Project Approval on 11 December 2024.

Environmental Performance Results (Particulate Matter)

Total Suspended Particulates (TSP) and Particulate Matter < 10 µm (PM10) results for the 2024 reporting period are summarised by **Table 18** and illustrated by **Figure 8** and **Figure 9** respectively. The results were compliant with the long-term criteria (TSP and PM10) and short-term criteria (PM10 only), as outlined below:

- The annual average TSP was 20.3 µg/m^3, which is below the long-term criteria of 90 µg/m^3;
- The annual average PM10 was 9.7 µg/m^3, which is below the long-term criteria of 30 µg/m^3; and
- The maximum PM10 was 21 µg/m^3, which is below the short-term criteria of 50 µg/m^3.

Table 18 TSP & PM10 High-Volume Air Sampler Results During the 2024 Reporting Period.

HVAS Run Date	TSP (µg/m³)	PM10 (µg/m³)	Status		HVAS Run Date	TSP (µg/m³)	PM10 (µg/m³)	Status
06/01/2024	17	8	Compliant		04/07/2024	9	6	Compliant
12/01/2024	22	10	Compliant		10/07/2024	7	2	Compliant
18/01/2024	19	8	Compliant		16/07/2024	13	6	Compliant
24/01/2024	33	14	Compliant		22/07/2024	17	11	Compliant
30/01/2024	32	17	Compliant		28/07/2024	13	6	Compliant
05/02/2024	34	19	Compliant		03/08/2024	10	7	Compliant
11/02/2024	29	10	Compliant		09/08/2024	15	8	Compliant
17/02/2024	23	11	Compliant		15/08/2024	7	3	Compliant
23/02/2024	32	13	Compliant		21/08/2024	28	16	Compliant
29/02/2024	53	21	Compliant		27/08/2024	25	14	Compliant
06/03/2024	40	14	Compliant		02/09/2024	39	20	Compliant
12/03/2024	41	17	Compliant		08/09/2024	31	18	Compliant
18/03/2024	12	4	Compliant		14/09/2024	15	9	Compliant
24/03/2024	10	4	Compliant		20/09/2024	29	12	Compliant
30/03/2024	8	3	Compliant		26/09/2024	18	9	Compliant
05/04/2024	9	5	Compliant		02/10/2024	12	7	Compliant
11/04/2024	16	6	Compliant		08/10/2024	21	11	Compliant
17/04/2024	25	10	Compliant		14/10/2024	10	5	Compliant
23/04/2024	12	5	Compliant		20/10/2024	27	14	Compliant
29/04/2024	12	5	Compliant		26/10/2024	19	9	Compliant
05/05/2024	3	2	Compliant		01/11/2024	14	7	Compliant
11/05/2024	7	4	Compliant		07/11/2024	39	18	Compliant
17/05/2024	15	9	Compliant		13/11/2024	19	9	Compliant
23/05/2024	12	7	Compliant		19/11/2024	29	14	Compliant
29/05/2024	21	11	Compliant		25/11/2024	36	16	Compliant
04/06/2024	8	4	Compliant		01/12/2024	18	10	Compliant
10/06/2024	9	4	Compliant		07/12/2024	28	15	Compliant
16/06/2024	5	3	Compliant		13/12/2024	43	20	Compliant
22/06/2024	5	3	Compliant		19/12/2024	24	10	Compliant
28/06/2024	12	6	Compliant		25/12/2024	23	9	Compliant
					31/12/2024	25	11	Compliant
					2024 Annual Average:	**20.3**	**9.7**	**Compliant**
					2024 Minimum:	**3**	**2**	
					2024 Maximum:	**53**	**21**	

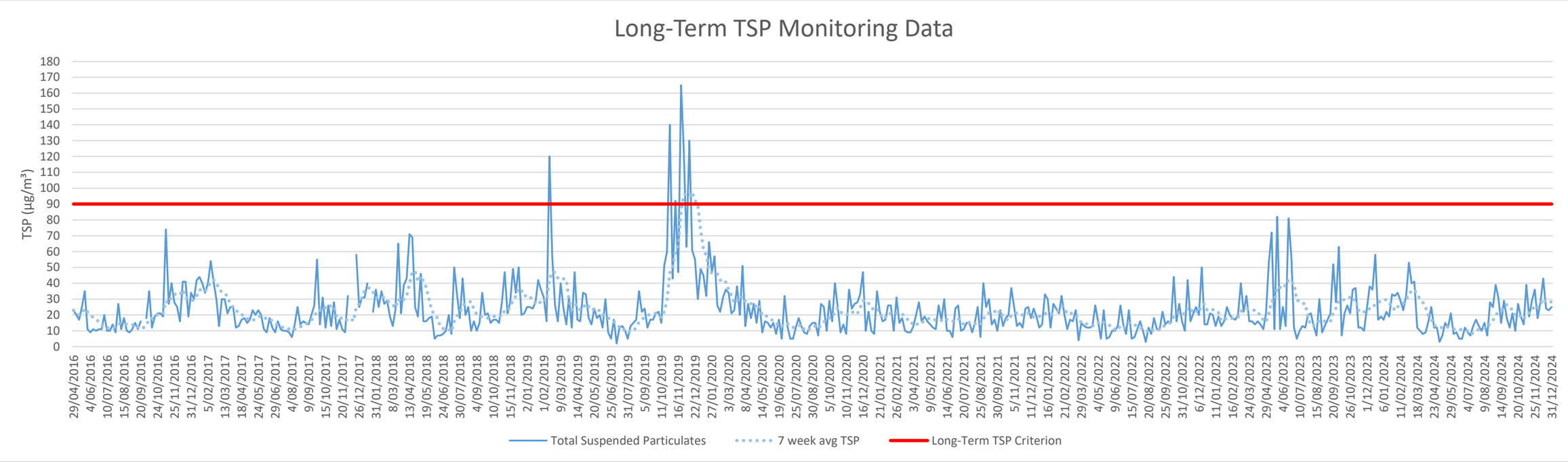


Figure 8 ***Long-term TSP monitoring trends.***

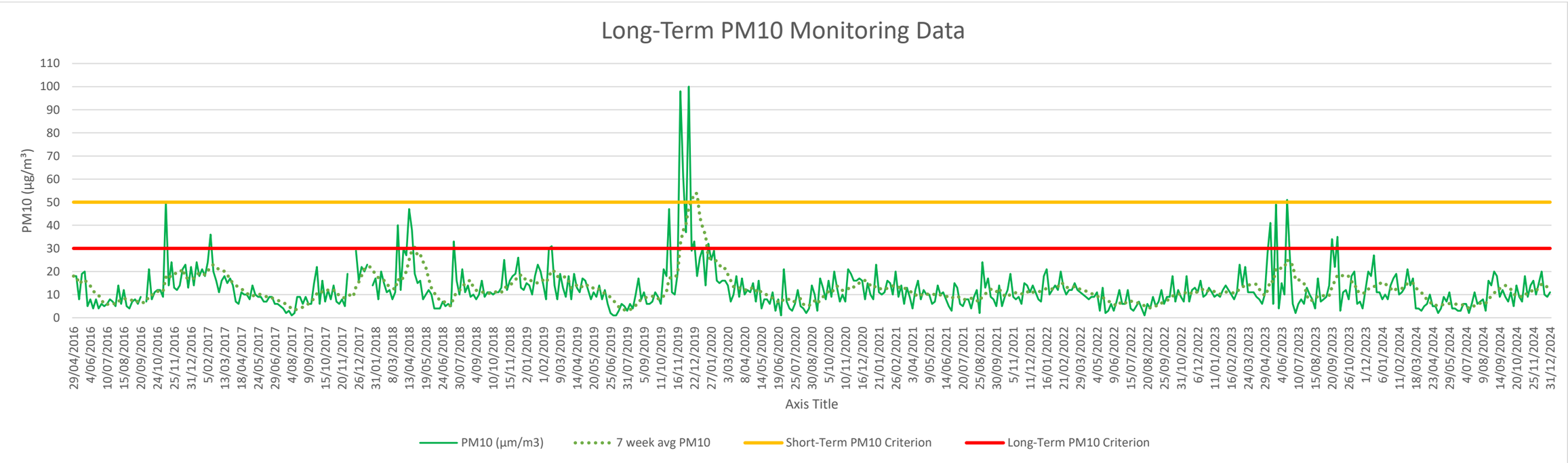


Figure 9 ***Long-term PM10 monitoring trends.***

Management Measures

The following best practice air quality control measures continued to be implemented in 2024 including:

- Disturb only the minimum area necessary for onsite activities.
- Perform regular inspections of weather conditions to identify conditions which would be unfavourable in terms of dust levels at nearest sensitive locations blowing in the direction of sensitive receptors and implement remedial measures where required.
- All trafficable areas and vehicle manoeuvring areas in or on the premises will be maintained in a condition that will minimise the emission of dust to the air, or emission from the premises of wind-blown or traffic generated dust.
- Trucks entering and leaving the premises that are carrying loads of dust generating materials will have their loads covered at all times, except during loading and unloading.
- All plant and equipment to be installed at the site to be maintained and operated in a proper and efficient condition, in accordance with manufacturer's instructions and the POEO Act.

Improvements

KEQPL will continue to monitor air quality in accordance with the conditions of the Project Approval and EPL and will review operational practices if particulate matter exceedances occur.

In response to DDG contamination events in 2023, KEQPL currently propose to undertake minor adjustments to the locations of three DDG's. EPL Variation 8 was approved on 17 February 2025 and at the time of writing, the minor relocation works are currently being scheduled with KEQPL's contractor.

6.3 Blasting

EIS Predictions

The Noise Impact Assessment (NIA) (SLR, 2012) prepared as part of the EIS, developed blasting site laws for Karuah East Quarry based on blast monitoring results from the existing Karuah Quarry. The site laws were utilised to determine limiting factors to blast design for the site in order to achieve the criteria described in **Section 6.3.2**. Based on the predicted blast results the blast emission criteria are predicted to be met without imposing any significant constraints on blast design throughout the life of the quarry. Subsequent modifications have not resulted to changes in blasting practices.

Approval Criteria

Blasting criteria for the site are provided in Schedule 3, Condition 8 of the Project Approval as outlined by **Figure 10**. Additionally, Conditions L5.1 to 5.7 of the EPL 20611 detail consistent blast limits for the project.

Blasting Criteria

8. The Applicant must ensure that blasting on the site does not cause exceedances of the criteria in Table 5.

Table 4: Blasting criteria

Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately-owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months

However, the blasting criteria in Table 5 do not apply if the Applicant has a written agreement with the relevant landowner or infrastructure provider/owner, and the Applicant has advised the Department in writing of the terms of this agreement.

Figure 10 Blasting Criteria provided by the Project Approval.

Environmental Performance Results

In 2024, eighteen (18x) blast events were completed at the site as summarised by **Table 19**. All blast output results were within the limits provided by the Project Approval and EPL.

Table 19 Blast Monitoring Results for the 2024 Reporting Period.

Date	Time	Location	Airblast Overpressure* (dB [Lin Peak])	Ground Vibration* PPV (mm/s)
22/01/2024	14:10	RL 128	105.5	0.50
14/02/2024	12:03	RL 128	n/t	n/t
11/03/2024	13:57	RL 105	112.4	0.60
16/04/2024	13:34	RL 120	112.2	0.69
03/05/2024	13:07	RL 105	104.6	1.26
22/05/2024	14:07	RL 120	112.4	0.88
27/05/2024	12:01	RL 105	106.6	0.97
06/06/2024	11:31	RL 99	108.3	0.84
19/06/2024	11:35	RL 135	111	0.50
04/07/2024	12:06	RL 128	n/t	n/t
12/07/2024	14:38	RL 120	112.7	0.66
26/07/2024	12:33	RL 105	106.8	1.30
19/08/2024	14:05	RL 105 + 128	108.6	1.23
02/09/2024	13:06	RL 105	110.5	0.77
02/10/2024	12:01	RL 105	105.9	1.17
16/10/2024	13:58	RL 105	113.5	0.63
06/11/2024	14:21	RL 120	n/t	n/t
14/11/2024	14:20	RL 120 + 128	110.7	0.37

***n/t = Not triggered**
Ground Vibration < 0.5 mm/s
Overpressure < 108 dB(L)

Management Measures

Section 3 of the approved *Blast Management Plan* outlines the blasting controls that are implemented at the site. During the 2024 reporting period, the sites Blast Notification register was subject to comprehensive review.

Improvements

KEQPL will continue to monitor blasting activities in accordance with the conditions of the Project Approval and EPL and will review operational practices if any exceedances or incidents occur, or community complaints are received.

6.4 Noise

EIS Predictions

For the KEQ MOD10 Project, a Noise Impact Assessment was conducted by EMM (EMM, 2022) in accordance with the methodology outlined in the NPfI for existing sites and the NSW Noise Policy for industry (2017). Quarry noise emissions are predicted to be below (i.e. comply with) the relevant PNTL during all periods of operations at most assessment locations. The one exception is Location H during the day and evening period, although it is noted however that operational noise emissions are predicted to be below the current consented daytime and evening noise limits at this location (44 dB and 46 dB respectively) and MOD10 did not propose to change these limits. These predicted noise levels are summarised by **Table 20**.

Table 20 MOD10 EIS Predicted Noise Levels.

Location	Period	Predicted Noise Level MOD 10 operations (LAeq,15min) (dB)	PNTL (LAeq,15min) (dB)	Existing Noise Limit (LAeq,15min) (dB)
A	Morning shoulder	<35	38	35
	Day	40	51	42
	Evening	40	43	40
B	Morning shoulder	<35	38	35
	Day	40	51	40
	Evening	40	43	40
C	Morning shoulder	<35	38	35
	Day	35	51	40
	Evening	35	43	35
D	Morning shoulder	<35	38	35
	Day	<35	51	40
	Evening	<35	43	35
E	Morning shoulder	<35	38	35
	Day	<35	51	40
	Evening	<35	43	35
F	Morning shoulder	<35	38	35
	Day	<35	48	40
	Evening	<35	43	35

Location	Period	Predicted Noise Level MOD 10 operations (LAeq,15min) (dB)	PNTL (LAeq,15min) (dB)	Existing Noise Limit (LAeq,15min) (dB)
G	Morning shoulder	<35	38	35
	Day	39	46	43
	Evening	39	43	39
H	Morning shoulder	<35	38	35
	Day	44	40	44
	Evening	46	43	46
I	Morning shoulder	<35	38	35
	Day	37	40	40
	Evening	37	40	37
J	Morning shoulder	<35	35	35
	Day	<35	40	40
	Evening	<35	35	35

Note: This predicted noise level included a moderation factor of +2 dB to account for the low frequency noise from the processing plant

Approval Criteria

Noise criteria for the site are provided in Schedule 3, Condition 3 of the Project Approval as outlined by **Figure 11**. Additionally, Conditions L4.1 to 4.5 of the EPL 20611 detail similar noise criteria.

NOTE – a minor administrative change to the EPL will be sought during the 2025 statutory licence review to reflect the KEQ MOD10 Project, however, this will not result in a change to the quantitative criteria.

Operational Noise Criteria

3. Except for the carrying out of construction works, the Applicant must ensure that the operational noise generated by the development does not exceed the criteria in Table 2 at any residence[a] on privately-owned land.

Table 2: Operational noise criteria dB

Noise Assessment Location[a]	Morning Shoulder $L_{Aeq\ (15\ min)}$	Morning Shoulder L_{Amax}	Day $L_{Aeq\ (15\ min)}$	Evening $L_{Aeq\ (15\ min)}$
A	35	52	42	40
B	35	52	40	40
G	35	52	43	39
H	35	52	44	46
I	35	52	40	37
All other residences	35	52	40	35

[a] *Noise Assessment Locations referred to in Table 2 are shown in Appendix 2.*

Noise generated by the development must be monitored and measured in accordance with the relevant procedures and modifications (including certain meteorological conditions) of the NPfI.

3A. The noise criteria in Table 2 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Figure 11 Noise Criteria provided by the Project Approval.

Environmental Performance Results

Attended noise monitoring was conducted at the nearest residential receivers surrounding the site on a quarterly basis by EMM Consulting in accordance with the Project Approval and EPL. The four monitoring reports for the 2024 reporting period are provided by **Appendix 3**.

Noise results for all residential receptors were generally within compliance limits for all morning shoulder, day and evening monitoring time periods across all four quarterly monitoring rounds. However, in the Q2 2024 monitoring round on 23 May 2024, a minor exceedance was identified.

Monitoring at Receptor G at 6:14 am during the morning shoulder, the site $LA_{1,1minute}$ (i.e. instantaneous maximum noise) was measured at 55 dB, with the direction of the noise coming from the Karuah East Quarry weighbridge. This noise exceeded the morning shoulder limit of 52 dB by 3 dB; whilst the LAeq,15minute (i.e. 15-minute average noise) remained within the compliance limits.

Therefore, the noise exceedance was assessed as being associated with truck tailgate impact noise, possibly caused by potholes on the access road following the continuous steady rainfall of approximately 20 to 30 mm of daily rainfall over the preceding week.

Upon identification of this noise source, repairs were completed to the access road later that day, and all drivers and operations staff were subject to toolbox talks at their next shift pre-start meeting, regarding appropriate travel speeds for crossing wheel washes, cattle grids, potholes, and other road defects to minimise noise emissions.

The incident was reported to NSW Planning, the EPA and surrounding landholders in accordance with the Project Approval and EPL. However, at the time of writing, no formal correspondence has been received from NSW Planning or the EPA in relation to this matter.

Management Measures and Improvements

Section 3.0 of the approved *Noise Management Plan* outlines the noise mitigation and management controls that are implemented at the site.

Following the exceedance of noise criteria, KEPQL have undertaken greater monitoring of road surface conditions following rainfall events to minimise the generation of impact noise associated with truck tailgates.

6.5 Heritage (Aboriginal Cultural Heritage & Historic Heritage)

EIS Predictions

An Aboriginal Heritage Impact Assessment was completed as part of the EIS specialist report prepared by RPS (2012). A search of the Aboriginal Heritage Information Management System (AHIMS) database revealed no listed sites inside the project area and the pedestrian survey revealed no Aboriginal cultural heritage items. No evidence of Aboriginal cultural heritage was found during the survey and no impacts were predicted.

A Due Diligence Report was completed by RPS on 17 August 2018 as part of the KEQ MOD2 Project; and by Heritage Now on 18 October 2021 as part of the KEQ MOD10 Project. These assessments confirmed that the site contains low archaeological sensitivity; with the subsequent management recommendations being outlined in Heritage Management Plan.

Approval Criteria

There are no specific performance criteria provided by the Project Approval associated with Aboriginal Cultural Heritage or Historic Heritage.

Environmental Performance Results

No additional disturbance was undertaken within the Reporting Period and therefore no heritage impacts occurred, or management issues were identified.

Management Measures and Improvements

A comprehensive review of the *Heritage Management Plan* for the MOD10 project was undertaken during the 2023 reporting period, which included consultation with Registered Aboriginal Parties, the Karuah LALC and Heritage NSW (Aboriginal Cultural Heritage and Historical Archaeology divisions) to ensure management measures are consistent with contemporary legislation and industry best practices.

This revised Heritage Management Plan was approved by NSW Planning on 12 January 2024 and will be implemented during the 2025 reporting period for the MOD10 project once construction commences.

6.6 Biodiversity

EIS Predictions

The Preferred Project Report (RPS, 2013) ecology assessment for the NSW Project Approval identified impacts to the following non-threatened vegetation communities:

- 20.38 Ha of *Spotted Gum-Grey Gum-Grey Ironbark White Mahogany Moist Sclerophyll Forest;*
- 7.31 Ha of *Smooth barked Apple-Red Bloodwood-Stringybark Dry Sclerophyll Forest*; and
- 0.4 Ha of *Grey Myrtle Dry Rainforest*.

RPS concluded that no fauna species would be materially impacted; however, one threatened flora species would be directly impacted by the removal of 243 individual clumps of *Tetratheca juncea* (Black-eyed Susan). Based on this impact (and possible indirect impacts to *Grevillea parviflora ssp. parviflora* [Small-flower Grevillea]), an EPBC Referral was conducted to the Commonwealth DCCEEW (formerly Department of Sustainability, Environment, Water, Population and Communities – SEWPAC).

The EPBC Assessment Report (ELA, 2014) considered the impact of the Preferred Project to the Matters of National Environmental Significance (MNES) and identified additional direct impacts to Commonwealth Listed threatened species, including:

- 60 individuals of *Asperula asthenes* (Trailing Woodruff); and
- 24.04 Ha of *Phascolarctos cinereus* (Koala) habitat.

The KEQ MOD2 Project impacted a further 0.25 Ha of the smooth-barked apple vegetation community and 13 individual clumps of Tetratheca juncea. The minor nature of this footprint extension was managed by altering existing offset arrangements as outlined in **Section 3.1** and **Section 3.3**.

The KEQ MOD10 Project impacted a further 7.17 Ha of native vegetation as assessed under the Bilateral Assessment process between the NSW Planning and the Commonwealth DCCEEW and utilised the NSW Biodiversity Assessment Methodology (BAM) 2020.

The assessment concluded additional impacts to the following biodiversity values which will be offset under the NSW Biodiversity Offsets Scheme (BOS):

- 6.68 Ha of *PCT 1619 - Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands*;
- 0.30 Ha of *PCT 695 - Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion*;
- 6.98 Ha of Tetratheca juncea habitat;
- 6.68 Ha of Grevillea parviflora spp. parviflora habitat;
- 6.98 Ha of Squirrel Glider habitat; and
- 2.90 Ha of Southern Myotis habitat.

Approved Criteria

There are no specific criteria associated with biodiversity management for the site; however, quarry activities are completed in accordance with the NSW Project Approval, Commonwealth EPBC Approval, and the site's Environment Management Plans, including the Biodiversity Offset Area Management Plan (BOAMP) and Landscape and Rehabilitation Management Plan (L&RMP).

Environmental Performance Results

The Biodiversity Offset Area (BOA) for the site is a 138.22 Ha parcel of land parcel comprised of three lots:

- Lot 13 DP 1024564 (part);
- Lot 14 DP 1024564; and
- Lot 5 DP 838128.

Ecological monitoring was completed by WPC in September and October 2024, with the Biodiversity Offset Area Monitoring Report attached in **Appendix 5**. Key findings from the 2024 monitoring programme include:

- Asperula asthenes, Tetratheca juncea and Grevillea parviflora subsp. parviflora populations are in good condition, though several populations have seen decreases in size since the previous monitoring event. This is possibly due to many factors including natural environmental variation, edge effect from quarry operations (MP 15, MP6) or Lantana camara infestations (MP3). Others have experienced a small increase but have overall remained relatively stable since the previous monitoring event.

- Key disturbances recorded within the KEQ BOA and Lot 12 include minor sedimentation due to overtopping of a small number of sediment fences, the occurrence of dust on foliage within close proximity to quarry operations, and the runoff of excavated rock into the BOA from the eastern boundary and western boundary along the haul road of the quarry operations.

- Weed coverage across the KEQ BOA and Lot 12 has significantly increased – management is required to reduce Lantana cover, especially within the northern portion of the site (Lot 5 and spreading down into Lot 13), adjacent to the powerline easement (particularly MP 2, MP3 and MP 4). Lantana infestations were also seen in the northern section of Lot 12.

- Maintenance required to repair and install fencing and sediment fencing.

- Minor erosion and sedimentation of a dam in Lot 12 due to runoff from the eastern boundary of the quarry.

- No feral pigs and foxes, or evidence thereof, were observed during the 2024 monitoring event, however this species was identified near the powerline easement in 2020. Despite not having been identified since, it is likely this species persists within the BOA and therefore continued control programmes be carried out.

- A total of 375 nest boxes have been installed to date across the KEQ BOA. Monitoring of nest boxes have been carried out in 2018, 2020 2022 and 2024. No further nest boxes need to be installed until further clearing of hollow bearing trees occurs. Monitoring will be required in 2026.

Management Measures

The 2024 Biodiversity Offset Area Monitoring Report (**Appendix 5**) identified a number of actions as summarised by **Table 21** and **Table 32**.

Table 21 Summary of Management Actions from the 2024 BOA Monitoring Report.

Action ID	Action Required	KEQPL Response	Status
Fencing and Access Tracks			
2024-1	Review all fencing and signage required for the BOA.	KEQPL will be completed a comprehensive review of the status of all fencing across the Biodiversity Offset Area.	**Open**
2024-2	Review all erosion and sediment controls for the BOA.	KEQPL will be completed a comprehensive review of the status of all fencing across the Biodiversity Offset Area.	**Open**

Improvements

The revised Landscape & Rehabilitation Management Plan (L&RMP) was approved on 11 February 2025; and the Biodiversity Offset Area Management Plan (BOAMP) will be finalised following receipt of Commonwealth EPBC Approval for the KEQ MOD10 Project.

Throughout 2024, KEQPL commenced the installation of permanent survey marks delineated with continuous flagging rope to mark-out internal boundaries of the BOA.

6.7 Waste Management

Approval Criteria

Waste management requirements for the site are provided in Schedule 3, Condition 42 of the Project Approval as outlined by **Figure 12**.

WASTE

42. The Applicant must:
    (a) minimise the waste generated by the development; and
    (b) ensure that the waste generated by the development is appropriately stored, handled, and disposed
    of,
    to the satisfaction of the Planning Secretary.

Figure 12 Waste Management Requirements provided by the Project Approval.

Environmental Performance Results

A licenced waste contractor removes waste from a 3 m^3 waste bin at the site. There were 50 collections during the reporting period, with capacity of the bin ranging from 50% to 95%, or a total of approximately 93 m^3 of waste being removed from site. This represents a stabilisation in the increase in waste generation compared to 106 m^3 in 2023 and 57 m^3 in 2022 which was be attributed to greater housekeeping processes being implemented in the previous reporting period.

Improvements

KEQPL will continue to monitor and review waste management processes as required.

7.0 Water Management

7.1 Water Management Overview

Surface water at Karuah East Quarry is managed in accordance with the Water Management Plan (WMP). The primary objective of water management is to remain compliant with the Project Approval and EPL; and ensure any discharges of water from the site is of a suitable quality, as far as reasonably practicable. This objective is intrinsic to erosion and sedimentation designs and controls for the quarry.

As such, the following specific objectives of this WMP have been established as part of the construction and operational phases:

- Conducting best practice land clearing procedures for all proposed disturbance areas;
- Implementation of erosion and sediment controls during construction and operation as per the Blue Book and WMP;
- Separating undisturbed runoff from disturbed runoff where possible to minimise and isolate the amount of disturbed or dirty water runoff;
- Directing sediment-laden runoff into designated sediment control dams;
- Diverting clean runoff from areas upstream of the operation into natural depressions and creeks;
- Allowing sediments to settle in sediment control dams so that the water can be re-used for onsite dust suppression, thereby maintaining dam capacities for subsequent rainfall events;
- Maintaining sediment control structures to ensure that the designed capacities are maintained for optimum settling of sediments; and
- Implementing an effective revegetation and maintenance program for the site.

The Karuah East Quarry has three sediment dams, including:

- Dam 1 - Catchment (crushing plant and product stockpiles);
- Dam 2 - Catchment (product stockpiles and office infrastructure area); and
- Dam 3 - Catchment (product stockpiles area).

The current water management system and location of dams are shown in **Figure 13.**

Karuah East Quarry

Annual Review 2024

FIGURE 13 - Water Monitoring Location

7.2 Surface Water

EIS Predictions

Surface water was assessed EIS and then updated for the Preferred Project Report (2013).

The only direct disturbance to occur to the local drainage system will be in the upper reaches of the northern most drainage line in Lot 12. The length of the channel which will be disturbed as a result of excavation in the upper reaches of the catchment with no clearly defined bed or banks. Therefore, the impact on the wider catchment as a result of disturbance to the upper reaches of this drainage line is not anticipated to be significant.

With regards to offsite discharges, a water balance model has been developed to predict the frequency and volume of discharges from the project. The water balance predicts that uncontrolled discharges will be minimal, averaging only one discharge day per year in Stage 2 (which represents approximately half of the total disturbance area) and two days in Stage 5 (at full disturbance).

Approval Criteria

Discharge criteria is provided in Condition L2.4 of the EPL and summarised in **Table 22**. These pollutants will be tested during discharge events from LDP 1, LDP 2 and LDP 3.

Table 22 EPL Discharge Monitoring Criteria for LDP 1, LDP 2, and LDP 3.

Parameter	Units of Measure	EPL Discharge Limits (100 Percentile Concentration Limit)
Oil and Grease	mg/L	5 and/or non-visible
pH	pH	6.5 – 8.5
Total Suspended Solids	mg/L	40
Turbidity	NTU	–

As detailed in Section 8.1.3 of the WMP, surface water monitoring is undertaken at the following locations:

- Dam 1 (LDP 1), Dam 2 (LDP 2), and Dam 3 (LDP 3);
- SW 1 – Existing first order drainage line upstream of the site;
- SW 2 – Existing second order drainage line downstream of the site;
- SW 3 – Existing first order drainage line downstream of Dam 2; and
- SW 4 – Existing first drainage line downstream of the quarry extraction area.

As per Section 8.1.3 of the WMP, SW 1 to 4 will be tested on a six-monthly basis (when flowing) during operations to determine ongoing compliance with the water quality performance criteria. SW2 and SW3 will be tested within 24 hours any discharge.

Environmental Performance Results (Discharge)

Discharge monitoring results for offsite water releases through the sites licenced discharge points are summarised by **Table 23**. In summary:

- 10x days of offsite discharges from Dam 1 (all of which were non-compliant);
- 47x days of offsite discharges from Dam 2 (8x of which were non-compliant); and
- 77x days of offsite discharges from Dam 3 (5x of which were non-compliant).

Table 23 Discharge Monitoring Results for LDP 1, LDP 2, and LDP 3.

Date	pH	Total Suspended Solids, TSS (mg/L)	Turbidity (NTU)	Oil and Grease	Discharge Type	Status
Dam 1 – LDP 1						
05/04/2024	7.6	500	800	NV	Uncontrolled	Non-Compliant
06/04/2024	7.2	1,200	>1,000	NV	Uncontrolled	Non-Compliant
07/04/2024	7.2	450	>1,000	NV	Uncontrolled	Non-Compliant
08/04/2024	7.2	780	>1,000	NV	Uncontrolled	Non-Compliant
21/04/2024	7.4	630	>1,000	NV	Uncontrolled	Non-Compliant
22/04/2024	7.2	1,640	>1,000	NV	Uncontrolled	Non-Compliant
22/04/2024	7.3	1,000	>1,000	NV	Uncontrolled	Non-Compliant
02/06/2024	7.5	420	>1,000	NV	Uncontrolled	Non-Compliant
03/06/2024	7.3	770	>1,000	NV	Uncontrolled	Non-Compliant
04/06/2024	7.6	350	>1,000	NV	Uncontrolled	Non-Compliant
Dam 2 – LDP 2						
16/01/2024	7.7	5	4.2	NV	Controlled	Compliant
08/02/2024	7.2	6	9.7	NV	Controlled	Compliant
09/02/2024	7.3	6	5.3	NV	Controlled	Compliant
15/02/2024	6.8	8	10	NV	Controlled	Compliant
16/02/2024	7.9	7	7.8	NV	Controlled	Compliant
05/03/2024	7.8	5	6	NV	Controlled	Compliant
18/03/2024	7.6	26	27	NV	Controlled	Compliant
25/03/2024	8.8	9	5	NV	Controlled	Non-Compliant^
05/04/2024	7.3	240	520	NV	Uncontrolled	Non-Compliant*
06/04/2024	6.8	150	320	NV	Uncontrolled	Non-Compliant*
07/04/2024	6.7	96	210	NV	Uncontrolled	Non-Compliant*
21/04/2024	6.8	280	520	NV	Uncontrolled	Non-Compliant*
22/04/2024	6.8	140	320	NV	Uncontrolled	Non-Compliant*
03/05/2024	6.9	14	55	NV	Controlled	Compliant
04/05/2024	6.8	16	50	NV	Controlled	Compliant
09/05/2024	6.8	38	45	NV	Controlled	Compliant
10/05/2024	7.3	7	17	NV	Controlled	Compliant
13/05/2024	7.1	7	13	NV	Controlled	Compliant
14/05/2024	7.1	<5	12	NV	Controlled	Compliant
20/05/2024	7.0	19	50	NV	Controlled	Compliant
21/05/2024	7.0	37	65	NV	Controlled	Compliant
22/05/2024	6.8	18	45	NV	Controlled	Compliant
23/05/2024	6.9	18	55	NV	Controlled	Compliant
02/06/2024	6.9	44	140	NV	Uncontrolled	Non-Compliant*
03/06/2024	6.8	42	110	NV	Uncontrolled	Non-Compliant*
04/06/2024	7.0	28	65	NV	Controlled	Compliant
06/06/2024	6.8	29	70	NV	Controlled	Compliant
17/06/2024	7.1	6	18	NV	Controlled	Compliant
18/06/2024	7.3	<5	13	NV	Controlled	Compliant
26/06/2024	7.1	16	38	NV	Controlled	Compliant
27/06/2024	7.0	14	38	NV	Controlled	Compliant
01/07/2024	7.1	9	26	NV	Controlled	Compliant
02/07/2024	6.9	22	29	NV	Controlled	Compliant
01/08/2024	7.1	18	28	NV	Controlled	Compliant

Date	pH	Total Suspended Solids, TSS (mg/L)	Turbidity (NTU)	Oil and Grease	Discharge Type	Status
06/08/2024	7.2	21	36	NV	Controlled	Compliant
15/08/2024	6.6	22	25	NV	Controlled	Compliant
16/08/2024	6.9	<5	6	NV	Controlled	Compliant
19/08/2024	6.9	<5	11	NV	Controlled	Compliant
26/08/2024	6.8	11	26	NV	Controlled	Compliant
26/09/2024	7.6	<5	3	NV	Controlled	Compliant
27/09/2024	7.3	36	50	NV	Controlled	Compliant
02/10/2024	7.5	29	50	NV	Controlled	Compliant
09/10/2024	6.8	27	45	NV	Controlled	Compliant
14/10/2024	7.1	6	13	NV	Controlled	Compliant
25/10/2024	7.9	12	22	NV	Controlled	Compliant
12/11/2024	7.7	14	22	NV	Controlled	Compliant
02/12/2024	7.3	25	40	NV	Controlled	Compliant
Dam 3 – LDP 3						
08/02/2024	7.2	7	8.4	NV	Controlled	Compliant
09/02/2024	7.4	5	4.8	NV	Controlled	Compliant
15/02/2024	7.5	<5	2.6	NV	Controlled	Compliant
16/02/2024	7.4	7	4.6	NV	Controlled	Compliant
04/03/2024	7.2	<5	5.6	NV	Controlled	Compliant
05/03/2024	7.3	<5	4.1	NV	Controlled	Compliant
18/03/2024	7.3	7	7	NV	Controlled	Compliant
19/03/2024	7.7	5	5.1	NV	Controlled	Compliant
28/03/2024	7.7	8	12	NV	Controlled	Compliant
29/03/2024	8.6	6	4.9	NV	Controlled	Non-compliant^
02/04/2024	8.5	<5	2.6	NV	Controlled	Compliant
03/04/2024	7.4	<5	3.7	NV	Controlled	Compliant
05/04/2024	7.3	25	36	NV	Controlled	Compliant
06/04/2024	7.1	96	**130**	NV	Uncontrolled	Non-compliant*
07/04/2024	7.0	54	**75**	NV	Uncontrolled	Non-compliant*
08/04/2024	7.2	30	**55**	NV	Controlled	Compliant
10/04/2024	7.1	22	31	NV	Controlled	Compliant
11/04/2024	7.2	17	24	NV	Controlled	Compliant
12/04/2024	7.3	16	20	NV	Controlled	Compliant
13/04/2024	7.3	8	13	NV	Controlled	Compliant
21/04/2024	7.0	18	24	NV	Controlled	Compliant
22/04/2024	7.0	10	18	NV	Controlled	Compliant
23/04/2024	7.0	10	17	NV	Controlled	Compliant
24/04/2024	7.2	6	10	NV	Controlled	Compliant
01/05/2024	7.3	12	21	NV	Controlled	Compliant
02/05/2024	7.1	18	28	NV	Controlled	Compliant
03/05/2024	7.2	10	21	NV	Controlled	Compliant
04/05/2024	7.2	8	17	NV	Controlled	Compliant
09/05/2024	6.9	38	**50**	NV	Controlled	Compliant
10/05/2024	7.2	5	12	NV	Controlled	Compliant
11/05/2024	7.0	24	40	NV	Controlled	Compliant
12/05/2024	7.2	<5	13	NV	Controlled	Compliant
13/05/2024	7.3	<5	**12**	NV	Controlled	Compliant

Date	pH	Total Suspended Solids, TSS (mg/L)	Turbidity (NTU)	Oil and Grease	Discharge Type	Status
20/05/2024	7.1	20	**50**	NV	Controlled	Compliant
21/05/2024	7.1	23	40	NV	Controlled	Compliant
22/05/2024	6.9	37	**75**	NV	Controlled	Compliant
23/05/2024	7.0	19	**55**	NV	Controlled	Compliant
24/05/2024	6.8	20	40	NV	Controlled	Compliant
02/06/2024	7.1	44	**130**	NV	Uncontrolled	Non-compliant*
03/06/2024	6.9	50	**120**	NV	Uncontrolled	Non-compliant*
04/06/2024	7.0	32	**85**	NV	Controlled	Compliant
05/06/2024	7.0	21	**60**	NV	Controlled	Compliant
06/06/2024	6.9	16	**60**	NV	Controlled	Compliant
07/06/2024	7.0	18	**80**	NV	Controlled	Compliant
17/06/2024	7.1	28	**45**	NV	Controlled	Compliant
18/06/2024	7.0	23	40	NV	Controlled	Compliant
19/06/2024	7.1	7	39	NV	Controlled	Compliant
24/06/2024	7.1	16	**60**	NV	Controlled	Compliant
25/06/2024	7.1	18	**50**	NV	Controlled	Compliant
26/06/2024	7.0	18	40	NV	Controlled	Compliant
01/07/2024	7.2	10	25	NV	Controlled	Compliant
02/07/2024	7.2	9	26	NV	Controlled	Compliant
04/07/2024	7.1	12	28	NV	Controlled	Compliant
05/07/2024	7.2	6	24	NV	Controlled	Compliant
09/07/2024	7.5	6	18	NV	Controlled	Compliant
10/07/2024	7.3	6	19	NV	Controlled	Compliant
01/08/2024	7.3	<5	8.5	NV	Controlled	Compliant
02/08/2024	7.3	<5	11	NV	Controlled	Compliant
06/08/2024	8.4	<5	5.1	NV	Controlled	Compliant
15/08/2024	8.3	<5	3.5	NV	Controlled	Compliant
16/08/2024	8.0	<5	5.5	NV	Controlled	Compliant
19/08/2024	7.5	<5	11	NV	Controlled	Compliant
26/08/2024	7.3	<5	5.4	NV	Controlled	Compliant
26/09/2024	7.2	7	9.5	NV	Controlled	Compliant
27/09/2024	7.1	32	**50**	NV	Controlled	Compliant
28/09/2024	7.1	27	40	NV	Controlled	Compliant
29/09/2024	7.5	21	29	NV	Controlled	Compliant
30/09/2024	7.6	12	21	NV	Controlled	Compliant
01/10/2024	7.6	22	36	NV	Controlled	Compliant
09/10/2024	7.2	<5	8	NV	Controlled	Compliant
10/10/2024	7.1	10	18	NV	Controlled	Compliant
14/10/2024	7.4	10	21	NV	Controlled	Compliant
15/10/2024	7.6	6	14	NV	Controlled	Compliant
12/11/2024	7.4	<5	2.7	NV	Controlled	Compliant
02/12/2024	7.2	11	14	NV	Controlled	Compliant
03/12/2024	7.7	5	6.8	NV	Controlled	Compliant
04/12/2024	7.4	6	5.1	NV	Controlled	Compliant

^Minor pH exceedances during controlled discharges.
**Discharges of sediment-laden water associated with major rainfall events.*

Environmental Performance Results (Monitoring)

Surface water monitoring results for the site are provided by **Table 24** for the first half of 2024 and **Table 25** for the second half of 2024. The results the downstream monitoring sites are generally compliant with the ANZECC Guidelines.

Table 24 Six-Monthly Surface Water Monitoring Results for H1 2024 (21 March 2024).

Parameter	Units	EPL Discharge Limits	LDP1	LDP2	LDP3	SW1	SW2	SW3	SW4
Oil and Grease	mg/L	5 and/or non-visible	Not Visible	Not Visible	Not Visible	Not flowing – unable to obtain sample.	Not Visible	Not Visible	Not flowing – unable to obtain sample.
pH	pH	6.5 – 8.5	8.1	8.6	8.7		6.9	6.6	
Total Suspended Solids	mg/L	40	370	17	<5		10	220	
Parameter	**Units**	**ANZECC Guidelines***	**LDP1**	**LDP2**	**LDP3**		**SW2**	**SW3**	
Conductivity	µS/cm	125 – 2200	638	1,210	1,090		493	396	
Total Dissolved Solids	mg/L	--	620	860	740		310	660	
Total Phosphorus	mg/L	0.025	0.3	<0.05	<0.05		<0.05	0.3	
Ammonia	mg/L	0.2	<0.02	<0.02	<0.02		0.11	<0.02	
Nitrogen (Nitrate)	mg/L	0.350	3.4	0.4	0.3		0.7	0.8	
Total Hardness (as $CaCO_3$)	mg/L	--	37	320	240		37	22	
Arsenic	mg/L	0.024	0.003	<0.001	<0.001		0.001	0.003	
Cadmium	mg/L	0.0002	0.0001	<0.0001	<0.0001		<0.0001	0.0001	
Calcium	mg/L	--	5	100	74		4	3	
Chromium	mg/L	0.001	0.017	<0.0001	<0.0001		<0.0001	0.0001	
Copper	mg/L	0.0014	0.019	0.001	<0.001		<0.001	0.021	
Lead	mg/L	0.0034	0.01	<0.001	<0.001		<0.001	<0.021	
Magnesium	mg/L	--	6.2	15	13		6.4	3.0	
Manganese	mg/L	1.9	0.65	0.03	0.013		0.18	0.65	
Nickel	mg/L	0.011	0.015	<0.001	<0.001		<0.001	0.016	
Potassium	mg/L	--	2	3	2		4	2	
Sodium	mg/L	--	99	82	110		70	58	
Vanadium	mg/L	--	0.064	0.003	<0.001		0.004	0.058	
Zinc	mg/L	0.0312	0.13	0.004	0.001		0.003	0.14	

*Key default trigger values presented in ANZECC 2000 for slightly disturbed upland rivers in NSW. Heavy metals based on hard water (120-179 mg CaCO3/L).

Table 25 Six-Monthly Surface Water Monitoring Results for H2 2024 (08 August 2024).

Parameter	Units	EPL Discharge Limits	LDP1	LDP2	LDP3	SW1	SW2	SW3	SW4
Oil and Grease	mg/L	5 and/or non-visible	Not Visible	Not Visible	Not Visible	Not flowing – unable to obtain sample.	Not Visible	Not Visible	Not Visible
pH	pH	6.5 – 8.5	7.6	7.7	8.8		6.0	6.6	6.2
Total Suspended Solids	mg/L	40	810	48	<5		10	130	36
Parameter	**Units**	**ANZECC Guidelines***	**LDP1**	**LDP2**	**LDP3**		**SW2**	**SW3**	**SW4**
Conductivity	µS/cm	125 – 2200	380	4,230	657		904	404	1,010
Total Dissolved Solids	mg/L	--	1,340	2,000	440		680	460	710
Total Phosphorus	mg/L	0.025	0.4	<0.05	<0.05		<0.05	0.07	<0.05
Ammonia	mg/L	0.2	<0.02	0.32	<0.02		<0.02	<0.02	<0.02
Nitrogen (Nitrate)	mg/L	0.350	4.7	1.7	0.02		0.01	0.074	0.11
Total Hardness (as $CaCO_3$)	mg/L	--	17	1,400	140		120	81	110
Arsenic	mg/L	0.024	0.004	<0.001	<0.001		<0.001	0.001	<0.001
Cadmium	mg/L	0.0002	0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001
Calcium	mg/L	--	2	510	46		12	23	10
Chromium	mg/L	0.001	0.035	0.001	<0.001		<0.001	0.007	0.002
Copper	mg/L	0.0014	0.047	0.002	0.001		0.001	0.008	0.002
Lead	mg/L	0.0034	0.027	<0.001	<0.001		<0.001	0.005	0.002
Magnesium	mg/L	--	3	18	5.8		23	5.9	20
Manganese	mg/L	1.9	1.4	0.51	0.006		0.26	0.22	0.10
Nickel	mg/L	0.011	0.031	0.002	<0.001		0.001	0.006	0.002
Potassium	mg/L	--	1	3	1		2	1	3
Sodium	mg/L	--	79	92	68		110	31	140
Vanadium	mg/L	--	0.011	0.006	0.001		0.003	0.022	0.009
Zinc	mg/L	0.0312	0.026	0.008	0.002		0.013	0.042	0.012

*Key default trigger values presented in ANZECC 2000 for slightly disturbed upland rivers in NSW. Heavy metals based on hard water (120-179 mg CaCO3/L).

Management Measures and Improvements

KEQPL implements management measures as outlined by the approved WMP; and aims to implement continual improvement processes. As such, in 2023 KEQPL engaged VGT to complete a review of the site surface water management system to reduce the potential for non-compliant off-site discharges. In 2024, KEQPL continued to progress detailed design work in accordance with the identified improvement opportunities; and will progress securing the relevant approvals in 2025.

Additionally, KEQPL implemented improved processes, including fieldsheets and checklists for controlled discharges to mitigate against minor exceedances of performance criteria, such as pH, TSS and Oil & Grease, that occurred on 25 March 2024 from LDP2 and 29 March 2024 from LDP3.

7.3 Groundwater

EIS Predictions and Approval Criteria

The EIS assessment indicted that the extraction area did not intercept any groundwater aquifers and therefore any impacts to groundwater were considered unlikely. As such, there are not approval criteria provided by the Project Approval or EPL.

However, to confirm this and identify any long-term groundwater level and quality trends, the WMP provides quarterly groundwater level and 6-monthly quality monitoring.

Groundwater is monitored at the existing groundwater monitoring bores at BH205, BH207, BH208, and BH303, as locationally illustrated in **Figure 13**. BH207 was relocated in September 2016 and BH205 was relocated on 11 March 2017. Both of these piezometers were relocated within 30 m to their original locations to allow construction to progress.

Environmental Performance Results

Table 26 shows a comparison of groundwater levels since 2017. All groundwater locations were monitored four times during 2024 with a requirement for quarterly monitoring of groundwater levels as per the WMP.

As evident, water levels have remained relatively consistent at BH208 and BH303 since monitoring commenced; however, BH205 and BH207 show a consistent increase followed by a stabilisation in water level in recent years.

Table 27 shows a comparison of groundwater quality since 2017. Sampling of groundwater monitoring locations occurred on 08 March, 28 June, 12 September and 19 December 2024.

2024 results are comparable to results from previous years. TDS levels continued to be highly variable across the years. Average Electrical Conductivity (EC) across the four monitoring locations was comparable to the 2023 average EC levels.

Management Measures and Improvements

Groundwater monitoring results are generally consistent with previous years and therefore no management measures are considered to be necessary. However, on 12 September 2024 data loggers were installed to provide additional data regarding seasonal trends.

As part of the KEQ MOD10 project, a drilling of replacement borehole (BH502) was completed in August 2024 to facilitate the future decommissioning of BH207 ahead of construction, subject to approval of the revised WMP by NSW Planning.

Table 26 Groundwater Level since 2017

Month	Groundwater level (metres below ground level)				
	BH205	BH207	BH208	BH303	BH502
Apr-2017	25.3	9.4	20.0	30.7	–
Oct-2017	22.9	8.9	19.9	30.6	–
Jan-2018	21.9	9.1	20.3	30.7	–
Apr-2018	21.7	9.2	20.5	30.8	–
Jul-2018	20.5	8.9	20.5	30.9	–
Oct-2018	20.4	9.3	19.9	30.8	–
Jan-2019	20.1	9.2	20.4	21.0	–
Apr-2019	20.3	9.2	20.5	30.6	–
Jul-2019	19.7	9.1	20.6	31.1	–
Oct-2019	18.6	8.2	20.6	30.7	–
Jan-2020	20.0	9.3	20.7	31.2	–
Apr-2020	18.4	8.3	20.6	30.4	–
Jul-2020	18.2	8.3	20.8	31.2	–
Oct-2020	16.7	7.7	20.7	30.8	–
Jan-2021	18.1	8.5	20.8	31.4	–
Apr-2021	17.5	7.4	20.7	30.9	–
Jun-2021	18.2	8.3	20.7	31.2	–
Oct-2021	16.7	7.4	20.5	30.7	–
Jan-2022	17.4	7.9	20.7	31.0	–
Apr-2022	17.2	7.7	*	31.0	–
Jul-2022	16.8	7.4	*	30.7	–
Oct-2022	15.8	6.9	*	30.2	–
Jan-2023	16.6	7.4	*	30.0	–
Apr-2023	15.7	7.1	20.2	30.1	–
Jul-2023	16.9	7.1	20.2	30.2	–
Dec-2023	16.4	7.6	20.5	30.5	–
Jan-2024	15.8	7.3	19.8	30.4	–
Apr-2024	15.6	6.4	19.8	30.5	–
Jul-2024	15.8	6.6	19.5	30.4	–
Dec-2024	16.8	7.0	19.2	30.3	23.3

*No data recorded due to insufficient water levels.

Table 27 Average Groundwater Quality Results for Key Parameters

Year	Monitoring Location	pH	TDS (mg/L)	EC (µS/cm)	Number of Samples
2017	BH 205	8.7	1200	2300	2
	BH 207	7.2	1800	3600	2
	BH 208	6.6	1900	3500	2
	BH 303	6.9	1175	2350	2
2018	BH 205	8.8	1150	2500	2
	BH 207	7.2	1020	1940	2
	BH 208	7.1	3000	3000	1
	BH 303	7.5	1250	2550	2
2019	BH 205	8.3	1734	2432	2
	BH 207	6.9	1579	2527	2
	BH 208	6.9	*	2505	1
	BH 303	6.2	1557	2404	2
2020	BH 205	7.1	1460	2735	2
	BH 207	7.0	1548	2865	2
	BH 208	*	*	*	0
	BH 303	5.9	1625	2985	2
2021	BH 205	6.8	1869	3350	2
	BH 207	6.5	1663	3070	2
	BH 208	*	*	*	0
	BH 303	5.8	1674	2910	2
2022	BH 205	6.3	2740	5020	2
	BH 207	6.6	1889	3465	2
	BH 208	*	*	*	0
	BH 303	6.0	1518	2745	2
2023	BH 205	6.2	2796	4845	2
	BH 207	6.4	2164	3430	2
	BH 208	6.5	2191	3745	2
	BH 303	5.7	1843	3010	2
2024	BH 205	6.0	2833	3730	4
	BH 207	6.3	2065	3525	4
	BH 208	6.4	2515	3725	4
	BH 303	5.9	1840	3768	4

*No data recorded due to insufficient water levels.

7.4 Other Water Management Matters

Water Licencing

KEQPL's surface water system has been designed to remain within Harvestable Rights provisions and therefore no surface water licences are required. Similarly, KEQPL holds no groundwater extraction licences.

Salinity Trading

KEQPL does not participate in any salinity trading schemes.

Compensatory Water Supply

KEQPL has not impacted any neighbouring landholders' water supply schemes requiring the provision of compensatory water supply.

8.0 Rehabilitation

In 2024, there have been no opportunities to establish rehabilitation at the quarry site in its current form as main extraction area is yet to reach terminal bench widths and extraction depth is yet to sufficiently progress to enable additional access roadways to become redundant. A summary of rehabilitation details is provided by **Table 28** and **Table 29** below.

Future rehabilitation activities will be undertaken in due course once available, as outlined by the approved Landscape and Rehabilitation Management Plan (L&RMP), with planned activities for the 2025 reporting period summarised by **Table 30**.

Table 28 Summary of Rehabilitation Performance During the 2024 Reporting Period.

Rehabilitation Performance Details	KEQ Site Comments
Extent of the operations and rehabilitation at completion of the reporting period.	No rehabilitation completed.
Agreed post-rehabilitation land-use.	Final land-use is outlined within the L&RMP. The vegetation at closure will be native woodland consistent with the surrounding bushland.
Key rehabilitation performance indicators.	No rehabilitation completed.
Renovation or removal of buildings.	No rehabilitation completed.
Any other Rehabilitation undertaken including: ▪ Exploration activities; ▪ Infrastructure; ▪ Dams; and ▪ The installation or maintenance of fences, bunds and any other works.	No rehabilitation completed.
Rehabilitation sign-off status of completed areas against the land-use objectives and completion criteria.	No rehabilitation completed.
Variations to activities undertaken to those proposed (including why there were variations and whether the Resources Regulator was notified)	No rehabilitation completed.
Outcomes of trials, research projects and other initiatives.	No rehabilitation completed.
Key issues that may affect successful rehabilitation.	No rehabilitation completed.

Table 29 Disturbance and Rehabilitation Status.

Item	Quarry Area Type	Previous 2023 Reporting Period [actual] (Ha)	Current 2024 Reporting Period [actual] (Ha)	Next 2025 Reporting Period [forecast] (Ha)
A	Total Quarry Footprint	29.35	29.35	40.18*
B	Total Active Disturbance	29.35	29.35	40.18*
C	Land Being Prepared for Rehabilitation	0	0	0
D	Land Under Active Rehabilitation	0	0	0
E	Completed Rehabilitation	0	0	0

* Increased disturbance area associated with the expected commencement of the MOD10 project.

Table 30 Actions for the Next 2025 Reporting Period.

Action	KEQ Site Comment
Describe the steps to be undertaken to progress agreement during next reporting period, where final rehabilitation outcomes have not yet been agreed between stakeholders.	There is no planned additional rehabilitation at the site in the next Annual Review period.
Outline proposed rehabilitation trials, research projects and other initiatives to be undertaken during next reporting period.	There are no additional rehabilitation trials during the next Annual Review period.
Summary of rehabilitation activities proposed for next report period.	There is no planned additional rehabilitation at the site in the next Annual Review period. Karuah East Quarry continues to assess opportunities for progressive rehabilitation throughout quarry planning.

9.0 Community

9.1 Community Engagement

A Community Consultative Committee (CCC) was formed for the Karuah East Quarry to undertake community engagement activities in accordance with Schedule 5, Condition 6 of the Project Approval as summarised by **Figure 14**.

Community Consultative Committee

6. The Applicant must establish and operate a Community Consultative Committee (CCC) for the development. The CCC must:
   (a) be established and operated in general accordance with the *Community Consultative Committees Guidelines for State Significant Projects* (Department of Planning and Environment, 2016); and
   (b) be established prior to the commencement of construction activities, to the satisfaction of the Planning Secretary.

   Notes:
   - *The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent.*
   - *In accordance with the guideline, the Committee should comprise an independent chair and appropriate representation from the Applicant, Council, recognised environmental groups and the local community.*

Figure 14 Community Consultative Committee requirements from the Project Approval.

In 2024, the CCC was called to meet twice on **25 March 2024** and **09 September 2024**; and consisted of the following members:

- 1x independent chair (Michael Ulph, GHD Technical Director – Communications and Stakeholder Engagement)
- 6x local community members (with an additional 2x guest community members);
- 3x stakeholder groups representatives from the North Arm Cove Residents Association, Port Stephens Shellfish Program and the Karuah LALC;
- 1x council representative from MidCoast Council; and
- 3x company representatives from KEQPL.

Key items discussed during the CCC meetings include project approvals and current operations, environmental management performance, community complaints and associated responses.

9.2 Community Contributions

The Karuah East Quarry contributes to supporting the local economy through parent company, Hunter Quarries Pty Ltd (HQPL). In 2024 HQPL supported the following organisations:

- Karuah Pearls Netball Club;
- Karuah Roos Rugby League Football Club;
- Karuah & District Tennis Club;
- North Arm Cove Community Association;
- Victoria Hotel Bullarama;
- Ringwood Motorsport Park;
- Bulahdelah Men's Shed;
- Rotary Clubs of Maitland;
- Stroud Show;
- Karuah Oyster & Timber Festival; and
- Karuah RSL.

9.3 Community Complaints

Members of the community are encouraged to report any issues that are identified associated with our operations via the dedicated **Community Call Line** on **1800 329 161**. The Environment & Development Manager reviews, investigates, and reports all complaints received in accordance with the Project Approval, EPL, and the site's Environmental Management Strategy.

The Community Call Line was advertised by:

- Signage at the entrance to the quarry premises;
- Inclusion of the Community Call Line in prominent locations on the Hunter Quarries' website; and
- Inclusion of the Community Call Line in communications with the CCC.

In 2024, no complaints were received or reported to KEQPL.

This represents a significant decrease in complaints compared to previous years with an annual average of 2.1 complaints per year as outlined by **Table 31.**

Table 31 Community Complaints 2016-2024.

Year	Total Received	Complaint Category						Comments
		Air Quality	Blasting	Noise	Transport	Water	Other	
2016	1	–	–	–	1	–	–	–
2017	3	1*	–	2*	–	1	–	*Combined noise and air quality (dust) complaint.
2018	2	–	1	1	–	–		–
2019	2	–	1	–	–	–	1^	^property access
2020	1	–	1	–	–	–	–	–
2021	1	–	–	1	–	–	–	–
2022	2	1	–	–	–	1	–	–
2023	5	–	3	–	2	–	–	–
2024	0	–	–	–	–	–	–	–

10.0 Independent Environment Audit

In accordance with Schedule 5, Condition 9 of the Project Approval, KEQPL has commissioned an Independent Environment Audit (IEA) every three years as summarised by **Figure 15**.

INDEPENDENT ENVIRONMENTAL AUDIT

9. Within 12 months of the commencement of development on the site, and every 3 years thereafter, unless the Planning Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
   (a) be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Planning Secretary;
   (b) include consultation with the relevant agencies;
   (c) assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent and any relevant EPL and/or Water Licence (including any assessment, plan or program required under these approvals);
   (d) review the adequacy of any approved strategy, plan or program required under these approvals; and
   (e) recommend measures or actions to improve the environmental performance of the development, and/or any assessment, plan or program required under these approvals.

   Note: This audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Planning Secretary.

10. Within three months of commencing an Independent Environmental Audit, or within another timeframe agreed by the Planning Secretary, the Applicant must submit a copy of the audit report to the Planning Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Planning Secretary.

Figure 15 Independent Environmental Audit requirements from the Project Approval.

The first IEA was completed in July 2017 by EMM Consulting and in October 2020, Hansen Bailey completed the second IEA.

In October 2023, ERM conducted the third IEA of the Karuah East Quarry; which included the following key documents:

- Project Approval, MP09_0175 (as modified);
- Environment Protection Licence, EPL 20611; and
- Karuah East Quarry's Environmental Management Plans.

The non-compliances identified in the 2023 IEA were generally minor in nature and focused on the regular revision of Environmental Management Plans, non-compliant water discharges and various other administrative matters.

All actions have been resolved throughout 2024, as outlined in **Appendix 4**.

11.0 Incidents & Non-Compliances During the Reporting Period

During the 2024 reporting period, six (6) exceedances of performance criteria occurred, relating to surface water discharges, noise and air quality as summarised below.

- **05 to 08 April 2024 – Discharges of sediment-laden water following major rainfall event**

Uncontrolled discharges of sediment-laden water to Yalimbah and Bulga Creeks from Friday 5 April to Monday 8 April following the receipt of 200.8 mm of rainfall over five days. This rainfall event exceeded the 95th percentile 5x day rainfall depth of 90.6 mm; which the site's sediment dams are designed to withstand in accordance with Landcom's Blue Book.

During the event the PIRMP was enacted through reporting to regulatory authorities, the KEQPL executive and the local community. Formal incident reports were subsequently submitted to NSW Planning and the NSW EPA.

- **21 to 23 April 2024 – Discharges of sediment-laden water following major rainfall event**

Uncontrolled discharges of sediment-laden water to Yalimbah and Bulga Creeks from Sunday 21 April to Tuesday 23 April following the receipt of 97.4 mm of rainfall over approximately 36 hours. This rainfall event exceeded the 95th percentile 5x day rainfall depth of 90.6 mm; which the site's sediment dams are designed to withstand in accordance with Landcom's Blue Book.

During the event the PIRMP was enacted through reporting to regulatory authorities, the KEQPL executive and the local community. Formal incident reports were subsequently submitted to NSW Planning and the NSW EPA.

- **25 March & 29 March 2024 – Minor exceedances of pH during controlled discharge events**

Minor exceedances of pH were identified following controlled discharge events, including a pH of 8.8 at LDP2 on 25 March and 8.6 at LDP3 on 29 March 2024. KEQPL has since implemented improved processes, including checklists and fieldsheets, to ensure water criteria parameters for pH, TSS, and Oil & Grease, are compliant with the EPL criteria prior to commencing controlled discharges. This has since prevented recurrence.

- **23 May 2024 – Exceedance of the instantaneous noise limit during the morning shoulder**

A minor exceedance of the noise criteria during the morning shoulder at Location G (Halloran Road, North Arm Cove) was measured, with the site $LA_{1,1\ minute}$ being observed at 55 dB, compared to the compliance limit of 52 dB (i.e. an instantaneous maximum noise exceedance of 3 dB). This was assessed as being attributable to truck impact and/or tailgate noise, possibly caused by potholes on the quarry access road. It was noted at 240 degrees (magnetic) from the measurement location, which is in the general direction of the KEQ weighbridge / access road to Blue Rock Close.

The potholes occurred due to the consistent 20 to 30 mm of daily rainfall over the preceding week. These damages were repaired later in the day (23 May 2024), and truck drivers and operational staff were subject to toolbox talks regarding driving at appropriate speeds through noise-sensitive features, such as the wheel wash, cattle grids, potholes and/or other road defects, at pre-start meetings the following morning.

The exceedance was reported to NSW Planning, the NSW EPA, and surrounding landholders in accordance with the relevant conditions of the Consent and EPL. No further formal correspondence from either agency has been received.

- **02 to 04 June 2024 – Discharges of sediment-laden water following major rainfall event**

Uncontrolled discharges of sediment-laden water to Yalimbah and Bulga Creeks from Sunday 02 June to Tuesday 04 June following the receipt of 91.6 mm of rainfall over approximately 36 hours. This rainfall event exceeded the 95th percentile 5x day rainfall depth of 90.6 mm; which the site's sediment dams are designed to withstand in accordance with Landcom's Blue Book.

During the event the PIRMP was enacted through reporting to regulatory authorities, the KEQPL executive and the local community. Formal incident reports were subsequently submitted to NSW Planning and the NSW EPA.

- **October 2024 – Exceedance of depositional dust criteria at DDG 4**

An anomalous exceedance was recorded at DDG4 during the October 2024 monitoring period which was subsequently reported to NSW Planning, the NSW EPA and surrounding landholders in accordance with the relevant conditions of the Project Approval and EPL. NSW Planning subsequently determined to record a breach of the Project Approval on 11 December 2024.

12.0 Activities to be Completed in the Next Reporting Period

A consolidated summary of proposed actions to be completed during the 2025 reporting period is provided by **Table 32**.

Table 32 Summary of Proposed Actions in the Next 2025 Reporting Period.

Action ID	Action	Timeline
	2023 Annual Review	
2023-1	Submit EPL Variation for updated activities for the KEQ MOD10 Project, pending approval of the Water Management Plan by NSW Planning.	EPL Variation to be approved prior to the commencement of construction.
2023-2	Undertake comprehensive review and update of the following Management Plans for the KEQ MOD10 Project and 2023 KEQ IEA.	Approval Management Plan updates for the KEQ MOD10 Project prior to the commencement of construction.
	C. Biodiversity Offset Area Management Plan.	Update pending Commonwealth Approval for MOD10.
	D. Biodiversity Offset Strategy.	Update pending Commonwealth Approval for MOD10.
	I. Water Management Plan (including effectiveness of WMP and TARP for surface water management to minimise exceedances of discharge limits).	Pending approval by NSW Planning.
2023-3	Air Quality: Submit EPL Variation (in conjunction with HQPL) to undertake minor relocation of three depositional dust gauges to minimise risk of contamination with organic as far as reasonably practicable.	The EPL Variation was approved on 17 February 2025 and at the time of writing, the relocation works are currently being scheduled.
2023-4	Surface Water Management: Progress with detailed design of surface water improvement opportunities identified by VGT (2023); and review appropriate approval pathways.	KEQPL will progress securing necessary approvals in 2025.
2023-6	Fencing: **C.** Install fauna fencing along the western boundary of Lot 13 adjoining the KEQ site.	Actions to be progressed during the 2024 reporting period.
2023-7	Erosion and Sediment Control: Repair sites of surface erosion along the eastern interface of the approved KEQ disturbance boundary and Lot 13.	Action to be completed in conjunction with fauna fencing installation (**Action #2023-6C)**.
2023-8	Weed Control: Determine appropriate lantana control programme.	KEQPL are continuing to review appropriate resourcing to undertake the programme.
2023-9	Pest Control: Undertake 2-yearly vertebrate pest monitoring.	KEQPL are continuing to review appropriate monitoring systems.
	2024 Annual Review	
2024-1	KEQPL will be complete a comprehensive review of the status of all fencing across the Biodiversity Offset Area.	KEQPL will complete the review by 31 December 2025.
2024-2	KEQPL will be complete a comprehensive review of the status of all fencing across the Biodiversity Offset Area.	KEQPL will complete the review by 31 December 2025.
2024-3	KEQPL to complete the 5-yearly statutory review of the site's EPL and include updating the administrative references to the KEQ MOD10 Project.	KEQPL will provide a submission by 02 April 2025.

Appendix 1 – NSW Planning Correspondence

NSW Planning Response to KEQ Annual Review 2023

NSW Planning ref: MP09_0175-PA-39

Scott Ellerton
Environment and Development Manager
KARUAH EAST QUARRY PTY LIMITED
Worimi Country

04/10/2024

Sent via the Major Projects Portal only

Subject: Karuah East Quarry Project - 2023 Annual Review

Dear Mr Ellerton

I refer to the Annual Review for the period 1 January 2023 to 31 December 2023, submitted as required by Schedule 5, Condition 4 of project approval MP09_0175 as modified (the approval) to the NSW Department of Planning, Housing and Infrastructure (NSW Planning) on 2 April 2024.

NSW Planning has reviewed the Annual Review and considers it to generally satisfy the reporting requirements of the approval and the NSW Planning Annual Review Guideline (October 2015). I note that a copy of the 2023 Annual Review is publicly available on the company's website.

For future Annual Reviews, under the provisions of Schedule 2, Condition 3 of the approval, please include the following information:

1. Status update for all actions listed in Table 34 *Summary of Proposed Actions in the Next Reporting Period*

Please note that the NSW Planning's acceptance of this Annual Review is not an endorsement of the compliance status of the project.

Should you wish to discuss the matter further, please contact Jennifer Sage, Senior Compliance Officer on 0400 245 170 or email compliance@planning.nsw.gov.au

Yours sincerely

Heidi Watters
Team Leader
Compliance

As nominee of the Planning Secretary

Appendix 2 – Transport Monitoring Reports

KEQ Transport Monitoring Report – H1 2024

KEQ Transport Monitoring Report – H2 2024

Karuah East Quarry

Transport Monitoring Data - H1 2024

Project Approval (MP09-0175)

Schedule 3, Condition 23

Monitoring of Product Transport

The Proponent must keep accurate records of all laden truck movements to and from the site (including time of arrival and dispatch) and publish a summary of records on its website every 6 months and in the Annual Review.

Calendar Date	DAILY TOTAL	Hourly Truck Movements																	Manual Sale
		5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to 12	12 to 13	13 to 14	14 to 15	15 to 16	16 to 17	17 to 18	18 to 19	19 to 20	20 to 21	21 to 22	
1/01/2024	-																		
2/01/2024	-																		
3/01/2024	-																		
4/01/2024	-																		
5/01/2024	-																		
6/01/2024	-																		
7/01/2024	-																		
8/01/2024	93		8	12	12	10	10	13	9	5	11	3							
9/01/2024	135		6	17	14	19	16	17	15	10	12	9							
10/01/2024	185		12	20	23	16	26	23	13	17	22	12	1						
11/01/2024	185		15	23	22	19	21	20	12	19	21	9	4						
12/01/2024	196		19	25	25	25	16	22	17	15	18	8	3						3
13/01/2024	81		16	11	20	15	12	7											
14/01/2024	-																		
15/01/2024	211		16	20	21	20	26	25	16	22	24	17	2						2
16/01/2024	233		16	26	26	28	21	28	16	23	26	19	4						
17/01/2024	289		20	28	30	32	29	32	34	19	33	22	5	5					
18/01/2024	198		10	25	20	24	28	22	25	20	14	9	1						
19/01/2024	162		20	12	12	18	16	22	17	13	19	13							
20/01/2024	61		14	7	12	11	12	5											
21/01/2024	-																		
22/01/2024	208		17	25	16	29	16	29	13	18	25	13	1						6
23/01/2024	238		19	27	25	27	28	28	25	24	24	10	1						
24/01/2024	211		24	21	19	29	23	22	20	17	19	15	2						
25/01/2024	166		24	19	20	17	19	23	7	17	14	6							
26/01/2024	-																		
27/01/2024	-																		
28/01/2024	-																		
29/01/2024	204		26	14	19	26	22	21	17	19	28	11	1						
30/01/2024	232		25	17	29	25	24	29	18	18	33	14							
31/01/2024	245		25	17	30	22	21	33	22	27	30	18							
1/02/2024	199		18	20	14	29	21	20	25	16	24	11	1						
2/02/2024	190		22	15	15	22	21	23	15	20	21	14	2						
3/02/2024	27		7	5	5	5	3	2											
4/02/2024	-																		
5/02/2024	202		21	16	24	22	26	20	25	24	15	8	1						
6/02/2024	145		11	16	17	20	10	21	14	12	17	7							
7/02/2024	51		5	9	2	7	7	3	4	8	4	2							
8/02/2024	71		8	1	9	10	6	8	8	6	7	6	2						
9/02/2024	105		14	10	7	18	10	12	11	10	4	8	1						
10/02/2024	12		4	1	2	3	2												
11/02/2024	-																		
12/02/2024	174		18	18	18	21	17	18	16	14	15	18	1						
13/02/2024	155		19	9	21	22	17	16	15	11	18	7							
14/02/2024	160		22	5	20	15	17	15	14	11	26	14	1						
15/02/2024	112		10	12	13	13	16	10	13	10	8	6	1						
16/02/2024	81		8	7	12	10	13	11	6	8	4	2							
17/02/2024	19		4	4	5	1	2	3											
18/02/2024	-																		
19/02/2024	113		14	8	14	13	8	19	14	10	10	3							
20/02/2024	69		11	7	10	6	11	5	5	7	4	3							
21/02/2024	112		17	5	18	11	13	12	10	9	9	8							
22/02/2024	108		15	14	14	14	10	6	7	10	6	12							
23/02/2024	72		11	6	8	10	6	9	5	8	6	3							
24/02/2024	12		4	1	2	1	2	2											
25/02/2024	-																		
26/02/2024	102		13	8	10	10	12	8	15	6	14	5	1						
27/02/2024	92		5	13	4	15	7	10	8	9	15	4	2						
28/02/2024	88		9	10	14	12	12	5	8	5	5	7	1						
29/02/2024	111		10	10	10	16	13	12	10	13	12	3	2						
1/03/2024	125		11	8	19	11	18	13	18	12	11	4							
2/03/2024	28		6	4	5	6	2	5											
3/03/2024	-																		
4/03/2024	176		14	20	16	21	18	22	20	14	16	12	3						
5/03/2024	191		10	15	21	26	23	21	25	12	26	12							
6/03/2024	175		17	13	22	20	20	22	14	23	16	7	1						
7/03/2024	192		17	22	17	17	20	20	24	15	18	18	4						
8/03/2024	160		14	12	14	15	14	22	20	12	17	17	3						
9/03/2024	9		1	3	1	2	1	1											
10/03/2024	-																		
11/03/2024	141		19	9	16	19	10	19	9	15	14	9	2						
12/03/2024	162		22	13	15	16	22	18	11	20	17	8							
13/03/2024	168		15	16	15	19	14	20	16	20	17	11	5						
14/03/2024	220		15	19	27	21	24	22	24	27	22	17	2						
15/03/2024	112		16	11	15	13	9	11	11	12	8	5	1						
16/03/2024	55		10	9	14	8	9	5											
17/03/2024	-																		
18/03/2024	109		9	10	11	11	12	18	12	14	6	6							
19/03/2024	115		18	8	12	16	15	14	12	10	8	1	1						
20/03/2024	117		14	10	17	12	16	13	13	7	12	3							
21/03/2024	66		7	8	6	6	6	8	7	3	8	5	2						
22/03/2024	90		11	15	8	13	5	16	11	3	6	2							
23/03/2024	14		3	5	2	2	1	1											

24/03/2024	-											
25/03/2024	116	10	12	12	10	12	17	7	14	11	11	
26/03/2024	140	13	15	11	17	15	17	15	14	14	8	1
27/03/2024	151	20	14	12	25	13	18	11	20	5	12	1
28/03/2024	109	10	17	11	17	13	15	12	3	8	3	
29/03/2024	-											
30/03/2024	-											
31/03/2024	-											
1/04/2024	-											
2/04/2024	133	10	18	11	17	19	9	14	11	17	6	1
3/04/2024	153	8	23	15	19	12	22	14	13	18	8	1
4/04/2024	114	17	13	22	8	16	9	11	7	7	4	
5/04/2024	78	10	10	13	8	11	10	5	6	3	2	
6/04/2024	1					1						
7/04/2024	-											
8/04/2024	153	11	17	18	16	17	18	14	16	15	10	1
9/04/2024	192	18	21	18	23	20	22	22	19	20	9	
10/04/2024	147	12	17	16	18	19	17	13	13	15	7	
11/04/2024	169	13	19	22	20	17	17	16	17	13	14	1
12/04/2024	169	14	21	21	19	19	19	15	14	20	6	1
13/04/2024	26	3	10	2	8	3						
14/04/2024	-											
15/04/2024	136	14	13	18	16	15	18	16	10	10	6	
16/04/2024	142	14	11	17	12	18	15	19	7	20	9	
17/04/2024	198	22	13	27	17	24	20	21	17	18	14	5
18/04/2024	191	13	19	24	17	26	18	21	18	15	19	1
19/04/2024	119	11	15	16	13	16	12	8	7	15	5	1
20/04/2024	25	2	4	3	6	6	4					
21/04/2024	-											
22/04/2024	130	11	19	19	13	9	15	11	10	12	7	4
23/04/2024	143	9	17	14	11	15	20	12	12	15	16	2
24/04/2024	148	16	13	15	13	18	13	15	13	22	10	
25/04/2024	-											
26/04/2024	43	5	4	15	3	7	4	2	3			
27/04/2024	-											
28/04/2024	-											
29/04/2024	182	21	20	18	32	19	17	15	15	17	8	
30/04/2024	123	16	19	11	11	18	8	11	14	9	6	
1/05/2024	98	7	17	12	15	10	9	12	6	6	4	
2/05/2024	82	7	9	9	10	8	11	9	2	15	1	1
3/05/2024	90	3	12	16	11	10	13	8	12	3	2	
4/05/2024	1				1							
5/05/2024	-											
6/05/2024	55	6	12	5	8	9	7	4	2	1	1	
7/05/2024	90	3	13	10	13	6	11	7	10	9	7	1
8/05/2024	111	3	20	8	17	7	17	12	7	15	5	
9/05/2024	79	14	7	5	7	3	19	5	5	7	7	
10/05/2024	86	9	11	12	10	13	12	8	8	2	1	
11/05/2024	11	2	4			3	2					
12/05/2024	-											
13/05/2024	144	8	21	9	23	11	18	13	15	12	14	
14/05/2024	193	21	16	21	20	19	22	20	22	17	11	4
15/05/2024	208	20	26	15	28	12	27	14	31	20	14	1
16/05/2024	166	19	16	11	19	11	26	23	12	19	7	3
17/05/2024	189	26	28	19	19	23	22	18	14	10	9	1
18/05/2024	20	5	2	4	4	3	2					
19/05/2024	-											
20/05/2024	167	16	12	23	23	21	21	22	15	11	3	
21/05/2024	124	12	17	10	18	12	14	17	10	10	3	1
22/05/2024	128	14	11	13	17	18	12	16	8	14	5	
23/05/2024	139	15	10	15	11	17	14	13	16	17	11	
24/05/2024	137	17	11	13	20	11	20	14	13	12	6	
25/05/2024	21	8	1	6	3	3						
26/05/2024	-											
27/05/2024	137	10	22	11	15	17	13	14	12	13	9	1
28/05/2024	127	21	10	9	14	16	12	11	13	10	9	2
29/05/2024	125	12	13	10	9	13	15	11	14	14	12	2
30/05/2024	171	15	19	15	19	15	21	15	18	15	16	3
31/05/2024	142	12	21	13	19	19	17	10	17	9	5	
1/06/2024	15	3	3	1	6	2						
2/06/2024	-											
3/06/2024	102	12	13	10	11	7	11	16	8	6	7	1
4/06/2024	132	12	20	15	14	16	9	18	10	11	7	
5/06/2024	167	12	18	18	19	21	16	16	21	12	14	
6/06/2024	143	9	16	20	9	17	19	14	20	10	8	1
7/06/2024	149	10	21	18	22	21	15	12	20	7	2	1
8/06/2024	-											
9/06/2024	-											
10/06/2024	-											
11/06/2024	106	15	9	10	11	8	16	10	10	8	6	3
12/06/2024	149	12	11	13	16	13	18	15	18	17	14	2
13/06/2024	171	16	14	22	15	17	18	20	22	16	9	2
14/06/2024	182	19	24	27	16	19	22	17	19	14	4	1
15/06/2024	16		3	4	3	4	2					
16/06/2024	-											
17/06/2024	115	13	12	15	9	14	16	12	8	8	7	1
18/06/2024	111	10	9	14	11	12	14	12	9	12	4	4
19/06/2024	148	19	11	9	20	12	16	24	12	11	13	1
20/06/2024	137	13	19	9	13	11	25	8	19	10	7	3
21/06/2024	131	16	16	14	16	13	16	15	12	5	7	1
22/06/2024	30	4	5	7	6	4	4					
23/06/2024	-											
24/06/2024	167	20	20	15	19	15	25	17	11	12	11	2
25/06/2024	213	22	22	29	19	28	32	16	16	16	11	2
26/06/2024	163	13	18	22	15	21	17	21	14	14	8	

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Karuah East Quarry

Transport Monitoring Data - H2 2024

Project Approval (MP09-0175)

Schedule 3, Condition 23

Monitoring of Product Transport

The Proponent must keep accurate records of all laden truck movements to and from the site (including time of arrival and dispatch) and publish a summary of records on its website every 6 months and in the Annual Review.

Calendar Date	DAILY TOTAL	Hourly Truck Movements																		Manual Sale
		5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to 12	12 to 13	13 to 14	14 to 15	15 to 16	16 to 17	17 to 18	18 to 19	19 to 20	20 to 21	21 to 22		
1/07/2024	164		9	19	17	22	20	18	15	17	18	8	1							
2/07/2024	102	1	15	15	13	16	10	17	3	6	4	2								
3/07/2024	104		3	16	7	8	15	12	16	12	12	3								
4/07/2024	150		21	13	19	18	12	17	14	15	11	10								
5/07/2024	120		13	18	15	15	16	19	3	8	11	2								
6/07/2024	22		4	1	6	6		5												
7/07/2024	-																			
8/07/2024	178		17	21	24	22	23	19	15	13	12	11	1							
9/07/2024	116		9	17	10	16	10	16	12	12	7	7								
10/07/2024	95		13	8	15	9	6	10	10	11	10	3								
11/07/2024	96		17	9	15	6	13	10	7	8	3	6	2							
12/07/2024	130		15	15	15	12	18	11	11	13	11	8	1							
13/07/2024	65		8	18	14	12	10	3												
14/07/2024	-																			
15/07/2024	121		12	11	14	8	13	15	15	17	7	9								
16/07/2024	121		12	11	14	7	10	14	15	9	16	9	4							
17/07/2024	157		16	15	20	16	13	18	15	16	15	12	1							
18/07/2024	125		10	16	15	21	5	19	7	16	8	7	1							
19/07/2024	137		11	20	18	14	18	13	12	11	11	9								
20/07/2024	35		4	8	8	7	5	3												
21/07/2024	-																			
22/07/2024	147		12	19	11	17	12	19	8	16	17	14	2							
23/07/2024	122		20	11	16	9	14	14	12	9	11	5	1							
24/07/2024	118		12	7	15	14	9	18	9	10	15	8	1							
25/07/2024	154		14	17	16	14	18	15	15	18	13	11	3							
26/07/2024	104		13	10	12	16	14	8	12	7	4	7	1							
27/07/2024	31		5	8	9	4	4	1												
28/07/2024	-																			
29/07/2024	107		13	10	14	7	15	9	15	5	10	8	1							
30/07/2024	144		15	16	15	18	10	14	10	15	18	10	3							
31/07/2024	109		12	10	9	12	12	13	10	8	17	6								
1/08/2024	105		14	10	15	8	11	7	10	15	8	7								
2/08/2024	175		19	14	24	21	16	23	14	17	10	15	2							
3/08/2024	15		3	1	4	2	4	1												
4/08/2024	-																			
5/08/2024	156		15	15	20	16	20	12	18	19	12	7	2							
6/08/2024	172		16	21	16	19	21	22	14	20	12	8	3							
7/08/2024	193		18	25	16	25	21	25	27	19	10	6	1							
8/08/2024	200		18	20	23	26	19	24	16	24	18	12								
9/08/2024	86		9	13	10	10	9	8	11	7	4	5								
10/08/2024	22		3	5	6	4	1	3												
11/08/2024	-																			
12/08/2024	121		11	14	12	13	12	11	12	17	11	7	1							
13/08/2024	131		12	12	14	18	11	16	21	11	9	5	1							1
14/08/2024	83		10	17	10	7	10	12	9	4	2	2								
15/08/2024	90		6	19	9	13	6	8	9	10	5	5								
16/08/2024	99		10	6	13	18	7	16	9	8	6	5	1							
17/08/2024	8		2		1	2	2	1												
18/08/2024	-																			
19/08/2024	135		15	13	13	15	15	17	12	12	12	9	2							
20/08/2024	138		12	14	14	17	18	13	15	13	13	7	2							
21/08/2024	161		14	19	17	17	19	22	15	12	12	14								
22/08/2024	151		17	18	15	19	17	16	12	15	10	10	2							
23/08/2024	207		14	24	20	22	24	21	24	21	24	13								
24/08/2024	34		6	3	9	6	7	3												
25/08/2024	-																			
26/08/2024	121		15	9	17	15	11	13	15	5	15	6								
27/08/2024	201		19	21	21	24	21	18	21	22	22	12								
28/08/2024	192		21	19	17	18	16	24	26	17	22	8	4							
29/08/2024	182		16	15	19	24	16	25	18	14	21	14								
30/08/2024	196		16	22	21	21	19	25	15	24	19	14								
31/08/2024	32		3	8	6	8	5	2												
1/09/2024	-																			
2/09/2024	210		19	20	19	21	22	27	25	22	19	13	3							
3/09/2024	163		19	16	17	20	13	20	14	14	13	15	2							
4/09/2024	165		20	18	15	17	13	22	12	18	16	12	2							
5/09/2024	200		17	26	19	22	27	18	20	18	16	13	4							
6/09/2024	155		17	16	19	18	16	20	21	9	12	7								
7/09/2024	26		6	3	5	6	5	1												
8/09/2024	-																			
9/09/2024	170		19	16	17	20	15	27	18	15	12	9	2							
10/09/2024	211		18	22	26	17	23	18	27	23	19	14	4							
11/09/2024	193		14	24	15	28	16	26	19	26	17	8								
12/09/2024	202		10	18	30	22	24	24	31	19	16	8								
13/09/2024	101		8	16	16		4	32	4	10	6	3	1							1
14/09/2024	39		4	9	6	7	7	6												
15/09/2024	-																			
16/09/2024	116		14	7	13	7	14	9	11	16	12	9	4							
17/09/2024	249		22	23	26	24	32	28	23	30	24	10	7							
18/09/2024	186		16	20	20	23	21	18	21	16	17	14								
19/09/2024	186		20	17	21	23	19	27	6	19	20	12	2							
20/09/2024	125		20	13	18	14	13	11	18	7	5	4	2							
21/09/2024	21		5	5	4	3	1	3												

22/09/2024	-													
23/09/2024	122		13	9	13	16	16	16	14	8	9	5	3	
24/09/2024	110		16	12	9	14	9	14	11	9	8	3	1	4
25/09/2024	135		14	10	15	15	16	12	19	12	9	12	1	
26/09/2024	86		10	5	11	15	11	11	10	7	3	3		
27/09/2024	57		8	8	4	8	7	9	5	5	1	2		
28/09/2024	10			3	2	2	3							
29/09/2024	-													
30/09/2024	72		4	8	9	8	4	13	5	10	6	5		
1/10/2024	111		4	11	16	10	16	9	13	10	15	7		
2/10/2024	153		11	16	18	20	12	21	11	13	17	14		
3/10/2024	180		22	13	25	19	16	22	16	18	16	12	1	
4/10/2024	155		19	25	19	18	16	27	12	9	6	4		
5/10/2024	-													
6/10/2024	-													
7/10/2024	-													
8/10/2024	189		21	17	21	19	16	25	20	15	25	8	2	
9/10/2024	105		8	14	12	7	13	14	15	7	10	5		
10/10/2024	153		14	10	22	14	22	17	11	18	15	8	2	
11/10/2024	181		16	18	22	22	22	24	20	15	11	10	1	
12/10/2024	19		6	3	3		6	1						
13/10/2024	-													
14/10/2024	86		19	8	7	10	4	11	9	8	3	4	3	
15/10/2024	113		16	15	15	16	11	12	8	9	10	1		
16/10/2024	152	1	7	25	9	19	18	17	17	13	14	10	2	
17/10/2024	177		15	19	19	17	21	17	17	20	11	18	3	
18/10/2024	148		16	15	21	12	21	13	17	15	12	6		
19/10/2024	24		2	5	3	8	5	1						
20/10/2024	-													
21/10/2024	137		11	19	10	21	12	15	15	16	13	5		
22/10/2024	131		15	8	14	14	16	17	13	14	13	7		
23/10/2024	155		16	16	18	19	14	14	18	14	10	12	4	
24/10/2024	161		18	18	21	18	12	19	10	16	12	14	3	
25/10/2024	72		7	9	10	8	9	6	8	4	3	8		
26/10/2024	17		3	2	3	5	4							
27/10/2024	-													
28/10/2024	133		13	11	15	19	14	15	14	15	8	9		
29/10/2024	93		8	7	8	9	11	8	13	9	10	9	1	
30/10/2024	109		9	8	8	11	13	10	13	16	13	8		
31/10/2024	166		14	20	12	21	17	18	18	10	22	8	6	
1/11/2024	142		15	17	16	16	17	19	13	14	6	8	1	
2/11/2024	22		3	6	3	6	2	2						
3/11/2024	-													
4/11/2024	143		14	13	19	16	17	15	15	7	15	10	2	
5/11/2024	167		20	16	18	14	18	24	13	17	19	6	2	
6/11/2024	133		16	16	13	14	15	14	12	10	13	10		
7/11/2024	133		15	18	11	17	14	13	16	11	12	6		
8/11/2024	140		13	19	15	22	14	18	14	11	9	5		
9/11/2024	32		9	4	8	4	2	5						
10/11/2024	-													
11/11/2024	106		14	11	7	13	11	11	11	13	8	6	1	
12/11/2024	88		11	15	15	10	11	8	7	5	3	3		
13/11/2024	71		4	11	10	3	9	12	9	11		2		
14/11/2024	131		13	15	15	12	12	22	12	9	16	3	2	
15/11/2024	138		15	16	14	17	17	14	13	14	10	8		
16/11/2024	21		6	3	2	1	9							
17/11/2024	-													
18/11/2024	120		14	9	24	9	15	10	14	8	9	7	1	
19/11/2024	86		14	3	7	8	7	12	7	11	11	6		
20/11/2024	97		10	10	7	15	10	10	8	12	7	6	2	
21/11/2024	117		15		9	20	10	14	8	25	5	8	3	
22/11/2024	107		12	14	13	11	9	12	10	11	5	10		
23/11/2024	21		2	6	4	5	3	1						
24/11/2024	-													
25/11/2024	142	2	17	18	13	14	12	16	15	12	10	13		
26/11/2024	225		17	25	26	23	25	29	18	22	22	16	2	
27/11/2024	176		18	21	17	21	16	19	17	17	16	11	3	
28/11/2024	175		14	21	18	24	17	22	21	16	13	8	1	
29/11/2024	115		8	15	14	14	15	13	16	8	10	2		
30/11/2024	10			3	4	1	1							1
1/12/2024	-													
2/12/2024	87		6	9	14	8	14	6	10	4	8	8		
3/12/2024	123		10	11	20	9	17	11	16	13	9	7		
4/12/2024	164		17	13	21	15	15	21	17	14	15	15	1	
5/12/2024	159		14	16	18	19	19	17	18	13	18	7		
6/12/2024	184		21	19	25	16	24	18	18	16	17	7	3	
7/12/2024	27		7	4	6	3	5	2						
8/12/2024	-													
9/12/2024	231	1	20	19	26	26	22	29	20	26	21	19	2	
10/12/2024	148		17	11	15	12	20	16	12	19	13	10	3	
11/12/2024	223		19	25	24	24	25	29	22	24	16	14	1	
12/12/2024	198		21	18	15	25	18	25	17	24	19	14	2	
13/12/2024	174		16	24	19	19	19	17	15	22	10	12		1
14/12/2024	65		13	13	14	11	10	4						
15/12/2024	-													
16/12/2024	236		22	26	27	22	31	17	26	22	26	14	2	1
17/12/2024	188		16	22	20	16	23	20	18	17	23	12	1	
18/12/2024	269		18	31	24	26	25	29	33	31	31	19	2	
19/12/2024	176		24	20	23	24	22	15	17	17	12	2		
20/12/2024	37		8	12	10	6		1						
21/12/2024	-													
22/12/2024	-													
23/12/2024	-													
24/12/2024	-													
25/12/2024	-													

26/12/2024	-		
27/12/2024	-		
28/12/2024	-		
29/12/2024	-		
30/12/2024	-		
31/12/2024	-		

Appendix 3 – Noise Monitoring Reports

Noise Monitoring Report – Q1 2024

Noise Monitoring Report – Q2 2024

Noise Monitoring Report – Q3 2024

Noise Monitoring Report – Q4 2024

Karuah East Quarry

Quarterly Attended Noise Monitoring - Q1 2024

Prepared for Karuah East Quarry Pty Limited

February 2023

Karuah East Quarry

Quarterly Attended Noise Monitoring - Q1 2024

Karuah East Quarry Pty Limited

E240073 RP1

February 2023

Version	Date	Prepared by	Reviewed by	Comments
1	19 February 2024	Lucas Adamson	Najah Ishac	Draft
2	29 February 2024	Lucas Adamson	Najah Ishac	Final

Approved by

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Director
29 February 2024

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This report has been prepared in accordance with the brief provided by Karuah East Quarry Pty Limited and, in its preparation, EMM has relied upon the information collected at the times and under the conditions specified in this report. All findings, conclusions or recommendations contained in this report are based on those aforementioned circumstances. The contents of this report are private and confidential. This report is only for Karuah East Quarry Pty Limited's use in accordance with its agreement with EMM and is not to be relied on by or made available to any other party without EMM's prior written consent. Except as permitted by the *Copyright Act 1968* (Cth) and only to the extent incapable of exclusion, any other use (including use or reproduction of this report for resale or other commercial purposes) is prohibited without EMM's prior written consent. Except where expressly agreed to by EMM in writing, and to the extent permitted by law, EMM will have no liability (and assumes no duty of care) to any person in relation to this document, other than to Karuah East Quarry Pty Limited (and subject to the terms of EMM's agreement with Karuah East Quarry Pty Limited).

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Karuah East Quarry Pty Limited to conduct a quarterly noise survey of operations at Karuah East Quarry (KEQ, the site) located at Blue Rock Close, Karuah NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

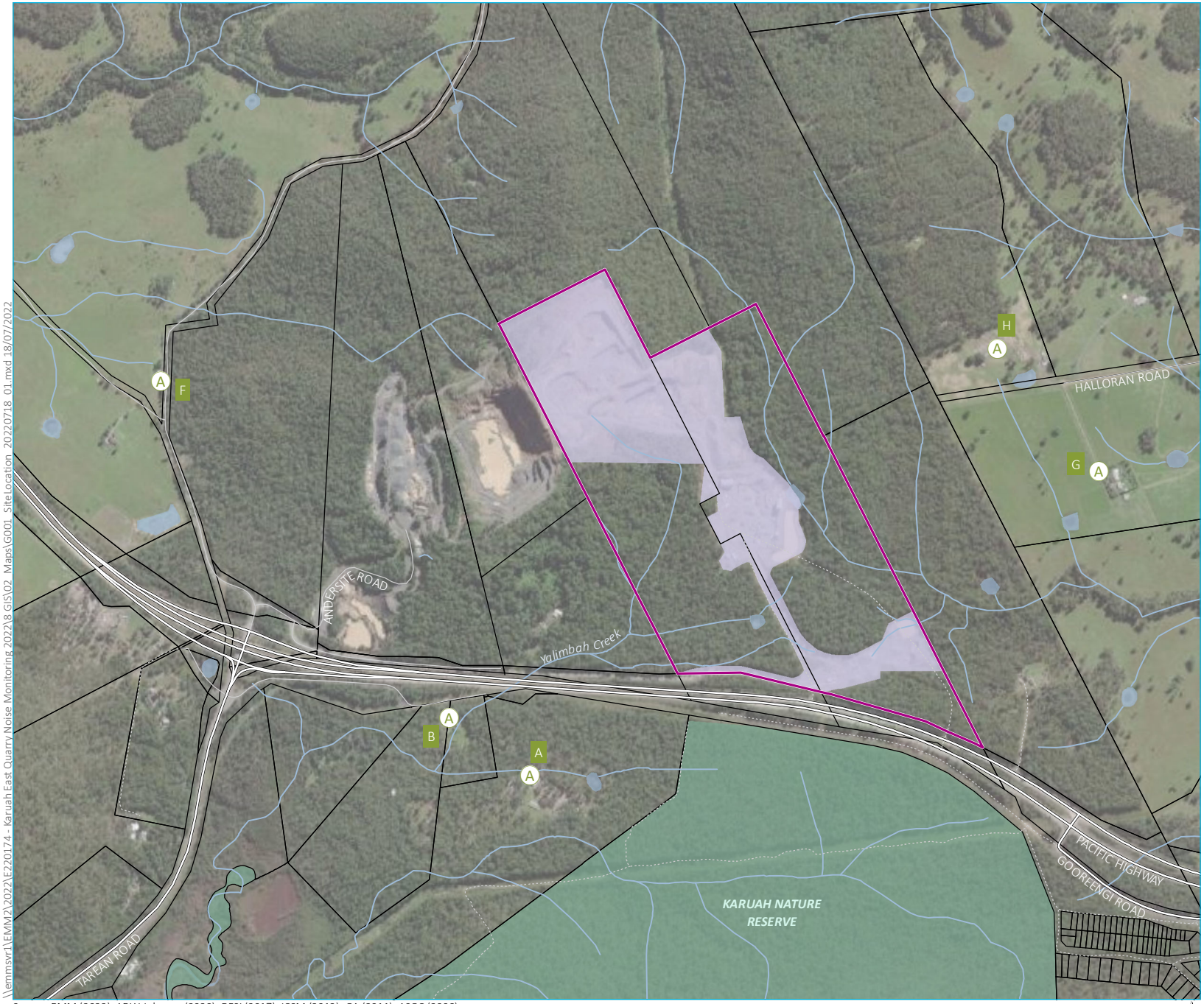
Attended environmental noise monitoring described in this report was done during morning shoulder, day and evening periods on Monday 5 February 2024 at five monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
A	Private residence - 74 Mill Hill Close, Karuah	406623	6388704
B	Private residence - 64 Mill Hill Close, Karuah	406405	6388859
F	Private residence - 1714 The Branch Lane, Karuah	405639	6389782
G	Private residence - 2 Halloran Road, North Arm Cove	405629	6389766
H	Private residence - 21 Halloran Road, North Arm Cove	407795	6389868



KEY

- Site boundary
- Attended noise monitoring location
- Approved disturbance area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Waterbody
- NPWS reserve
- State forest

Attended noise monitoring locations

Source: EMM (2022); ADW Johnson (2020); DFSI (2017); ICSM (2012); GA (2011); ASGC (2006)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

Karuah East Quarry
Quarterly attended noise monitoring
Figure 1.1

EMM creating opportunities

\\emmsvr1\EMM2\2022\E220174 - Karuah East Quarry Noise Monitoring 2022\8 GIS\02 Maps\G001 Site Location 20220718 01.mxd 18/07/2022

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 per cent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 per cent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Morning Shoulder	Monday – Saturday: 5 am to 7 am.

Appendix A provides further information that indicates how an average person perceives changes in noise levels and examples of common noise levels.

2 Noise limits

2.1 Project approval

Karuah East Quarry noise limits are detailed in Condition 3 of Project Approval (PA) 09_0175. Relevant sections of PA 09_0175 are reproduced in Appendix B.1.

2.2 Environment protection licence

Karuah East Quarry noise limits are detailed in Condition L4.1 of Environment Protection Licence (EPL) 20611. Relevant sections of EPL 20611 are reproduced in Appendix B.2.

2.3 Noise management plan

The approved Noise Management Plan (NMP) adopts five attended noise monitoring locations that are representative of residences outlined in PA 09_0175 and EPL 20611. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limit summary

Noise limits based on PA 09_0175 and EPL 20611 are as shown in Table 2.1.

Table 2.1 Noise limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Morning Shoulder $L_{Aeq,15minute}$	Morning Shoulder $L_{A1,1minute}$
A	42	40	35	52
B	40	40	35	52
F	40	35	35	52
G	43	39	35	52
H	44	46	35	52

Notes: 1. Morning shoulder period is from 5:00 am to 7:00 am Monday to Saturday as defined in Condition L4.2 of EPL 20611.

2.5 Meteorological conditions

PA 09_0175 specifies that noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017.

The EPA requirements in Condition L4.3 of EPL 20611 state that noise limits do not apply under the following meteorological conditions:

- wind speeds greater than 3 m/s at 10 m above ground level;
- stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level; or
- stability category G temperature inversion conditions.

2.6 Additional considerations

Monitoring and reporting have been done in accordance with the NPfI and the NSW EPA 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

2.7 Very noise-enhancing meteorological conditions

In accordance with the approved methods, noise monitoring for the site is scheduled to occur during forecasted meteorological conditions where noise limits in Table 2.1 will be applicable. However, in cases where actual meteorological conditions do not align with forecasts and noise limits are subsequently not directly applicable, it is the expectation of regulators that noise impact still be managed.

The NPfI states that:

> Noise limits derived for consents and licences will apply under the meteorological conditions used in the environmental assessment process, that is, standard or noise-enhancing meteorological conditions. For 'very noise-enhancing meteorological conditions' … a limit is set based on the limit derived under standard or noise-enhancing conditions (whichever is adopted in the assessment) plus 5 dB. In this way a development is subject to noise limits under all meteorological conditions.

Therefore, if monthly noise monitoring occurs during meteorological conditions outside of those specified in Section 2.5, site limits will be adjusted based on Table 2.1 plus 5 dB.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the KEQ on-site meteorological station which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the morning shoulder, day and evening periods at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location using a hand held device.

Measured sound levels from various sources were noted during each measurement, and particular attention was given to the extent of the site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

Meteorological data for the monitoring period was sourced from the Karuah East Quarry on-site meteorological station (the site AWS) to determine the applicability of criteria in accordance with the EPL and PA.

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site-only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Site operations

As required by Condition R4.3(a) of the EPL, the operations occurring at the time of monitoring are summarised per period below:

- Day
  - Routine quarry operations in the quarry pit
  - Routine plant processing operations
  - Routine material transport from the quarry pit to the processing plant and product stockpile areas
  - Routine product loading and dispatch to road trucks
- Evening
  - Routine material transport from the processing plant to product stockpile areas
  - Routine maintenance activities of plant and equipment
- Morning shoulder
  - Routine maintenance activities of plant and equipment
  - Routine product loading and dispatch to road trucks

3.6 Instrumentation

Attended noise monitoring was conducted by Lucas Adamson. Qualifications, experience, and/or demonstration of competence is in accordance with the Approved methods and supportive documentation is available upon request.

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	79952	27/9/2025	IEC 60942

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.1 Total measured noise levels – Q1 2024[1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
A	5/02/2024 5:01	61	55	51	48	46	42	35
B	5/02/2024 5:19	76	73	66	63	60	51	42
F	5/02/2024 5:39	88	78	61	64	50	41	38
G	5/02/2024 6:05	54	47	42	41	40	39	37
H	5/02/2024 6:35	56	46	41	37	35	33	31
H	5/02/2024 7:00	59	47	38	38	34	33	31
G	5/02/2024 7:17	54	46	39	37	36	34	32
F	5/02/2024 7:43	90	77	54	62	43	40	38
B	5/02/2024 8:03	75	72	68	66	65	63	60
A	5/02/2024 8:24	66	58	56	55	55	53	52
A	5/02/2024 18:00	73	58	53	51	49	45	41
B	5/02/2024 18:18	74	72	66	63	60	54	45
F	5/02/2024 18:37	84	73	51	59	39	36	34
G	5/02/2024 19:02	60	51	44	40	34	31	27
H	5/02/2024 19:20	81	63	45	55	41	41	39

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – Q1 2024

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction ° Magnetic north[1]	Cloud cover 1/8s
A	5/02/2024 5:01	24.4	<0.5	-	6
B	5/02/2024 5:19	24.3	<0.5	-	6
F	5/02/2024 5:39	24.2	<0.5	-	6
G	5/02/2024 6:05	24.2	<0.5	-	5
H	5/02/2024 6:35	24.3	<0.5	-	5
H	5/02/2024 7:00	24.2	<0.5	-	4
G	5/02/2024 7:17	24.3	<0.5	-	3
F	5/02/2024 7:43	24.7	<0.5	-	2
B	5/02/2024 8:03	25	<0.5	-	3
A	5/02/2024 8:24	25.3	<0.5	-	3
A	5/02/2024 18:00	31.1	<0.5	-	7
B	5/02/2024 18:18	30.5	<0.5	-	7
F	5/02/2024 18:37	29.9	<0.5	-	7
G	5/02/2024 19:02	27.9	<0.5	-	7
H	5/02/2024 19:20	26.9	0.9	90	7

Notes: 1. "-" indicates calm conditions at the monitoring location.

4.2 Site only noise levels

4.2.1 Modifying factors

No modifying factors were applicable during the survey, as defined in the NPfI.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data obtained from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – Q1 2024

Location	Start Date and Time (Period)	Wind		Stability Class	Very enhancing? [1]	Limit, dB		Site level, dB [2]		Exceedance	
		Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
A	5/02/2024 5:01 (MS)	0.6	115	F	N	35	52	IA	IA	No	No
B	5/02/2024 5:19 (MS)	0.9	56	F	N	35	52	IA	IA	No	No
F	5/02/2024 5:39 (MS)	1.3	101	E	N	35	52	IA	IA	No	No
G	5/02/2024 6:05 (MS)	1.7	110	D	N	35	52	IA	IA	No	No
H	5/02/2024 6:35 (MS)	0.4	118	F	N	35	52	IA	IA	No	No
H	5/02/2024 7:00 (D)	0.3	156	A	N	44	N/A	IA	N/A	No	N/A
G	5/02/2024 7:17 (D)	0.6	149	A	N	43	N/A	IA	N/A	No	N/A
F	5/02/2024 7:43 (D)	0.8	139	B	N	40	N/A	IA	N/A	No	N/A
B	5/02/2024 8:03 (D)	0.7	135	A	N	40	N/A	IA	N/A	No	N/A
A	5/02/2024 8:24 (D)	0.7	184	A	N	42	N/A	IA	N/A	No	N/A
A	5/02/2024 18:00 (E)	2.0	100	F	Y	45[1]	N/A	IA	N/A	No	N/A
B	5/02/2024 18:18 (E)	1.7	111	F	N	40	N/A	IA	N/A	No	N/A
F	5/02/2024 18:37 (E)	1.0	109	F	N	35	N/A	IA	N/A	No	N/A
G	5/02/2024 19:02 (E)	1.7	119	F	N	39	N/A	IA	N/A	No	N/A

Table 4.3 Site noise levels and limits – Q1 2024

Location	Start Date and Time (Period)	Wind		Stability Class	Very enhancing? [1]	Limit, dB		Site level, dB [2]		Exceedance	
		Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
H	5/02/2024 19:20 (E)	1.5	61	F	N	46	N/A	IA	N/A	No	N/A

Notes:
1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. Degrees magnetic north, "-" indicates calm conditions.
4. MS = Morning Shoulder period; D = Day period; E = Evening period.

5 Mitigation and management

5.1 Proposed management actions

EPL Condition 4.3(c) requires details of any management actions taken within the monitoring period to address any exceedances of the limits. As there were no exceedances, no management actions were required.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Karuah East Quarry Pty Limited to conduct a quarterly noise survey of operations at the site. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified PA and EPL noise limits.

Attended environmental noise monitoring described in this report was done during the morning shoulder, day and evening periods on Monday 5 February 2024 at five monitoring locations.

Noise levels from the site complied with relevant limits at all monitoring locations during the Q1 2024 survey.

Appendix A

Noise perception and examples

EMM
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A.1 Noise levels

Table A.1 indicates how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

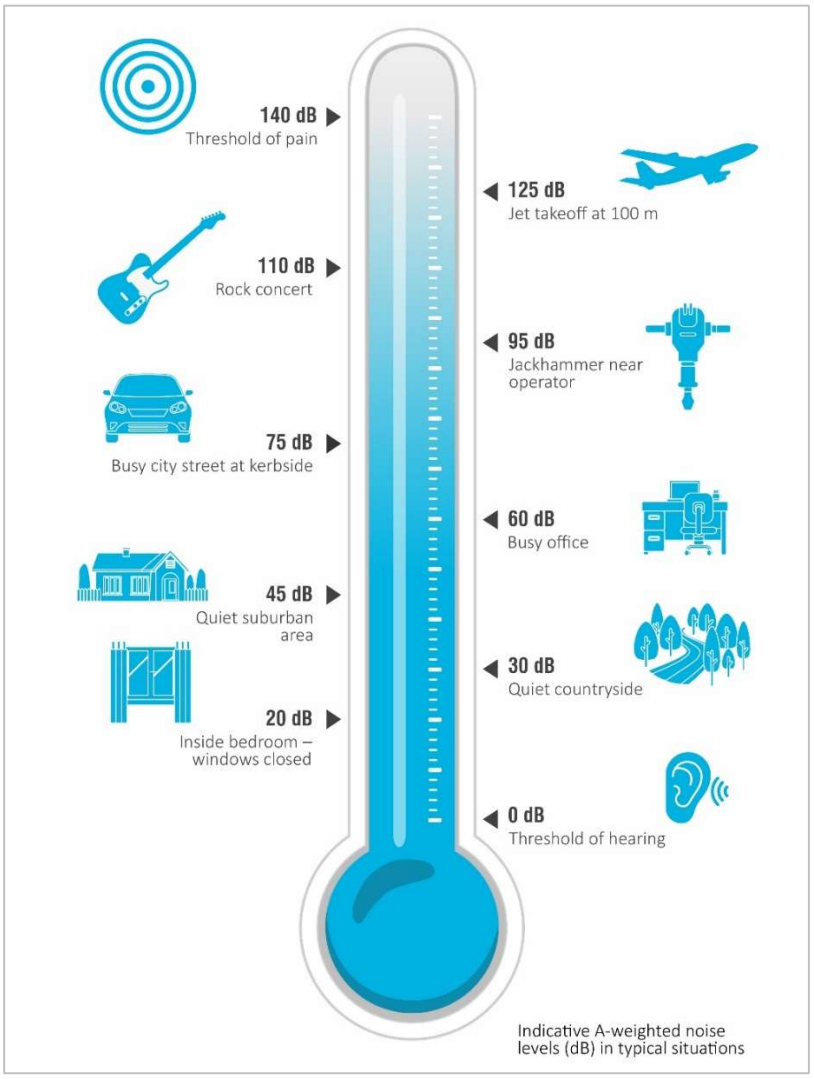

Figure A.1 Common noise levels

Appendix B

Regulator documents

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B.1 Project approval

SCHEDULE 3
ENVIRONMENTAL PERFORMANCE CONDITIONS

IDENTIFICATION OF APPROVED LIMITS OF EXTRACTION

1. The Applicant shall, prior to carrying out quarrying operations on the site:
   (a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction within the Extraction Area; and
   (b) submit a survey plan of the extraction boundaries,
   to the satisfaction of the Planning Secretary.

2. The Applicant must ensure that the extraction boundaries are clearly marked at all times while quarrying operations are being carried out, in a manner that allows the limits of extraction to be clearly identified.

NOISE

Operational Noise Criteria

3. Except for the carrying out of construction works, the Applicant must ensure that the operational noise generated by the development does not exceed the criteria in Table 2 at any residence[a] on privately-owned land.

Table 2: Operational noise criteria dB

Noise Assessment Location[a]	Morning Shoulder $L_{Aeq\ (15\ min)}$	Morning Shoulder L_{Amax}	Day $L_{Aeq\ (15\ min)}$	Evening $L_{Aeq\ (15\ min)}$
A	35	52	42	40
B	35	52	40	40
G	35	52	43	39
H	35	52	44	46
I	35	52	40	37
All other residences	35	52	40	35

[a] Noise Assessment Locations referred to in Table 2 are shown in Appendix 2.

Noise generated by the development must be monitored and measured in accordance with the relevant procedures and modifications (including certain meteorological conditions) of the NPfI.

3A. The noise criteria in Table 2 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Road Traffic Noise Criteria

4. The Applicant must take all reasonable and feasible measures to ensure that the traffic noise generated by the development does not cause additional exceedances of the criteria in Table 3 at any residence on privately-owned land.

Table 3: Road traffic noise criteria

Road	***Criteria (Day[a])***
Pacific Highway	60 dB(A) $L_{Aeq\ (15\ hour)}$
Local roads	55 dB(A) $L_{Aeq\ (1\ hour)}$

[a] *Day is the period from 7 am to 10 pm every day in accordance with the EPA's NSW Road Noise Policy (2011).*

5. Deleted

Noise Operating Conditions

6. The Applicant must:
   (a) take all reasonable steps to minimise noise from construction and operational activities, including low frequency noise and other audible characteristics, associated with the development;
   (b) implement reasonable and feasible noise attenuation measures on all plant and equipment that will operate in noise sensitive areas;
   (c) operate a comprehensive noise management system commensurate with the risk of impact;
   (d) take all reasonable steps to minimise the noise impacts of the development during noise-enhancing meteorological conditions when the noise criteria in this consent do not apply (see NPfI);
   (e) carry out quarterly attended noise monitoring (unless otherwise agreed by the Planning Secretary) to determine whether the development is complying with the relevant conditions of this consent; and
   (f) regularly assess the noise monitoring data and modify or stop operations on the site to ensure compliance with the relevant conditions of this consent.

Noise Management Plan

7. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
   (b) be prepared in consultation with the EPA;
   (c) describe the measures to be implemented to ensure:
      (i) compliance with the noise criteria and operating conditions in this consent;
      (ii) best practice management is being employed;
      (iii) noise impacts of the development are minimised during noise-enhancing meteorological conditions when the noise criteria in this consent do not apply (see NPfI);
   (d) describe the noise management system in detail; and
   (e) include a monitoring program that:
      (i) is capable of evaluating the performance of the development;
      (ii) monitors noise at the nearest and/or most affected residences;
      (iii) adequately supports the noise management system;
      (iv) includes a protocol for distinguishing noise emissions of the development from any neighbouring developments; and
      (v) includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of any such event.

7A. The Applicant must implement the plan as approved by the Planning Secretary.

BLASTING

Blasting Criteria

8. The Applicant must ensure that blasting on the site does not cause exceedances of the criteria in Table 5.

B.2 Environmental protection licence

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.

L4 Noise limits

L4.1 Noise generated at the premises must not exceed the noise limits in the table below. The locations referred to in the table below are indicated in Table 2: Operational Noise Criteria, and Figure 1 of the document titled Project Approval 09_0175 Modification 9 (MOD 9) Department of Planning, Industry& Environment - which has been filed on EPA file Doc22/715570-1.

Noise Assesment Location	Morning Shoulder LAeq(15 min)	Morning shoulder LAmax	Day LAeq (15 min)	Evening LAeq (15 min)
A (74 Mill Hill Close, Karuah, Lot 100 DP 1028885)	35	52	42	40
B (64 Mill Hill Close, Karuah, Lot 3 DP785172)	35	52	40	40
G (2 Halloran Road, North Arm Cove Lot 1 DP1032636)	35	52	43	39
H (21 Halloran Road, North Arm Cove Lot 10 DP1032636)	35	52	44	46
All other residences	35	52	40	35

L4.2 Noise limit definitions - For the purpose of the table at L4.1, the following definitions apply:
Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays;
Morning Shoulder is defined as the period from 5:00am to 7:00am Monday to Saturday;
Evening is defined as the period from 6:00pm to 10:00pm Monday to Saturday.

L4.3 The noise limits set out in this licence apply under all meteorological conditions except for the following:
a) Wind speed greater than 3 metres/second at 10 metres above ground level; or
b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Stability category G temperature inversion conditions.

L4.4 **Determining Compliance**

To determine compliance with the noise limits set out in the table above, the licensee must locate monitoring equipment:
a) within 30 metres of a dwelling façade (but not closer than 3 metres) where any dwelling on the property is situated more than 30 metres from the property boundary that is closest to the premises;
b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises;
c) at the most affected point at a location where there is no dwelling at the location; and
d) within approximately 50 metres of the boundary of a national park or nature reserve.

Note: A non-compliance of the Noise Limits table will still occur where noise generated from the premises in excess of the appropriate limit is measured:
i) at a location other than an area prescribed in part (a) and part (b); and/or
ii) at a point other than the most affected point at a location.

L4.5 For the purposes of determining the noise generated at the premises the modification factors in Fact Sheet C of the EPA's "Noise Policy for Industry" must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L5 Blasting

L5.1 Blasting in or on the premises must only be carried out between the hours of 9:00 am and 4:00 pm Monday to Friday. No blasting is permitted on Saturdays, Sundays or public holidays. Blasting outside of the hours specified in this condition can only take place with the written approval of the EPA.

L5.2 Blasting is not permitted simultaneously with adjacent quarry(s).

L5.3 The airblast overpressure level from blasting operations in or on the premises must not exceed:
a) 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period; and
b) 120 dB (Lin Peak) at any time,
at monitoring point 11 detailed in Condition P1.4.

L5.4 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed:
a) 5 mm/second for more than 5% of the total number of blasts during each reporting period; and
b) 10 mm/second at any time,
at monitoring point 11 detailed in Condition P1.4.

L5.5 Error margins associated with any monitoring equipment used to measure airblast overpressure or peak particle velocity are not to be taken into account in determing whether or not the limit has been exceeded.

L5.6 The airblast overpressure and ground vibration levels in the conditions above do not apply at noise sensitive locations that are owned by the licensee or subject to a private agreement, relating to airblast overpressure and ground vibration levels, between the licensee and land owner.

L5.7 Offensive blast fume must not be emitted from the premises.

Definition:

d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M6 Telephone complaints line

M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M6.3 The preceding two conditions do not apply until 1 month after the date of the issue of this licence.

M7 Blasting

M7.1 To determine complaince with Blast Limit conditions of this licence:
a) Airblast overpressure and ground vibration levels must be measured and electronically recorded for monitoring point 11 for the parameters specified in Column 1 of the table below; and
b) The licensee must use the units of measure, sampling method, and sample at the frequency specified opposite in the other columns.

Parameter	Units of Measure	Frequency	Sampling Method
Airblast Overpressure	Decibels (Linear Peak	All blasts	Australian Standard AS 2187.2-2006
Ground Vibration Peak Particle Velocity	millimetres/second	All blasts	Australian Standard AS 2187.2-2006

M8 Noise monitoring

M8.1 To assess compliance with the noise limits for this premises attended noise monitoring must be undertaken in accordance with all noise conditions and:
a) during a period of normal quarry operations;
b) at each one of the locations listed in the noise limits table of this licence;
c) occur quarterly in the reporting period;
d) occur during each day period as defined in the NSW Noise Policy for Industry.

.

Note: Quarterly attended noise monitoring must be completed (unless otherwise agreed by the Planning

Secretary) to determine whether the development is complying with the relevant conditions of this consent. The frequency of noise monitoring will be reviewed, upon request.

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after

B.3 Noise management plan

5 Noise limits

5.1 Operational noise

Condition 3 of Schedule 3 of PA 09_0175 provides the operational noise limits for KEQ. These are reproduced in Table 5.1.

Table 5.1 Operational noise criteria (dB) from Table 2 of PA 09_0175

Noise Assessment Location[1]	Morning Shoulder $L_{Aeq(15\ minute)}$	Morning Shoulder L_{Amax}	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$
A	35	52	42	40
B	35	52	40	40
G	35	52	43	39
H	35	52	44	46
I	35	52	40	37
All other residences	35	52	40	35

Noise assessment locations are shown in Figure 3.1.

Noise generated by the development must be monitored and measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NPfI (EPA 2017).

The noise limits provided in Table 5.1 apply under standard and noise-enhancing meteorological conditions (as defined in the NPfI) determined by monitoring at the relevant weather station. In accordance with Condition L4.3 of EPL 20611 and consistent with Condition 3 of Schedule 3 of PA 09_0175 the noise limits provided in Table 5.1 apply under all meteorological conditions except for the following:

- wind speeds greater than 3m/s at 10m above ground level;
- stability category F temperature inversion conditions and wind speeds greater then 2m/s at 10m above ground level; or
- stability category G temperature inversion conditions.

In accordance with Fact Sheet D of the NPfI, for 'very noise enhancing meteorological conditions' the applicable noise limit is set at 5dB above those provided in Table 5.1.

Noise limits do not apply if Karuah East has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and Karuah East has advised the Department in writing of the terms of this agreement.

5.2 Road traffic noise

Condition 4 of Schedule 3 of PA 09_0175 states that all reasonable and feasible measures must be taken to ensure that the traffic generated by KEQ does not cause additional exceedances of the criteria provided in Table 5.2 at any residence on privately-owned land.

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C37642

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV 36 **Serial No:** 86311
Class: 1
Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1003	hPa ±1 hPa	**Date of Receipt :**	11/10/2023
Temperature	23	°C ±1° C	**Date of Calibration :**	13/10/2023
Relative Humidity	38	% ±5%	**Date of Issue :**	13/10/2023

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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CERTIFICATE OF CALIBRATION

Certificate No: CAU2300941

CALIBRATION OF:

Sound Level Meter:	Brüel & Kjær	2250	No: 2759405
Microphone:	Brüel & Kjær	4189	No: 2983733
Preamplifier:	Brüel & Kjær	ZC-0032	No: 22666
Supplied Calibrator:	None		
Software version:	BZ7224 Version 4.7.4	Pattern Approval:	-
Instruction manual:	BE1712-22	Identification:	N/A

CUSTOMER:

EMM Consulting Pty Limited
20 Chandos Street
St Leonards NSW 2065

CALIBRATION CONDITIONS:

Preconditioning: 4 hours at 23 °C

Environment conditions: *see actual values in **Environmental conditions** sections*

SPECIFICATIONS:

The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC61672-1:2013 class 1.
Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
The measurements included in this document are traceable to Australian/National standards.

PROCEDURE:

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System B&K 3630 with application software type 7763 (version 8.6 - DB: 8.60) and test procedure 2250-4189.

RESULTS:

	Initial calibration		Calibration prior to repair/adjustment
X	Calibration without repair/adjustment		Calibration after repair/adjustment

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor k = 2 providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of Calibration:20/12/2023

Certificate issued:21/12/2023

Calibration Technician: Sajeeb Tharayil

Approved signatory: Sajeeb Tharayil

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Karuah East Quarry

Quarterly Attended Noise Monitoring - Q2 2024

Prepared for Karuah East Quarry Pty Limited

June 2024

Karuah East Quarry

Quarterly Attended Noise Monitoring - Q2 2024

Karuah East Quarry Pty Limited

E240073 RP2

June 2024

Version	Date	Prepared by	Reviewed by	Comments
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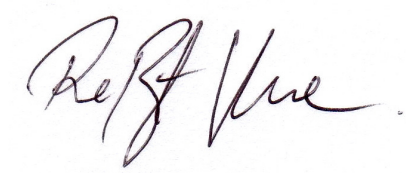
Approved by



Robert Kirwan
Associate Acoustics Consultant
6 June 2024

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This report has been prepared in accordance with the brief provided by Karuah East Quarry Pty Limited and, in its preparation, EMM has relied upon the information collected at the times and under the conditions specified in this report. All findings, conclusions or recommendations contained in this report are based on those aforementioned circumstances. The contents of this report are private and confidential. This report is only for Karuah East Quarry Pty Limited's use in accordance with its agreement with EMM and is not to be relied on by or made available to any other party without EMM's prior written consent. Except as permitted by the *Copyright Act 1968* (Cth) and only to the extent incapable of exclusion, any other use (including use or reproduction of this report for resale or other commercial purposes) is prohibited without EMM's prior written consent. Except where expressly agreed to by EMM in writing, and to the extent permitted by law, EMM will have no liability (and assumes no duty of care) to any person in relation to this document, other than to Karuah East Quarry Pty Limited (and subject to the terms of EMM's agreement with Karuah East Quarry Pty Limited).

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Karuah East Quarry Pty Limited to conduct a quarterly noise survey of operations at Karuah East Quarry (KEQ, the site) located at Blue Rock Close, Karuah NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

Attended environmental noise monitoring described in this report was done during morning shoulder and day periods on Thursday 23 May 2024 at five monitoring locations. Evening periods were also monitored on 30 May 2024 at five monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on

Figure 1.1. It should be noted that

Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
A	Private residence - 74 Mill Hill Close, Karuah	406623	6388704
B	Private residence - 64 Mill Hill Close, Karuah	406405	6388859
F	Private residence - 1714 The Branch Lane, Karuah	405639	6389782
G	Private residence - 2 Halloran Road, North Arm Cove	405629	6389766
H	Private residence - 21 Halloran Road, North Arm Cove	407795	6389868

KEY

- Site boundary
- Attended noise monitoring location
- Approved disturbance area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Waterbody
- NPWS reserve
- State forest

Attended noise monitoring locations

Source: EMM (2022); ADW Johnson (2020); DFSI (2017); ICSM (2012); GA (2011); ASGC (2006)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

Karuah East Quarry
Quarterly attended noise monitoring
Figure 1.1

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\\emmsvr1\EMM2\2022\E220174 - Karuah East Quarry Noise Monitoring 2022\8 GIS\02_Maps\G001_SiteLocation_20220718_01.mxd 18/07/2022

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1% of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1% of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10% of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50% of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90% of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Morning Shoulder	Monday – Saturday: 5 am to 7 am.

Appendix A provides further information that indicates how an average person perceives changes in noise levels and examples of common noise levels.

2 Noise limits

2.1 Project approval

Karuah East Quarry noise limits are detailed in Condition 3 of Project Approval (PA) 09_0175. Relevant sections of PA 09_0175 are reproduced in Appendix B.1.

2.2 Environment protection licence

Karuah East Quarry noise limits are detailed in Condition L4.1 of Environment Protection Licence (EPL) 20611. Relevant sections of EPL 20611 are reproduced in Appendix B.2.

2.3 Noise management plan

The approved Noise Management Plan (NMP) adopts five attended noise monitoring locations that are representative of residences outlined in PA 09_0175 and EPL 20611. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limit summary

Noise limits based on PA 09_0175 and EPL 20611 are as shown in Table 2.1.

Table 2.1 Noise limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Morning Shoulder $L_{Aeq,15minute}$	Morning Shoulder $L_{A1,1minute}$
A	42	40	35	52
B	40	40	35	52
F	40	35	35	52
G	43	39	35	52
H	44	46	35	52

Notes: 1. Morning shoulder period is from 5:00 am to 7:00 am Monday to Saturday as defined in Condition L4.2 of EPL 20611.

2.5 Meteorological conditions

PA 09_0175 specifies that noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017.

The EPA requirements in Condition L4.3 of EPL 20611 state that noise limits do not apply under the following meteorological conditions:

- wind speeds greater than 3 m/s at 10 m above ground level
- stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level, or
- stability category G temperature inversion conditions.

2.6 Additional considerations

Monitoring and reporting have been done in accordance with the NPfI and the NSW EPA 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

2.7 Very noise-enhancing meteorological conditions

In accordance with the approved methods, noise monitoring for the site is scheduled to occur during forecasted meteorological conditions where noise limits in Table 2.1 will be applicable. However, in cases where actual meteorological conditions do not align with forecasts and noise limits are subsequently not directly applicable, it is the expectation of regulators that noise impact still be managed.

The NPfI states that:

> Noise limits derived for consents and licences will apply under the meteorological conditions used in the environmental assessment process, that is, standard or noise-enhancing meteorological conditions. For 'very noise-enhancing meteorological conditions' … a limit is set based on the limit derived under standard or noise-enhancing conditions (whichever is adopted in the assessment) plus 5 dB. In this way a development is subject to noise limits under all meteorological conditions.

Therefore, if monthly noise monitoring occurs during meteorological conditions outside of those specified in Section 2.5, site limits will be adjusted based on Table 2.1 plus 5 dB.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the KEQ on-site meteorological station which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the morning shoulder, day and evening periods at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location using a hand held device.

Measured sound levels from various sources were noted during each measurement, and particular attention was given to the extent of the site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

Meteorological data for the monitoring period was sourced from the Karuah East Quarry on-site meteorological station (the site AWS) to determine the applicability of criteria in accordance with the EPL and PA.

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site-only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Site operations

As required by Condition R4.3(a) of the EPL, the operations occurring at the time of monitoring are summarised per period below:

- day
  - routine quarry operations in the quarry pit
  - routine plant processing operations
  - routine material transport from the quarry pit to the processing plant and product stockpile areas
  - routine product loading and dispatch to road trucks
- evening
  - routine material transport from the processing plant to product stockpile areas
  - routine maintenance activities of plant and equipment
- morning shoulder
  - routine maintenance activities of plant and equipment
  - routine product loading and dispatch to road trucks.

3.6 Instrumentation

Attended noise monitoring was conducted by Isaac Hepworth. Qualifications, experience, and/or demonstration of competence is in accordance with the Approved methods and supportive documentation is available upon request.

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Rion NA-28 sound level meter	00701424	01/06/2025	IEC 61672-1:2002
Pulsar Model 106 calibrator	81334	21/06/2024	IEC 60942:2003

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.1 Total measured noise levels – Q2 2024[1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
A	23/05/2024 05:00	56	54	52	49	48	45	36
B	23/05/2024 05:21	72	69	65	61	57	50	45
F	23/05/2024 05:44	61	58	54	52	51	48	45
G	23/05/2024 06:14	60	50	47	45	44	40	37
H	23/05/2024 06:37	60	52	46	44	43	41	38
H	23/05/2024 07:00	61	50	48	46	45	43	40
G	23/05/2024 07:21	55	51	48	47	46	44	42
F	23/05/2024 07:51	62	52	50	48	47	45	42
B	23/05/2024 08:13	70	68	65	62	60	56	48
A	23/05/2024 08:35	70	57	54	52	52	49	45
H	30/05/2024 18:00	44	41	38	36	36	34	31
G	30/05/2024 18:21	46	40	36	34	33	31	27
F	30/05/2024 18:49	52	50	48	45	44	41	37
B	30/05/2024 19:13	73	71	68	64	62	57	49
A	30/05/2024 19:34	68	65	58	55	54	45	38

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – Q2 2024

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction ° Magnetic north[1]	Cloud cover 1/8s
A	23/05/2024 05:00	14	<0.5	-	8
B	23/05/2024 05:21	15	<0.5	-	8
F	23/05/2024 05:44	11	<0.5	-	8
G	23/05/2024 06:14	11	<0.5	-	6
H	23/05/2024 06:37	14	<0.5	-	6
H	23/05/2024 07:00	15	<0.5	-	6
G	23/05/2024 07:21	16	<0.5	-	6
F	23/05/2024 07:51	13	0.6	180	6
B	23/05/2024 08:13	14	<0.5	-	7
A	23/05/2024 08:35	16	<0.5	-	7
H	30/05/2024 18:00	19	<0.5	-	3
G	30/05/2024 18:21	17	<0.5	-	3
F	30/05/2024 18:49	18	<0.5	-	6
B	30/05/2024 19:13	19	<0.5	-	6
A	30/05/2024 19:34	15	<0.5	-	6

Notes: 1. "-" indicates calm conditions at the monitoring location.

4.2 Site only noise levels

4.2.1 Modifying factors

No modifying factors were applicable during the survey, as defined in the NPfI.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data obtained from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – Q2 2024

Location	Start date and time (period)	Wind		Stability class	Very enhancing? [1]	Limit, dB		Site level, dB [2]		Exceedance	
		Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
A	23/05/2024 05:00 (MS)	0.6	265	F	N	35	52	IA	IA	No	No
B	23/05/2024 05:21 (MS)	0.3	243	F	N	35	52	IA	IA	No	No
F	23/05/2024 05:44 (MS)	0.8	263	F	N	35	52	IA	IA	No	No
G	23/05/2024 06:14 (MS)	0.6	278	B	N	35	52	<20	**55**	No	**Yes**
H	23/05/2024 06:37 (MS)	0.4	204	A	N	35	52	<20	50	No	No
H	23/05/2024 07:00 (D)	0.3	203	A	N	44	N/A	40	N/A	No	N/A
G	23/05/2024 07:21 (D)	0.9	282	A	N	43	N/A	36	N/A	No	N/A
F	23/05/2024 07:51 (D)	0.4	283	A	N	40	N/A	<20	N/A	No	N/A
B	23/05/2024 08:13 (D)	0.7	232	A	N	40	N/A	IA	N/A	No	N/A
A	23/05/2024 08:35 (D)	0.4	209	A	N	42	N/A	IA	N/A	No	N/A
H	30/05/2024 18:00 (E)	0.1	163	F	N	46	N/A	IA	N/A	No	N/A
G	30/05/2024 18:21 (E)	0.2	197	F	N	39	N/A	IA	N/A	No	N/A
F	30/05/2024 18:49 (E)	0.2	110	F	N	35	N/A	IA	N/A	No	N/A

Table 4.3 Site noise levels and limits – Q2 2024

Location	Start date and time (period)	Wind		Stability class	Very enhancing? [1]	Limit, dB		Site level, dB [2]		Exceedance	
		Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
B	30/05/2024 19:13 (E)	0.3	89	F	N	40	N/A	IA	N/A	No	N/A
A	30/05/2024 19:34 (E)	1.1	62	F	N	40	N/A	IA	N/A	No	N/A

Notes:
1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. Degrees magnetic north, "-" indicates calm conditions.
4. MS = Morning Shoulder period; D = Day period; E = Evening period.

5 Mitigation and management

5.1 Proposed management actions

EPL Condition 4.3(c) requires details of any management actions taken within the monitoring period to address any exceedances of the limits.

During the measurement at location G, starting at 6:14 am, the site L_{Amax} was measured at 55 dB which exceeded the morning shoulder limit of 52 dB by 3 dB. This was assessed as likely being attributable to truck impact and/or tailgate noise, possibly caused by potholes on the access road. It was noted at 240 degrees (magnetic) from the measurement location, which is in the general direction of the KEQ weighbridge/access road to Blue Rock Close.

The potholes occurred due to the consistent 20 to 30 mm of daily rainfall over the preceding week. These damages were repaired later in the day (23 May 2024), and truck drivers and operational staff were subject to toolbox talks regarding driving at appropriate speeds through noise sensitive features, such as the wheel wash, cattle grids, potholes and/or other road defects, at pre-start meetings the following morning.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Karuah East Quarry Pty Limited to conduct a quarterly noise survey of operations at the site. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified EPA and EPL noise limits.

Attended environmental noise monitoring described in this report was done during the morning shoulder and day periods on Thursday 23 May 2024 at five monitoring locations. Evening periods were also monitored on 30 May 2024 at five monitoring locations.

During the measurement at location G, starting at 6:14 am, the site L_{Amax} was measured at 55 dB which exceeded the morning shoulder limit of 52 dB by 3 dB. This was assessed as likely being attributable to truck impact and/or tailgate noise, possibly caused by potholes on the access road.

These potholes/road defects were repaired later in the day (23 May 2024), and truck drivers and operational staff were subject to toolbox talks regarding driving at appropriate speeds through noise sensitive features the at pre-start meetings following morning.

Appendix A

Noise perception and examples

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A.1 Noise levels

Table A.1 indicates how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
Up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

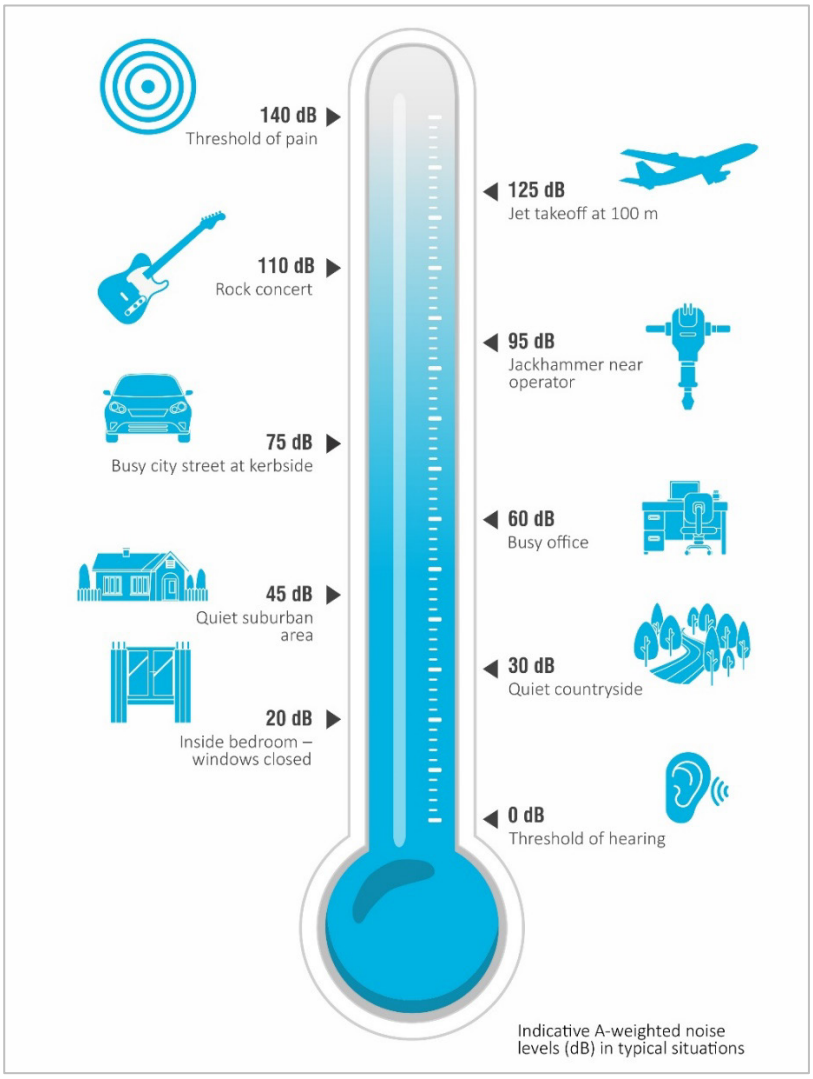

Figure A.1 Common noise levels

Appendix B
Regulator documents

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B.1 Project approval

SCHEDULE 3
ENVIRONMENTAL PERFORMANCE CONDITIONS

IDENTIFICATION OF APPROVED LIMITS OF EXTRACTION

1. The Applicant shall, prior to carrying out quarrying operations on the site:
   (a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction within the Extraction Area; and
   (b) submit a survey plan of the extraction boundaries,
   to the satisfaction of the Planning Secretary.

2. The Applicant must ensure that the extraction boundaries are clearly marked at all times while quarrying operations are being carried out, in a manner that allows the limits of extraction to be clearly identified.

NOISE

Operational Noise Criteria

3. Except for the carrying out of construction works, the Applicant must ensure that the operational noise generated by the development does not exceed the criteria in Table 2 at any residence[a] on privately-owned land.

Table 2: Operational noise criteria dB

Noise Assessment Location[a]	Morning Shoulder $L_{Aeq\ (15\ min)}$	Morning Shoulder L_{Amax}	Day $L_{Aeq\ (15\ min)}$	Evening $L_{Aeq\ (15\ min)}$
A	35	52	42	40
B	35	52	40	40
G	35	52	43	39
H	35	52	44	46
I	35	52	40	37
All other residences	35	52	40	35

[a] Noise Assessment Locations referred to in Table 2 are shown in Appendix 2.

Noise generated by the development must be monitored and measured in accordance with the relevant procedures and modifications (including certain meteorological conditions) of the NPfI.

3A. The noise criteria in Table 2 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Road Traffic Noise Criteria

4. The Applicant must take all reasonable and feasible measures to ensure that the traffic noise generated by the development does not cause additional exceedances of the criteria in Table 3 at any residence on privately-owned land.

Table 3: Road traffic noise criteria

Road	***Criteria (Day[a])***
Pacific Highway	60 dB(A) $L_{Aeq\ (15\ hour)}$
Local roads	55 dB(A) $L_{Aeq\ (1\ hour)}$

[a] *Day is the period from 7 am to 10 pm every day in accordance with the EPA's NSW Road Noise Policy (2011).*

5. Deleted

Noise Operating Conditions

6. The Applicant must:
   (a) take all reasonable steps to minimise noise from construction and operational activities, including low frequency noise and other audible characteristics, associated with the development;
   (b) implement reasonable and feasible noise attenuation measures on all plant and equipment that will operate in noise sensitive areas;
   (c) operate a comprehensive noise management system commensurate with the risk of impact;
   (d) take all reasonable steps to minimise the noise impacts of the development during noise-enhancing meteorological conditions when the noise criteria in this consent do not apply (see NPfI);
   (e) carry out quarterly attended noise monitoring (unless otherwise agreed by the Planning Secretary) to determine whether the development is complying with the relevant conditions of this consent; and
   (f) regularly assess the noise monitoring data and modify or stop operations on the site to ensure compliance with the relevant conditions of this consent.

Noise Management Plan

7. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
   (b) be prepared in consultation with the EPA;
   (c) describe the measures to be implemented to ensure:
      (i) compliance with the noise criteria and operating conditions in this consent;
      (ii) best practice management is being employed;
      (iii) noise impacts of the development are minimised during noise-enhancing meteorological conditions when the noise criteria in this consent do not apply (see NPfI);
   (d) describe the noise management system in detail; and
   (e) include a monitoring program that:
      (i) is capable of evaluating the performance of the development;
      (ii) monitors noise at the nearest and/or most affected residences;
      (iii) adequately supports the noise management system;
      (iv) includes a protocol for distinguishing noise emissions of the development from any neighbouring developments; and
      (v) includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of any such event.

7A. The Applicant must implement the plan as approved by the Planning Secretary.

BLASTING

Blasting Criteria

8. The Applicant must ensure that blasting on the site does not cause exceedances of the criteria in Table 5.

B.2 Environmental protection licence

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.

L4 Noise limits

L4.1 Noise generated at the premises must not exceed the noise limits in the table below. The locations referred to in the table below are indicated in Table 2: Operational Noise Criteria, and Figure 1 of the document titled Project Approval 09_0175 Modification 9 (MOD 9) Department of Planning, Industry& Environment - which has been filed on EPA file Doc22/715570-1.

Noise Assesment Location	Morning Shoulder LAeq(15 min)	Morning shoulder LAmax	Day LAeq (15 min)	Evening LAeq (15 min)
A (74 Mill Hill Close, Karuah, Lot 100 DP 1028885)	35	52	42	40
B (64 Mill Hill Close, Karuah, Lot 3 DP785172)	35	52	40	40
G (2 Halloran Road, North Arm Cove Lot 1 DP1032636)	35	52	43	39
H (21 Halloran Road, North Arm Cove Lot 10 DP1032636)	35	52	44	46
All other residences	35	52	40	35

L4.2 Noise limit definitions - For the purpose of the table at L4.1, the following definitions apply:
Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays;
Morning Shoulder is defined as the period from 5:00am to 7:00am Monday to Saturday;
Evening is defined as the period from 6:00pm to 10:00pm Monday to Saturday.

L4.3 The noise limits set out in this licence apply under all meteorological conditions except for the following:
a) Wind speed greater than 3 metres/second at 10 metres above ground level; or
b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Stability category G temperature inversion conditions.

L4.4 **Determining Compliance**

To determine compliance with the noise limits set out in the table above, the licensee must locate monitoring equipment:
a) within 30 metres of a dwelling façade (but not closer than 3 metres) where any dwelling on the property is situated more than 30 metres from the property boundary that is closest to the premises;
b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises;
c) at the most affected point at a location where there is no dwelling at the location; and
d) within approximately 50 metres of the boundary of a national park or nature reserve.

Note: A non-compliance of the Noise Limits table will still occur where noise generated from the premises in excess of the appropriate limit is measured:
i) at a location other than an area prescribed in part (a) and part (b); and/or
ii) at a point other than the most affected point at a location.

L4.5 For the purposes of determining the noise generated at the premises the modification factors in Fact Sheet C of the EPA's "Noise Policy for Industry" must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L5 Blasting

L5.1 Blasting in or on the premises must only be carried out between the hours of 9:00 am and 4:00 pm Monday to Friday. No blasting is permitted on Saturdays, Sundays or public holidays. Blasting outside of the hours specified in this condition can only take place with the written approval of the EPA.

L5.2 Blasting is not permitted simultaneously with adjacent quarry(s).

L5.3 The airblast overpressure level from blasting operations in or on the premises must not exceed:
a) 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period; and
b) 120 dB (Lin Peak) at any time,
at monitoring point 11 detailed in Condition P1.4.

L5.4 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed:
a) 5 mm/second for more than 5% of the total number of blasts during each reporting period; and
b) 10 mm/second at any time,
at monitoring point 11 detailed in Condition P1.4.

L5.5 Error margins associated with any monitoring equipment used to measure airblast overpressure or peak particle velocity are not to be taken into account in determing whether or not the limit has been exceeded.

L5.6 The airblast overpressure and ground vibration levels in the conditions above do not apply at noise sensitive locations that are owned by the licensee or subject to a private agreement, relating to airblast overpressure and ground vibration levels, between the licensee and land owner.

L5.7 Offensive blast fume must not be emitted from the premises.

Definition:

d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M6 Telephone complaints line

M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M6.3 The preceding two conditions do not apply until 1 month after the date of the issue of this licence.

M7 Blasting

M7.1 To determine complaince with Blast Limit conditions of this licence:
a) Airblast overpressure and ground vibration levels must be measured and electronically recorded for monitoring point 11 for the parameters specified in Column 1 of the table below; and
b) The licensee must use the units of measure, sampling method, and sample at the frequency specified opposite in the other columns.

Parameter	Units of Measure	Frequency	Sampling Method
Airblast Overpressure	Decibels (Linear Peak	All blasts	Australian Standard AS 2187.2-2006
Ground Vibration Peak Particle Velocity	millimetres/second	All blasts	Australian Standard AS 2187.2-2006

M8 Noise monitoring

M8.1 To assess compliance with the noise limits for this premises attended noise monitoring must be undertaken in accordance with all noise conditions and:
a) during a period of normal quarry operations;
b) at each one of the locations listed in the noise limits table of this licence;
c) occur quarterly in the reporting period;
d) occur during each day period as defined in the NSW Noise Policy for Industry.

.

Note: Quarterly attended noise monitoring must be completed (unless otherwise agreed by the Planning

Secretary) to determine whether the development is complying with the relevant conditions of this consent. The frequency of noise monitoring will be reviewed, upon request.

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after

B.3 Noise management plan

5 Noise limits

5.1 Operational noise

Condition 3 of Schedule 3 of PA 09_0175 provides the operational noise limits for KEQ. These are reproduced in Table 5.1.

Table 5.1 Operational noise criteria (dB) from Table 2 of PA 09_0175

Noise Assessment Location[1]	Morning Shoulder $L_{Aeq(15\ minute)}$	Morning Shoulder L_{Amax}	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$
A	35	52	42	40
B	35	52	40	40
G	35	52	43	39
H	35	52	44	46
I	35	52	40	37
All other residences	35	52	40	35

Noise assessment locations are shown in Figure 3.1.

Noise generated by the development must be monitored and measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NPfI (EPA 2017).

The noise limits provided in Table 5.1 apply under standard and noise-enhancing meteorological conditions (as defined in the NPfI) determined by monitoring at the relevant weather station. In accordance with Condition L4.3 of EPL 20611 and consistent with Condition 3 of Schedule 3 of PA 09_0175 the noise limits provided in Table 5.1 apply under all meteorological conditions except for the following:

- wind speeds greater than 3m/s at 10m above ground level;
- stability category F temperature inversion conditions and wind speeds greater then 2m/s at 10m above ground level; or
- stability category G temperature inversion conditions.

In accordance with Fact Sheet D of the NPfI, for 'very noise enhancing meteorological conditions' the applicable noise limit is set at 5dB above those provided in Table 5.1.

Noise limits do not apply if Karuah East has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and Karuah East has advised the Department in writing of the terms of this agreement.

5.2 Road traffic noise

Condition 4 of Schedule 3 of PA 09_0175 states that all reasonable and feasible measures must be taken to ensure that the traffic generated by KEQ does not cause additional exceedances of the criteria provided in Table 5.2 at any residence on privately-owned land.

Appendix C
Calibration certificates

EMM
creating opportunities

C.1 Calibration certificates

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter

IEC 61672-3:2013

Calibration Certificate

Calibration Number C23317

Client Details EMM Consulting
Level 3, 175 Scott Street
Newcastle NSW 2300

Equipment Tested/ Model Number : NA-28
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463
Firmware Version : 2.0

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	24°C	**Ambient Temperature :**	22.6°C
Relative Humidity :	46%	**Relative Humidity :**	46.6%
Barometric Pressure :	100.6kPa	**Barometric Pressure :**	100.6kPa

Calibration Technician : Max Moore
Calibration Date : 1 Jun 2023
Secondary Check: Dylan Selge
Report Issue Date : 2 Jun 2023

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13dB*	*Temperature*	*±0.1°C*
1kHz	*±0.13dB*	*Relative Humidity*	*±1.9%*
8kHz	*±0.14dB*	*Barometric Pressure*	*±0.014kPa*
Electrical Tests	*±0.13dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1

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Sound Calibrator

IEC 60942:2017

Calibration Certificate

Calibration Number C23389

Client Details EMM Consulting
Level 3, 175 Scott Street
Newcastle NSW 2300

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 81334

Atmospheric Conditions

Ambient Temperature : 22.6°C
Relative Humidity : 35.5%
Barometric Pressure : 101.43kPa

Calibration Technician : Shaheen Boaz
Calibration Date : 21 Jun 2023
Secondary Check: Dhanush Bonu
Report Issue Date : 21 Jun 2023

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.18	1000.30

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.10dB*	*Temperature*	*±0.1°C*
Frequency	*±0.07%*	*Relative Humidity*	*±1.9%*
Distortion	*±0.20%*	*Barometric Pressure*	*±0.014kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

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Karuah East Quarry

Quarterly attended noise monitoring - Q3 2024

Prepared for Karuah East Quarry Pty Limited

August 2024

Karuah East Quarry

Quarterly attended noise monitoring - Q3 2024

Karuah East Quarry Pty Limited

E240073 RP#4

August 2024

Version	Date	Prepared by	Reviewed by	Comments
1	30 August 2024	Lucas Adamson	Najah Ishac	Final

Approved by

Najah Ishac
Director
30 August 2024

Level 3 175 Scott Street
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This report has been prepared in accordance with the brief provided by Karuah East Quarry Pty Limited and, in its preparation, EMM has relied upon the information collected at the times and under the conditions specified in this report. All findings, conclusions or recommendations contained in this report are based on those aforementioned circumstances. The contents of this report are private and confidential. This report is only for Karuah East Quarry Pty Limited's use in accordance with its agreement with EMM and is not to be relied on by or made available to any other party without EMM's prior written consent. Except as permitted by the Copyright Act 1968 (Cth) and only to the extent incapable of exclusion, any other use (including use or reproduction of this report for resale or other commercial purposes) is prohibited without EMM's prior written consent. Except where expressly agreed to by EMM in writing, and to the extent permitted by law, EMM will have no liability (and assumes no duty of care) to any person in relation to this document, other than to Karuah East Quarry Pty Limited (and subject to the terms of EMM's agreement with Karuah East Quarry Pty Limited).

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Karuah East Quarry Pty Limited to conduct a quarterly noise survey of operations at Karuah East Quarry (KEQ, the site) located at Blue Rock Close, Karuah NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

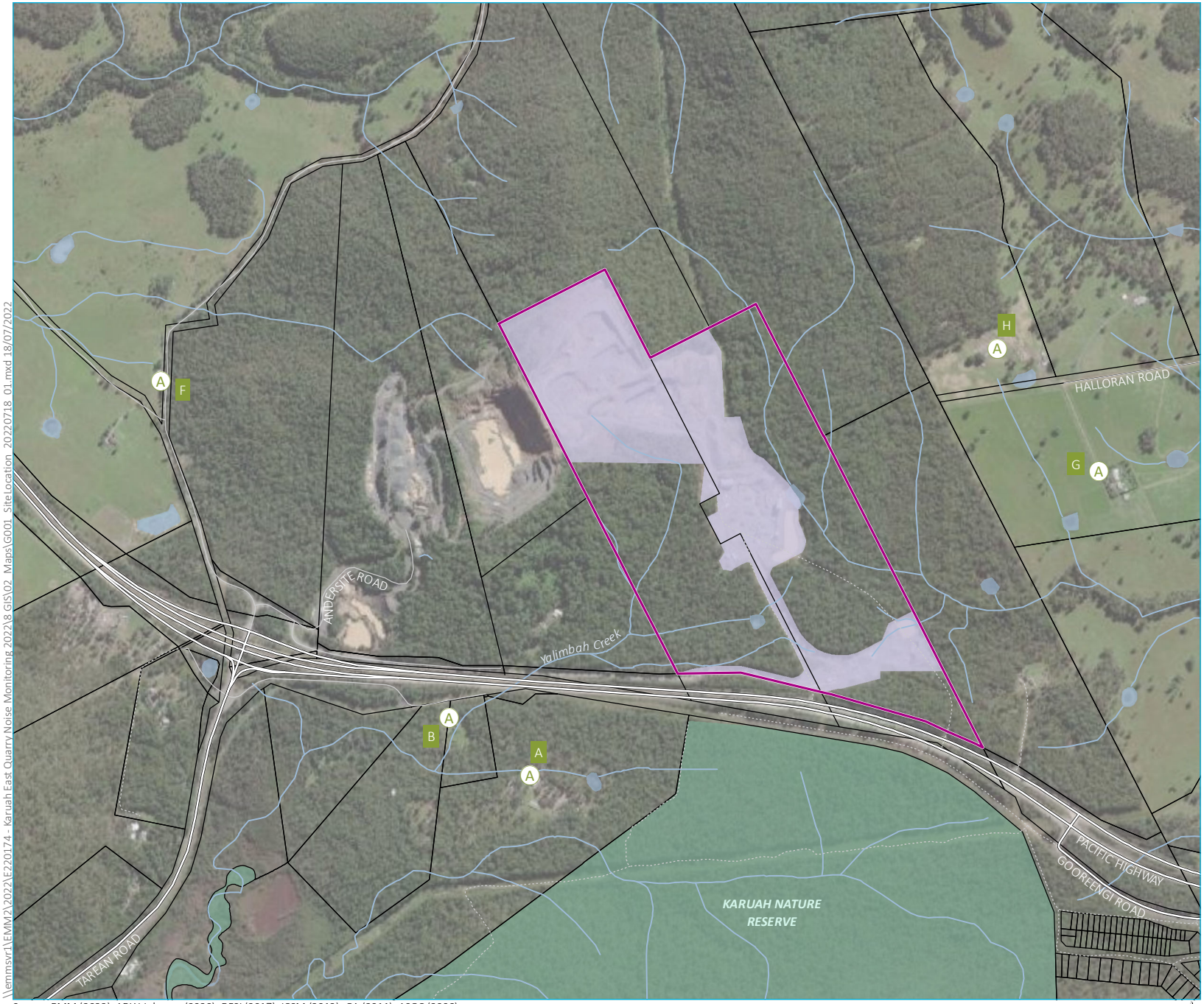
Attended environmental noise monitoring described in this report was done during morning shoulder and day periods on Friday 9 August 2024 and during the evening period on Tuesday 27 August 2024 at five monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
A	Private residence - 74 Mill Hill Close, Karuah	406623	6388704
B	Private residence - 64 Mill Hill Close, Karuah	406405	6388859
F	Private residence - 1714 The Branch Lane, Karuah	405639	6389782
G	Private residence - 2 Halloran Road, North Arm Cove	405629	6389766
H	Private residence - 21 Halloran Road, North Arm Cove	407795	6389868



KEY

- Site boundary
- Attended noise monitoring location
- Approved disturbance area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Waterbody
- NPWS reserve
- State forest

Attended noise monitoring locations

Source: EMM (2022); ADW Johnson (2020); DFSI (2017); ICSM (2012); GA (2011); ASGC (2006)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

Karuah East Quarry
Quarterly attended noise monitoring
Figure 1.1

EMM creating opportunities

\\emmsvr1\EMM2\2022\E220174 - Karuah East Quarry Noise Monitoring 2022\8 GIS\02 Maps\G001 Site Location 20220718 01.mxd 18/07/2022

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 per cent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 per cent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Morning Shoulder	Monday – Saturday: 5 am to 7 am.

Appendix A provides further information that indicates how an average person perceives changes in noise levels and examples of common noise levels.

2 Noise limits

2.1 Project approval

Karuah East Quarry noise limits are detailed in Condition 3 of Project Approval (PA) 09_0175. Relevant sections of PA 09_0175 are reproduced in Appendix B.1.

2.2 Environment protection licence

Karuah East Quarry noise limits are detailed in Condition L4.1 of Environment Protection Licence (EPL) 20611. Relevant sections of EPL 20611 are reproduced in Appendix B.2.

2.3 Noise management plan

The approved Noise Management Plan (NMP) adopts five attended noise monitoring locations that are representative of residences outlined in PA 09_0175 and EPL 20611. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limit summary

Noise limits based on PA 09_0175 and EPL 20611 are as shown in Table 2.1.

Table 2.1 Noise limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Morning Shoulder $L_{Aeq,15minute}$	Morning Shoulder $L_{A1,1minute}$
A	42	40	35	52
B	40	40	35	52
F	40	35	35	52
G	43	39	35	52
H	44	46	35	52

Notes: 1. Morning shoulder period is from 5:00 am to 7:00 am Monday to Saturday as defined in Condition L4.2 of EPL 20611.

2.5 Meteorological conditions

PA 09_0175 specifies that noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017.

The EPA requirements in Condition L4.3 of EPL 20611 state that noise limits do not apply under the following meteorological conditions:

- wind speeds greater than 3 m/s at 10 m above ground level;
- stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level; or
- stability category G temperature inversion conditions.

2.6 Additional considerations

Monitoring and reporting have been done in accordance with the NPfI and the NSW EPA 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

2.7 Very noise-enhancing meteorological conditions

In accordance with the approved methods, noise monitoring for the site is scheduled to occur during forecasted meteorological conditions where noise limits in Table 2.1 will be applicable. However, in cases where actual meteorological conditions do not align with forecasts and noise limits are subsequently not directly applicable, it is the expectation of regulators that noise impact still be managed.

The NPfI states that:

> Noise limits derived for consents and licences will apply under the meteorological conditions used in the environmental assessment process, that is, standard or noise-enhancing meteorological conditions. For 'very noise-enhancing meteorological conditions' … a limit is set based on the limit derived under standard or noise-enhancing conditions (whichever is adopted in the assessment) plus 5 dB. In this way a development is subject to noise limits under all meteorological conditions.

Therefore, if monthly noise monitoring occurs during meteorological conditions outside of those specified in Section 2.5, site limits will be adjusted based on Table 2.1 plus 5 dB.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the KEQ on-site meteorological station which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the morning shoulder, day and evening periods at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location using a hand held device.

Measured sound levels from various sources were noted during each measurement, and particular attention was given to the extent of the site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

Meteorological data for the monitoring period was sourced from the Karuah East Quarry on-site meteorological station (the site AWS) to determine the applicability of criteria in accordance with the EPL and PA.

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site-only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Site operations

As required by Condition R4.3(a) of the EPL, the operations occurring at the time of monitoring are summarised per period below:

- Day
  - Routine quarry operations in the quarry pit
  - Routine plant processing operations
  - Routine material transport from the quarry pit to the processing plant and product stockpile areas
  - Routine product loading and dispatch to road trucks
- Evening
  - Routine material transport from the processing plant to product stockpile areas
  - Routine maintenance activities of plant and equipment
- Morning shoulder
  - Routine maintenance activities of plant and equipment
  - Routine product loading and dispatch to road trucks

3.6 Instrumentation

Attended noise monitoring was conducted by Lucas Adamson. Qualifications, experience, and/or demonstration of competence is in accordance with the Approved methods and supportive documentation is available upon request.

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær 2250 sound level meter	3029363	3/11/2024	IEC 61672-1:2002
Svantek SV-36 calibrator	79952	27/9/2025	IEC 60942

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.1 Total measured noise levels – Q3 2024[1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
A	9/8/2024 5:00	58	55	53	50	49	46	41
B	9/8/2024 5:17	78	75	68	65	59	52	44
F	9/8/2024 5:35	80	65	53	56	49	45	39
G	9/8/2024 5:59	62	56	45	44	39	37	34
H	9/8/2024 6:17	67	51	43	43	40	38	35
H	9/8/2024 7:00	62	56	48	45	42	40	37
G	9/8/2024 7:18	63	54	47	46	44	42	40
F	9/8/2024 7:41	83	67	53	56	48	45	42
B	9/8/2024 8:00	77	74	69	66	64	58	52
A	9/8/2024 8:18	67	63	55	53	52	49	46
A	28/8/2024 18:09	89	78	59	65	54	50	45
B	28/8/2024 18:26	77	74	69	65	61	55	48
F	28/8/2024 18:45	75	59	56	53	51	47	43
G	28/8/2024 19:08	56	44	42	40	39	37	35
H	28/8/2024 19:27	54	47	42	40	39	36	34

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – Q3 2024

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction ° Magnetic north[1]	Cloud cover 1/8s
A	9/8/2024 5:00	7.5	<0.5	-	0
B	9/8/2024 5:17	7.7	<0.5	-	0
F	9/8/2024 5:35	7.8	<0.5	-	0
G	9/8/2024 5:59	7.4	<0.5	-	0
H	9/8/2024 6:17	7.8	<0.5	-	0
H	9/8/2024 7:00	8.1	<0.5	-	0
G	9/8/2024 7:18	7.9	<0.5	-	1
F	9/8/2024 7:41	8.8	<0.5	-	2
B	9/8/2024 8:00	10.1	<0.5	-	2
A	9/8/2024 8:18	10.8	<0.5	-	2
A	28/8/2024 18:09	18.6	<0.5	-	0
B	28/8/2024 18:26	18.8	<0.5	-	0
F	28/8/2024 18:45	18.5	<0.5	-	0
G	28/8/2024 19:08	18.2	<0.5	-	0
H	28/8/2024 19:27	18.0	<0.5	-	0

Notes: 1. "-" indicates calm conditions at the monitoring location.

4.2 Site only noise levels

4.2.1 Modifying factors

No modifying factors were applicable during the survey, as defined in the NPfI.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data obtained from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – Q3 2024

Location	Start Date and Time (Period)	Wind		Stability Class	Very enhancing? [1]	Limit, dB		Site level, dB [2]		Exceedance	
		Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
A	9/8/2024 5:00 (MS)	0.2	56	F	No	35	52	IA	IA	No	No
B	9/8/2024 5:17 (MS)	0.2	17	F	No	35	52	IA	IA	No	No
F	9/8/2024 5:35 (MS)	0.4	37	F	No	35	52	IA	IA	No	No
G	9/8/2024 5:59 (MS)	0.3	347	F	No	35	52	NM	48	No	No
H	9/8/2024 6:17 (MS)	0.1	40	F	No	35	52	NM	46	No	No
H	9/8/2024 7:00 (D)	0.1	0	A	No	44	N/A	<40	N/A	No	N/A
G	9/8/2024 7:18 (D)	0.1	339	A	No	43	N/A	39	N/A	No	N/A
F	9/8/2024 7:41 (D)	0.1	315	A	No	40	N/A	IA	N/A	No	N/A
B	9/8/2024 8:00 (D)	0.3	211	A	No	40	N/A	IA	N/A	No	N/A
A	9/8/2024 8:18 (D)	0.5	257	A	No	42	N/A	IA	N/A	No	N/A
A	28/8/2024 18:09 (E)	0.3	283	F	No	40	N/A	IA	N/A	No	N/A
B	28/8/2024 18:26 (E)	0.1	203	F	No	40	N/A	IA	N/A	No	N/A
F	28/8/2024 18:45 (E)	0.2	83	F	No	35	N/A	IA	N/A	No	N/A
G	28/8/2024 19:08 (E)	0.3	302	F	No	39	N/A	IA	N/A	No	N/A

Table 4.3 Site noise levels and limits – Q3 2024

Location	Start Date and Time (Period)	Wind		Stability Class	Very enhancing? [1]	Limit, dB		Site level, dB [2]		Exceedance	
		Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
H	28/8/2024 19:27 (E)	0.3	241	F	No	46	N/A	IA	N/A	No	N/A

Notes:
1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. Degrees magnetic north, "-" indicates calm conditions.
4. MS = Morning Shoulder period; D = Day period; E = Evening period.

5 Mitigation and management

5.1 Proposed management actions

EPL Condition 4.3(c) requires details of any management actions taken within the monitoring period to address any exceedances of the limits. As there were no exceedances, no management actions were required.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Karuah East Quarry Pty Limited to conduct a quarterly noise survey of operations at the site. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified PA and EPL noise limits.

Attended environmental noise monitoring described in this report was done during the morning shoulder and day periods on Friday 9 August 2024 and during the evening period on Tuesday 27 August 2024 at five monitoring locations.

Noise levels from the site complied with relevant limits at all monitoring locations during the Q3 2024 survey.

Appendix A

Noise perception and examples

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A.1 Noise levels

Table A.1 indicates how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

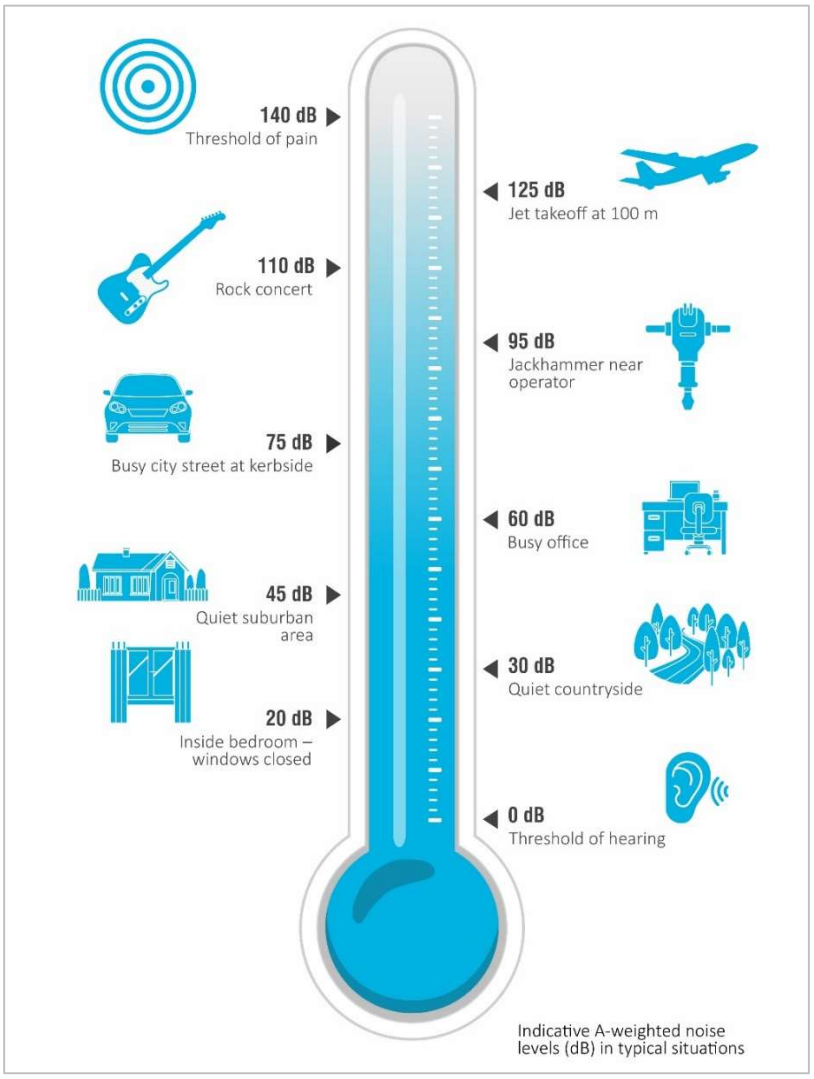

Figure A.1 Common noise levels

Appendix B

Regulator documents

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B.1 Project approval

SCHEDULE 3
ENVIRONMENTAL PERFORMANCE CONDITIONS

IDENTIFICATION OF APPROVED LIMITS OF EXTRACTION

1. The Applicant shall, prior to carrying out quarrying operations on the site:
   (a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction within the Extraction Area; and
   (b) submit a survey plan of the extraction boundaries,
   to the satisfaction of the Planning Secretary.

2. The Applicant must ensure that the extraction boundaries are clearly marked at all times while quarrying operations are being carried out, in a manner that allows the limits of extraction to be clearly identified.

NOISE

Operational Noise Criteria

3. Except for the carrying out of construction works, the Applicant must ensure that the operational noise generated by the development does not exceed the criteria in Table 2 at any residence[a] on privately-owned land.

Table 2: Operational noise criteria dB

Noise Assessment Location[a]	Morning Shoulder $L_{Aeq\ (15\ min)}$	Morning Shoulder L_{Amax}	Day $L_{Aeq\ (15\ min)}$	Evening $L_{Aeq\ (15\ min)}$
A	35	52	42	40
B	35	52	40	40
G	35	52	43	39
H	35	52	44	46
I	35	52	40	37
All other residences	35	52	40	35

[a] Noise Assessment Locations referred to in Table 2 are shown in Appendix 2.

Noise generated by the development must be monitored and measured in accordance with the relevant procedures and modifications (including certain meteorological conditions) of the NPfI.

3A. The noise criteria in Table 2 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Road Traffic Noise Criteria

4. The Applicant must take all reasonable and feasible measures to ensure that the traffic noise generated by the development does not cause additional exceedances of the criteria in Table 3 at any residence on privately-owned land.

Table 3: Road traffic noise criteria

Road	***Criteria (Day[a])***
Pacific Highway	60 dB(A) $L_{Aeq\ (15\ hour)}$
Local roads	55 dB(A) $L_{Aeq\ (1\ hour)}$

[a] *Day is the period from 7 am to 10 pm every day in accordance with the EPA's NSW Road Noise Policy (2011).*

5. Deleted

Noise Operating Conditions

6. The Applicant must:
   (a) take all reasonable steps to minimise noise from construction and operational activities, including low frequency noise and other audible characteristics, associated with the development;
   (b) implement reasonable and feasible noise attenuation measures on all plant and equipment that will operate in noise sensitive areas;
   (c) operate a comprehensive noise management system commensurate with the risk of impact;
   (d) take all reasonable steps to minimise the noise impacts of the development during noise-enhancing meteorological conditions when the noise criteria in this consent do not apply (see NPfI);
   (e) carry out quarterly attended noise monitoring (unless otherwise agreed by the Planning Secretary) to determine whether the development is complying with the relevant conditions of this consent; and
   (f) regularly assess the noise monitoring data and modify or stop operations on the site to ensure compliance with the relevant conditions of this consent.

Noise Management Plan

7. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
   (b) be prepared in consultation with the EPA;
   (c) describe the measures to be implemented to ensure:
      (i) compliance with the noise criteria and operating conditions in this consent;
      (ii) best practice management is being employed;
      (iii) noise impacts of the development are minimised during noise-enhancing meteorological conditions when the noise criteria in this consent do not apply (see NPfI);
   (d) describe the noise management system in detail; and
   (e) include a monitoring program that:
      (i) is capable of evaluating the performance of the development;
      (ii) monitors noise at the nearest and/or most affected residences;
      (iii) adequately supports the noise management system;
      (iv) includes a protocol for distinguishing noise emissions of the development from any neighbouring developments; and
      (v) includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of any such event.

7A. The Applicant must implement the plan as approved by the Planning Secretary.

BLASTING

Blasting Criteria

8. The Applicant must ensure that blasting on the site does not cause exceedances of the criteria in Table 5.

B.2 Environmental protection licence

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.

L4 Noise limits

L4.1 Noise generated at the premises must not exceed the noise limits in the table below. The locations referred to in the table below are indicated in Table 2: Operational Noise Criteria, and Figure 1 of the document titled Project Approval 09_0175 Modification 9 (MOD 9) Department of Planning, Industry& Environment - which has been filed on EPA file Doc22/715570-1.

Noise Assesment Location	Morning Shoulder LAeq(15 min)	Morning shoulder LAmax	Day LAeq (15 min)	Evening LAeq (15 min)
A (74 Mill Hill Close, Karuah, Lot 100 DP 1028885)	35	52	42	40
B (64 Mill Hill Close, Karuah, Lot 3 DP785172)	35	52	40	40
G (2 Halloran Road, North Arm Cove Lot 1 DP1032636)	35	52	43	39
H (21 Halloran Road, North Arm Cove Lot 10 DP1032636)	35	52	44	46
All other residences	35	52	40	35

L4.2 Noise limit definitions - For the purpose of the table at L4.1, the following definitions apply:
Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays;
Morning Shoulder is defined as the period from 5:00am to 7:00am Monday to Saturday;
Evening is defined as the period from 6:00pm to 10:00pm Monday to Saturday.

L4.3 The noise limits set out in this licence apply under all meteorological conditions except for the following:
a) Wind speed greater than 3 metres/second at 10 metres above ground level; or
b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Stability category G temperature inversion conditions.

L4.4 **Determining Compliance**

To determine compliance with the noise limits set out in the table above, the licensee must locate monitoring equipment:
a) within 30 metres of a dwelling façade (but not closer than 3 metres) where any dwelling on the property is situated more than 30 metres from the property boundary that is closest to the premises;
b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises;
c) at the most affected point at a location where there is no dwelling at the location; and
d) within approximately 50 metres of the boundary of a national park or nature reserve.

Note: A non-compliance of the Noise Limits table will still occur where noise generated from the premises in excess of the appropriate limit is measured:
i) at a location other than an area prescribed in part (a) and part (b); and/or
ii) at a point other than the most affected point at a location.

L4.5 For the purposes of determining the noise generated at the premises the modification factors in Fact Sheet C of the EPA's "Noise Policy for Industry" must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L5 Blasting

L5.1 Blasting in or on the premises must only be carried out between the hours of 9:00 am and 4:00 pm Monday to Friday. No blasting is permitted on Saturdays, Sundays or public holidays. Blasting outside of the hours specified in this condition can only take place with the written approval of the EPA.

L5.2 Blasting is not permitted simultaneously with adjacent quarry(s).

L5.3 The airblast overpressure level from blasting operations in or on the premises must not exceed:
a) 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period; and
b) 120 dB (Lin Peak) at any time,
at monitoring point 11 detailed in Condition P1.4.

L5.4 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed:
a) 5 mm/second for more than 5% of the total number of blasts during each reporting period; and
b) 10 mm/second at any time,
at monitoring point 11 detailed in Condition P1.4.

L5.5 Error margins associated with any monitoring equipment used to measure airblast overpressure or peak particle velocity are not to be taken into account in determing whether or not the limit has been exceeded.

L5.6 The airblast overpressure and ground vibration levels in the conditions above do not apply at noise sensitive locations that are owned by the licensee or subject to a private agreement, relating to airblast overpressure and ground vibration levels, between the licensee and land owner.

L5.7 Offensive blast fume must not be emitted from the premises.

Definition:

d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M6 Telephone complaints line

M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M6.3 The preceding two conditions do not apply until 1 month after the date of the issue of this licence.

M7 Blasting

M7.1 To determine complaince with Blast Limit conditions of this licence:
a) Airblast overpressure and ground vibration levels must be measured and electronically recorded for monitoring point 11 for the parameters specified in Column 1 of the table below; and
b) The licensee must use the units of measure, sampling method, and sample at the frequency specified opposite in the other columns.

Parameter	Units of Measure	Frequency	Sampling Method
Airblast Overpressure	Decibels (Linear Peak	All blasts	Australian Standard AS 2187.2-2006
Ground Vibration Peak Particle Velocity	millimetres/second	All blasts	Australian Standard AS 2187.2-2006

M8 Noise monitoring

M8.1 To assess compliance with the noise limits for this premises attended noise monitoring must be undertaken in accordance with all noise conditions and:
a) during a period of normal quarry operations;
b) at each one of the locations listed in the noise limits table of this licence;
c) occur quarterly in the reporting period;
d) occur during each day period as defined in the NSW Noise Policy for Industry.

.

Note: Quarterly attended noise monitoring must be completed (unless otherwise agreed by the Planning

Secretary) to determine whether the development is complying with the relevant conditions of this consent. The frequency of noise monitoring will be reviewed, upon request.

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after

B.3 Noise management plan

5 Noise limits

5.1 Operational noise

Condition 3 of Schedule 3 of PA 09_0175 provides the operational noise limits for KEQ. These are reproduced in Table 5.1.

Table 5.1 Operational noise criteria (dB) from Table 2 of PA 09_0175

Noise Assessment Location[1]	Morning Shoulder $L_{Aeq(15\ minute)}$	Morning Shoulder L_{Amax}	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$
A	35	52	42	40
B	35	52	40	40
G	35	52	43	39
H	35	52	44	46
I	35	52	40	37
All other residences	35	52	40	35

Noise assessment locations are shown in Figure 3.1.

Noise generated by the development must be monitored and measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NPfI (EPA 2017).

The noise limits provided in Table 5.1 apply under standard and noise-enhancing meteorological conditions (as defined in the NPfI) determined by monitoring at the relevant weather station. In accordance with Condition L4.3 of EPL 20611 and consistent with Condition 3 of Schedule 3 of PA 09_0175 the noise limits provided in Table 5.1 apply under all meteorological conditions except for the following:

- wind speeds greater than 3m/s at 10m above ground level;
- stability category F temperature inversion conditions and wind speeds greater then 2m/s at 10m above ground level; or
- stability category G temperature inversion conditions.

In accordance with Fact Sheet D of the NPfI, for 'very noise enhancing meteorological conditions' the applicable noise limit is set at 5dB above those provided in Table 5.1.

Noise limits do not apply if Karuah East has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and Karuah East has advised the Department in writing of the terms of this agreement.

5.2 Road traffic noise

Condition 4 of Schedule 3 of PA 09_0175 states that all reasonable and feasible measures must be taken to ensure that the traffic generated by KEQ does not cause additional exceedances of the criteria provided in Table 5.2 at any residence on privately-owned land.

Appendix C
Calibration certificates

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C37508

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV 36 **Serial No:** 79952
Class: 1
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1005	hPa ±1 hPa	**Date of Receipt :**	26/09/2023
Temperature	23	°C ±1° C	**Date of Calibration :**	27/09/2023
Relative Humidity	47	% ±5%	**Date of Issue :**	28/09/2023

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

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Head Office & Calibration Laboratory
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www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34169

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B & K		
Type No:	2250	**Serial No:**	3029363
Mic. Type:	4189	**Serial No:**	3260501
Pre-Amp. Type:	ZC0032	**Serial No:**	30109
Filter Type:	1/3 Octave	**Test No:**	F034175

Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	02/11/2022
Temperature	24	°C ±1° C	**Date of Calibration :**	03/11/2022
Relative Humidity	35	% ±5%	**Date of Issue :**	04/11/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Jack Kielt

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Karuah East Quarry

Quarterly attended noise monitoring - Q4 2024

Prepared for Karuah East Quarry Pty Limited

November 2024

Karuah East Quarry

Quarterly attended noise monitoring - Q4 2024

Karuah East Quarry Pty Limited

E240073 RP#5

November 2024

Version	Date	Prepared by	Reviewed by	Comments
1	29 November 2024	Lucas Adamson	Robert Kirwan	Final

Approved by

Robert Kirwan
Associate Acoustics Consultant
29 November 2024

Level 3 175 Scott Street
Newcastle NSW 2300
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This report has been prepared in accordance with the brief provided by Karuah East Quarry Pty Limited and, in its preparation, EMM has relied upon the information collected at the times and under the conditions specified in this report. All findings, conclusions or recommendations contained in this report are based on those aforementioned circumstances. The contents of this report are private and confidential. This report is only for Karuah East Quarry Pty Limited's use in accordance with its agreement with EMM and is not to be relied on by or made available to any other party without EMM's prior written consent. Except as permitted by the Copyright Act 1968 (Cth) and only to the extent incapable of exclusion, any other use (including use or reproduction of this report for resale or other commercial purposes) is prohibited without EMM's prior written consent. Except where expressly agreed to by EMM in writing, and to the extent permitted by law, EMM will have no liability (and assumes no duty of care) to any person in relation to this document, other than to Karuah East Quarry Pty Limited (and subject to the terms of EMM's agreement with Karuah East Quarry Pty Limited).

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ABN: 28 141 736 558

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) was engaged by Karuah East Quarry Pty Limited to conduct a quarterly noise survey of operations at Karuah East Quarry (KEQ, the site) located at Blue Rock Close, Karuah NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

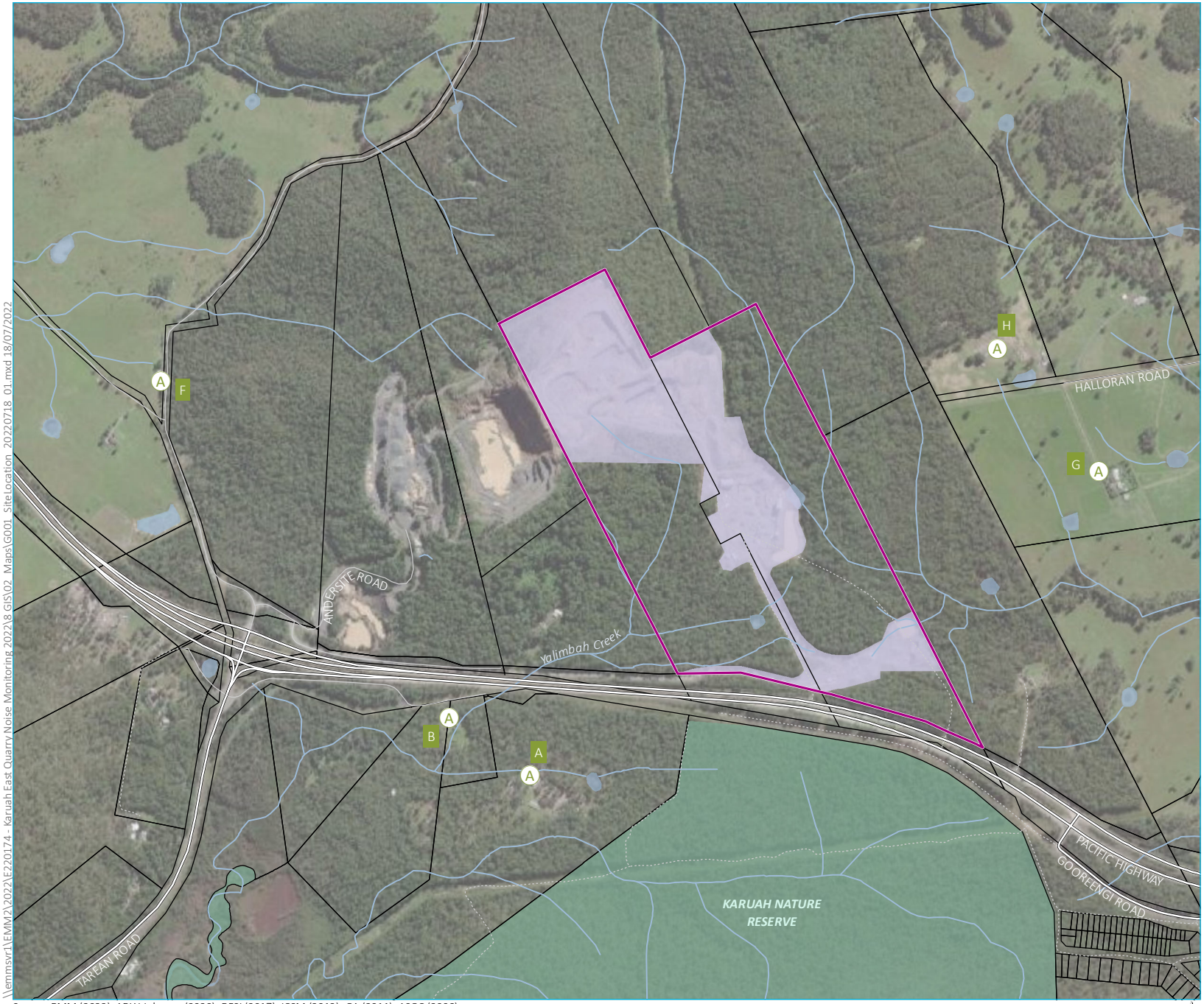
Attended environmental noise monitoring described in this report was done during morning shoulder and day periods on Monday 25 November 2024 and during the evening period on Tuesday 19 November 2024 at five monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions, not necessarily the location of residences.

Table 1.1 Attended noise monitoring locations

Location descriptor/ID	Description/address	Coordinates (MGA56)	
		Easting	Northing
A	Private residence - 74 Mill Hill Close, Karuah	406623	6388704
B	Private residence - 64 Mill Hill Close, Karuah	406405	6388859
F	Private residence - 1714 The Branch Lane, Karuah	405639	6389782
G	Private residence - 2 Halloran Road, North Arm Cove	405629	6389766
H	Private residence - 21 Halloran Road, North Arm Cove	407795	6389868



KEY

- Site boundary
- Attended noise monitoring location
- Approved disturbance area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Waterbody
- NPWS reserve
- State forest

Attended noise monitoring locations

Source: EMM (2022); ADW Johnson (2020); DFSI (2017); ICSM (2012); GA (2011); ASGC (2006)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

Karuah East Quarry
Quarterly attended noise monitoring
Figure 1.1

EMM creating opportunities

\\emmsvr1\EMM2\2022\E220174 - Karuah East Quarry Noise Monitoring 2022\8 GIS\02 Maps\G001 Site Location 20220718 01.mxd 18/07/2022

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10 per cent of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50 per cent of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90 per cent of the time, also referred to as the "background" noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	The vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Morning Shoulder	Monday – Saturday: 5 am to 7 am.

Appendix A provides further information that indicates how an average person perceives changes in noise levels and examples of common noise levels.

2 Noise limits

2.1 Project approval

Karuah East Quarry noise limits are detailed in Condition 3 of Project Approval (PA) 09_0175. Relevant sections of PA 09_0175 are reproduced in Appendix B.1.

2.2 Environment protection licence

Karuah East Quarry noise limits are detailed in Condition L4.1 of Environment Protection Licence (EPL) 20611. Relevant sections of EPL 20611 are reproduced in Appendix B.2.

2.3 Noise management plan

The approved Noise Management Plan (NMP) adopts five attended noise monitoring locations that are representative of residences outlined in PA 09_0175 and EPL 20611. Relevant sections of the NMP are reproduced in Appendix B.3.

2.4 Noise limit summary

Noise limits based on PA 09_0175 and EPL 20611 are as shown in Table 2.1.

Table 2.1 Noise limits, dB

Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Morning Shoulder $L_{Aeq,15minute}$	Morning Shoulder $L_{A1,1minute}$
A	42	40	35	52
B	40	40	35	52
F	40	35	35	52
G	43	39	35	52
H	44	46	35	52

Notes: 1. Morning shoulder period is from 5:00 am to 7:00 am Monday to Saturday as defined in Condition L4.2 of EPL 20611.

2.5 Meteorological conditions

PA 09_0175 specifies that noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017.

The EPA requirements in Condition L4.3 of EPL 20611 state that noise limits do not apply under the following meteorological conditions:

- wind speeds greater than 3 m/s at 10 m above ground level;
- stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level; or
- stability category G temperature inversion conditions.

2.6 Additional considerations

Monitoring and reporting have been done in accordance with the NPfI and the NSW EPA 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

2.7 Very noise-enhancing meteorological conditions

In accordance with the approved methods, noise monitoring for the site is scheduled to occur during forecasted meteorological conditions where noise limits in Table 2.1 will be applicable. However, in cases where actual meteorological conditions do not align with forecasts and noise limits are subsequently not directly applicable, it is the expectation of regulators that noise impact still be managed.

The NPfI states that:

> Noise limits derived for consents and licences will apply under the meteorological conditions used in the environmental assessment process, that is, standard or noise-enhancing meteorological conditions. For 'very noise-enhancing meteorological conditions' … a limit is set based on the limit derived under standard or noise-enhancing conditions (whichever is adopted in the assessment) plus 5 dB. In this way a development is subject to noise limits under all meteorological conditions.

Therefore, if monthly noise monitoring occurs during meteorological conditions outside of those specified in Section 2.5, site limits will be adjusted based on Table 2.1 plus 5 dB.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant EPA requirements. Meteorological data was obtained from the KEQ on-site meteorological station which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the morning shoulder, day and evening periods at each location. The duration of each measurement was 15 minutes. Atmospheric conditions were measured at each monitoring location using a hand held device.

Measured sound levels from various sources were noted during each measurement, and particular attention was given to the extent of the site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfI.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

For this assessment, the measured L_{Amax} has been used as a conservative estimate of $L_{A1,1minute}$. The EPA accepts sleep disturbance analysis based on either the $L_{A1,1minute}$ or L_{Amax} metrics, with the L_{Amax} representing a more conservative assessment of site noise emissions.

3.3 Meteorological data

Meteorological data for the monitoring period was sourced from the Karuah East Quarry on-site meteorological station (the site AWS) to determine the applicability of criteria in accordance with the EPL and PA.

3.4 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site-only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.5 Site operations

As required by Condition R4.3(a) of the EPL, the operations occurring at the time of monitoring are summarised per period below:

- Day
  - Routine quarry operations in the quarry pit
  - Routine plant processing operations
  - Routine material transport from the quarry pit to the processing plant and product stockpile areas
  - Routine product loading and dispatch to road trucks
- Evening
  - Routine material transport from the processing plant to product stockpile areas
  - Routine maintenance activities of plant and equipment
- Morning shoulder
  - Routine maintenance activities of plant and equipment
  - Routine product loading and dispatch to road trucks

3.6 Instrumentation

Attended noise monitoring was conducted by Isacc Hepworth and Lucas Adamson. Qualifications, experience, and/or demonstration of competence is in accordance with the Approved methods and supportive documentation is available upon request.

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Rion NA-28 sound level meter	1070590	27/5/2026	IEC 61672-1:2002
Pulsar Model 105 calibrator	96080	26/2/2025	IEC 60942:2003
Brüel & Kjær 2250 sound level meter	2759405	20/12/2024	IEC 61672-1:2013

Table 3.1 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Svantek SV-36 calibrator	79952	9/10/2025	IEC 60942:2017

4 Results

4.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 4.1.

Table 4.1 Total measured noise levels – Q4 2024[1]

Location	Start date and time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
H	19/11/2024 18:07	58	45	41	39	38	36	33
G	19/11/2024 18:28	53	44	41	39	38	36	33
F	19/11/2024 18:58	50	47	44	41	41	36	34
A	19/11/2024 19:24	58	56	54	52	51	48	44
B	19/11/2024 20:13	72	71	67	63	60	53	47
A	25/11/2024 5:06	63	60	55	52	51	47	42
B	25/11/2024 5:23	76	72	67	63	60	55	47
F	25/11/2024 5:42	78	60	46	52	43	40	36
G	25/11/2024 6:08	62	45	36	37	32	30	28
H	25/11/2024 6:28	64	43	36	35	32	30	29
H	25/11/2024 7:02	68	43	35	36	31	30	28
G	25/11/2024 7:20	66	42	37	35	33	31	29
F	25/11/2024 7:43	85	68	45	57	41	38	35
B	25/11/2024 8:02	75	73	70	69	68	67	64
A	25/11/2024 8:23	64	56	53	51	51	48	46

Notes: 1. Levels in this table are not necessarily the result of activity at the site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 metres above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – Q4 2024

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction ° Magnetic north[1]	Cloud cover 1/8s
H	19/11/2024 18:07	24.1	1.9	10	3
G	19/11/2024 18:28	21.8	1.5	10	4
F	19/11/2024 18:58	25.3	<0.5	-	5
A	19/11/2024 19:24	25.7	<0.5	-	6
B	19/11/2024 20:13	23.5	<0.5	-	7
A	25/11/2024 5:06	19.3	<0.5	-	1
B	25/11/2024 5:23	19.3	<0.5	-	2
F	25/11/2024 5:42	19.2	<0.5	-	1
G	25/11/2024 6:08	19.1	<0.5	-	1
H	25/11/2024 6:28	19.2	<0.5	-	1
H	25/11/2024 7:02	19.7	<0.5	-	1
G	25/11/2024 7:20	20.2	<0.5	-	1
F	25/11/2024 7:43	20.5	<0.5	-	1
B	25/11/2024 8:02	21.1	<0.5	-	1
A	25/11/2024 8:23	22.3	<0.5	-	1

Notes: 1. "-" indicates calm conditions at the monitoring location.

4.2 Site only noise levels

4.2.1 Modifying factors

No modifying factors were applicable during the survey, as defined in the NPfI.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data obtained from the site AWS. Limits are applicable if weather conditions were within specified parameters during each measurement.

Table 4.3 Site noise levels and limits – Q4 2024

Location	Start Date and Time (Period)	Wind		Stability Class	Very enhancing? [1]	Limit, dB		Site level, dB [2]		Exceedance	
		Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
H	19/11/2024 18:07 (E)	1.5	165	F	No	46	N/A	IA	N/A	No	N/A
G	19/11/2024 18:28 (E)	1.6	73	F	No	39	N/A	IA	N/A	No	N/A
F	19/11/2024 18:58 (E)	1.1	109	F	No	35	N/A	IA	N/A	No	N/A
A	19/11/2024 19:24 (E)	0.9	62	F	No	40	N/A	IA	N/A	No	N/A
B	19/11/2024 20:13 (E)	0.9	52	F	No	40	N/A	IA	N/A	No	N/A
A	25/11/2024 5:06 (MS)	1.0	16	F	No	35	52	IA	IA	No	No
B	25/11/2024 5:23 (MS)	0.5	219	F	No	35	52	IA	IA	No	No
F	25/11/2024 5:42 (MS)	0.2	290	F	No	35	52	IA	IA	No	No
G	25/11/2024 6:08 (MS)	0.1	299	F	No	35	52	IA	IA	No	No
H	25/11/2024 6:28 (MS)	0.2	331	F	No	35	52	IA	IA	No	No
H	25/11/2024 7:02 (D)	0.6	266	A	No	44	N/A	IA	N/A	No	N/A
G	25/11/2024 7:20 (D)	1.1	290	A	No	43	N/A	IA	N/A	No	N/A
F	25/11/2024 7:43 (D)	1.2	306	A	No	40	N/A	IA	N/A	No	N/A
B	25/11/2024 8:02 (D)	1.8	311	A	No	40	N/A	IA	N/A	No	N/A

Table 4.3 Site noise levels and limits – Q4 2024

Location	Start Date and Time (Period)	Wind		Stability Class	Very enhancing? [1]	Limit, dB		Site level, dB [2]		Exceedance	
		Speed m/s	Direction [4]			$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
A	25/11/2024 8:23 (D)	1.2	321	A	No	42	N/A	IA	N/A	No	N/A

Notes:
1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfI.
2. Site-only $L_{Aeq,15minute}$, includes modifying factor penalties if applicable.
3. Degrees magnetic north, "-" indicates calm conditions.
4. MS = Morning Shoulder period; D = Day period; E = Evening period.

5 Mitigation and management

5.1 Proposed management actions

EPL Condition 4.3(c) requires details of any management actions taken within the monitoring period to address any exceedances of the limits. As there were no exceedances, no management actions were required.

6 Summary

EMM Consulting Pty Ltd (EMM) was engaged by Karuah East Quarry Pty Limited to conduct a quarterly noise survey of operations at the site. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified PA and EPL noise limits.

Attended environmental noise monitoring described in this report was done during the morning shoulder and day periods on Monday 25 November 2024 and during the evening period on Tuesday 19 November 2024 at five monitoring locations.

Noise levels from the site complied with relevant limits at all monitoring locations during the Q4 2024 survey.

Appendix A

Noise perception and examples

EMM
creating opportunities

A.1 Noise levels

Table A.1 indicates how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or a quarter) as loud

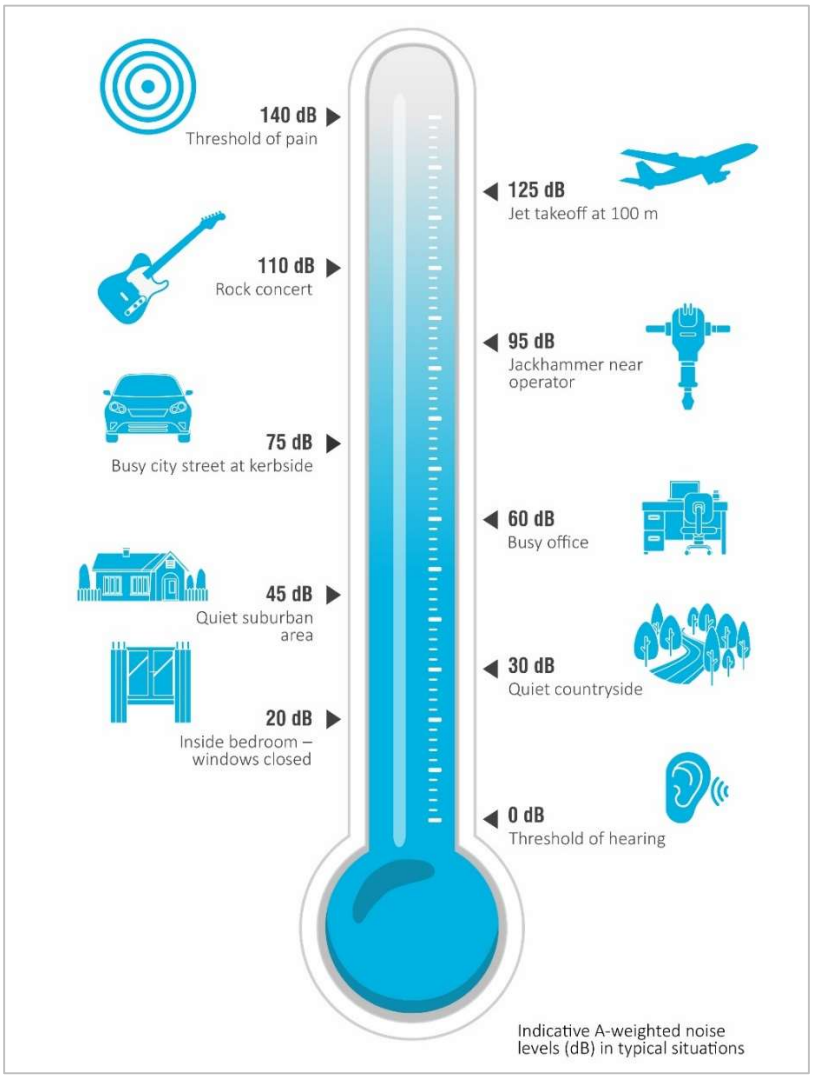


Figure A.1 Common noise levels

Appendix B

Regulator documents

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B.1 Project approval

SCHEDULE 3
ENVIRONMENTAL PERFORMANCE CONDITIONS

IDENTIFICATION OF APPROVED LIMITS OF EXTRACTION

1. The Applicant shall, prior to carrying out quarrying operations on the site:
   (a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction within the Extraction Area; and
   (b) submit a survey plan of the extraction boundaries,
   to the satisfaction of the Planning Secretary.

2. The Applicant must ensure that the extraction boundaries are clearly marked at all times while quarrying operations are being carried out, in a manner that allows the limits of extraction to be clearly identified.

NOISE

Operational Noise Criteria

3. Except for the carrying out of construction works, the Applicant must ensure that the operational noise generated by the development does not exceed the criteria in Table 2 at any residence[a] on privately-owned land.

Table 2: Operational noise criteria dB

Noise Assessment Location[a]	Morning Shoulder $L_{Aeq\ (15\ min)}$	Morning Shoulder L_{Amax}	Day $L_{Aeq\ (15\ min)}$	Evening $L_{Aeq\ (15\ min)}$
A	35	52	42	40
B	35	52	40	40
G	35	52	43	39
H	35	52	44	46
I	35	52	40	37
All other residences	35	52	40	35

[a] Noise Assessment Locations referred to in Table 2 are shown in Appendix 2.

Noise generated by the development must be monitored and measured in accordance with the relevant procedures and modifications (including certain meteorological conditions) of the NPfI.

3A. The noise criteria in Table 2 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Road Traffic Noise Criteria

4. The Applicant must take all reasonable and feasible measures to ensure that the traffic noise generated by the development does not cause additional exceedances of the criteria in Table 3 at any residence on privately-owned land.

Table 3: Road traffic noise criteria

Road	***Criteria (Day[a])***
Pacific Highway	60 dB(A) $L_{Aeq\ (15\ hour)}$
Local roads	55 dB(A) $L_{Aeq\ (1\ hour)}$

[a] *Day is the period from 7 am to 10 pm every day in accordance with the EPA's NSW Road Noise Policy (2011).*

5. Deleted

Noise Operating Conditions

6. The Applicant must:
   (a) take all reasonable steps to minimise noise from construction and operational activities, including low frequency noise and other audible characteristics, associated with the development;
   (b) implement reasonable and feasible noise attenuation measures on all plant and equipment that will operate in noise sensitive areas;
   (c) operate a comprehensive noise management system commensurate with the risk of impact;
   (d) take all reasonable steps to minimise the noise impacts of the development during noise-enhancing meteorological conditions when the noise criteria in this consent do not apply (see NPfI);
   (e) carry out quarterly attended noise monitoring (unless otherwise agreed by the Planning Secretary) to determine whether the development is complying with the relevant conditions of this consent; and
   (f) regularly assess the noise monitoring data and modify or stop operations on the site to ensure compliance with the relevant conditions of this consent.

Noise Management Plan

7. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
   (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
   (b) be prepared in consultation with the EPA;
   (c) describe the measures to be implemented to ensure:
      (i) compliance with the noise criteria and operating conditions in this consent;
      (ii) best practice management is being employed;
      (iii) noise impacts of the development are minimised during noise-enhancing meteorological conditions when the noise criteria in this consent do not apply (see NPfI);
   (d) describe the noise management system in detail; and
   (e) include a monitoring program that:
      (i) is capable of evaluating the performance of the development;
      (ii) monitors noise at the nearest and/or most affected residences;
      (iii) adequately supports the noise management system;
      (iv) includes a protocol for distinguishing noise emissions of the development from any neighbouring developments; and
      (v) includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of any such event.

7A. The Applicant must implement the plan as approved by the Planning Secretary.

BLASTING

Blasting Criteria

8. The Applicant must ensure that blasting on the site does not cause exceedances of the criteria in Table 5.

B.2 Environmental protection licence

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.

L4 Noise limits

L4.1 Noise generated at the premises must not exceed the noise limits in the table below. The locations referred to in the table below are indicated in Table 2: Operational Noise Criteria, and Figure 1 of the document titled Project Approval 09_0175 Modification 9 (MOD 9) Department of Planning, Industry& Environment - which has been filed on EPA file Doc22/715570-1.

Noise Assesment Location	Morning Shoulder LAeq(15 min)	Morning shoulder LAmax	Day LAeq (15 min)	Evening LAeq (15 min)
A (74 Mill Hill Close, Karuah, Lot 100 DP 1028885)	35	52	42	40
B (64 Mill Hill Close, Karuah, Lot 3 DP785172)	35	52	40	40
G (2 Halloran Road, North Arm Cove Lot 1 DP1032636)	35	52	43	39
H (21 Halloran Road, North Arm Cove Lot 10 DP1032636)	35	52	44	46
All other residences	35	52	40	35

L4.2 Noise limit definitions - For the purpose of the table at L4.1, the following definitions apply:
Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays;
Morning Shoulder is defined as the period from 5:00am to 7:00am Monday to Saturday;
Evening is defined as the period from 6:00pm to 10:00pm Monday to Saturday.

L4.3 The noise limits set out in this licence apply under all meteorological conditions except for the following:
a) Wind speed greater than 3 metres/second at 10 metres above ground level; or
b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Stability category G temperature inversion conditions.

L4.4 **Determining Compliance**

To determine compliance with the noise limits set out in the table above, the licensee must locate monitoring equipment:
a) within 30 metres of a dwelling façade (but not closer than 3 metres) where any dwelling on the property is situated more than 30 metres from the property boundary that is closest to the premises;
b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises;
c) at the most affected point at a location where there is no dwelling at the location; and
d) within approximately 50 metres of the boundary of a national park or nature reserve.

Note: A non-compliance of the Noise Limits table will still occur where noise generated from the premises in excess of the appropriate limit is measured:
i) at a location other than an area prescribed in part (a) and part (b); and/or
ii) at a point other than the most affected point at a location.

L4.5 For the purposes of determining the noise generated at the premises the modification factors in Fact Sheet C of the EPA's "Noise Policy for Industry" must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L5 Blasting

L5.1 Blasting in or on the premises must only be carried out between the hours of 9:00 am and 4:00 pm Monday to Friday. No blasting is permitted on Saturdays, Sundays or public holidays. Blasting outside of the hours specified in this condition can only take place with the written approval of the EPA.

L5.2 Blasting is not permitted simultaneously with adjacent quarry(s).

L5.3 The airblast overpressure level from blasting operations in or on the premises must not exceed:
a) 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period; and
b) 120 dB (Lin Peak) at any time,
at monitoring point 11 detailed in Condition P1.4.

L5.4 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed:
a) 5 mm/second for more than 5% of the total number of blasts during each reporting period; and
b) 10 mm/second at any time,
at monitoring point 11 detailed in Condition P1.4.

L5.5 Error margins associated with any monitoring equipment used to measure airblast overpressure or peak particle velocity are not to be taken into account in determing whether or not the limit has been exceeded.

L5.6 The airblast overpressure and ground vibration levels in the conditions above do not apply at noise sensitive locations that are owned by the licensee or subject to a private agreement, relating to airblast overpressure and ground vibration levels, between the licensee and land owner.

L5.7 Offensive blast fume must not be emitted from the premises.

Definition:

d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M6 Telephone complaints line

M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M6.3 The preceding two conditions do not apply until 1 month after the date of the issue of this licence.

M7 Blasting

M7.1 To determine complaince with Blast Limit conditions of this licence:
a) Airblast overpressure and ground vibration levels must be measured and electronically recorded for monitoring point 11 for the parameters specified in Column 1 of the table below; and
b) The licensee must use the units of measure, sampling method, and sample at the frequency specified opposite in the other columns.

Parameter	Units of Measure	Frequency	Sampling Method
Airblast Overpressure	Decibels (Linear Peak	All blasts	Australian Standard AS 2187.2-2006
Ground Vibration Peak Particle Velocity	millimetres/second	All blasts	Australian Standard AS 2187.2-2006

M8 Noise monitoring

M8.1 To assess compliance with the noise limits for this premises attended noise monitoring must be undertaken in accordance with all noise conditions and:
a) during a period of normal quarry operations;
b) at each one of the locations listed in the noise limits table of this licence;
c) occur quarterly in the reporting period;
d) occur during each day period as defined in the NSW Noise Policy for Industry.

.

Note: Quarterly attended noise monitoring must be completed (unless otherwise agreed by the Planning

Secretary) to determine whether the development is complying with the relevant conditions of this consent. The frequency of noise monitoring will be reviewed, upon request.

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after

B.3 Noise management plan

5 Noise limits

5.1 Operational noise

Condition 3 of Schedule 3 of PA 09_0175 provides the operational noise limits for KEQ. These are reproduced in Table 5.1.

Table 5.1 Operational noise criteria (dB) from Table 2 of PA 09_0175

Noise Assessment Location[1]	Morning Shoulder $L_{Aeq(15\ minute)}$	Morning Shoulder L_{Amax}	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$
A	35	52	42	40
B	35	52	40	40
G	35	52	43	39
H	35	52	44	46
I	35	52	40	37
All other residences	35	52	40	35

Noise assessment locations are shown in Figure 3.1.

Noise generated by the development must be monitored and measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NPfI (EPA 2017).

The noise limits provided in Table 5.1 apply under standard and noise-enhancing meteorological conditions (as defined in the NPfI) determined by monitoring at the relevant weather station. In accordance with Condition L4.3 of EPL 20611 and consistent with Condition 3 of Schedule 3 of PA 09_0175 the noise limits provided in Table 5.1 apply under all meteorological conditions except for the following:

- wind speeds greater than 3m/s at 10m above ground level;
- stability category F temperature inversion conditions and wind speeds greater then 2m/s at 10m above ground level; or
- stability category G temperature inversion conditions.

In accordance with Fact Sheet D of the NPfI, for 'very noise enhancing meteorological conditions' the applicable noise limit is set at 5dB above those provided in Table 5.1.

Noise limits do not apply if Karuah East has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and Karuah East has advised the Department in writing of the terms of this agreement.

5.2 Road traffic noise

Condition 4 of Schedule 3 of PA 09_0175 states that all reasonable and feasible measures must be taken to ensure that the traffic generated by KEQ does not cause additional exceedances of the criteria provided in Table 5.2 at any residence on privately-owned land.

Appendix C
Calibration certificates

EMM
creating opportunities

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C51438

EQUIPMENT TESTED : Acoustic Calibrator

Manufacturer: Svantek
Type No: SV 36 **Serial No:** 79952
Class: 1
Owner: EMM Consulting Pty Ltd
L3, 175 Scott Street
Newcastle, NSW 2300
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1013	hPa ±1 hPa	**Date of Receipt :**	02/10/2024
Temperature	22	°C ±1° C	**Date of Calibration :**	09/10/2024
Relative Humidity	42	% ±5%	**Date of Issue :**	09/10/2024

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

Acu-Vib Electronics
ACOUSTICS AND VIBRATIONS
Head Office & Calibration Laboratory
Unit 14, 22 Hudson Avenue, Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Laboratory No. 9262
Acoustic and Vibration Measurements

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter

IEC 61672-3:2013

Calibration Certificate

Calibration Number C24405

Client Details EMM Consulting
Level 3, 175 Scott Street
Newcastle NSW 2300

Equipment Tested/ Model Number : NA-28
Instrument Serial Number : 01070590
Microphone Serial Number : 08184
Pre-amplifier Serial Number : 52329
Firmware Version : v2.0

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	24.4 °C	**Ambient Temperature :**	23.8 °C
Relative Humidity :	45.2 %	**Relative Humidity :**	46.7 %
Barometric Pressure :	101.3 kPa	**Barometric Pressure :**	101.26 kPa

Calibration Technician : Peter Elters
Calibration Date : 27 May 2024
Secondary Check: Rhys Gravelle
Report Issue Date : 3 Jun 2024

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13 dB*	*Temperature*	*±0.1 °C*
1kHz	*±0.13 dB*	*Relative Humidity*	*±1.9 %*
8kHz	*±0.14 dB*	*Barometric Pressure*	*±0.11 kPa*
Electrical Tests	*±0.13 dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
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Sound Calibrator

IEC 60942:2017

Calibration Certificate

Calibration Number C24154

Client Details EMM Consulting
Level 3, 175 Scott Street
Newcastle NSW 2300

Equipment Tested/ Model Number : Model 105
Instrument Serial Number : 96080

Atmospheric Conditions

Ambient Temperature : 25.5 °C
Relative Humidity : 52.1 %
Barometric Pressure : 100.4 kPa

Calibration Technician : Peter Elters
Calibration Date : 26 Feb 2024
Secondary Check: Rhys Gravelle
Report Issue Date : 26 Feb 2024

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	93.80	1000.30

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.10 dB*	*Temperature*	*±0.1 °C*
Frequency	*±0.07 %*	*Relative Humidity*	*±1.9 %*
Distortion	*±0.20 %*	*Barometric Pressure*	*±0.11 kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Sydney Calibration Laboratory
Suite 4.03, Level 4, 3 Thomas Holt Drive, Macquarie Park NSW 2113, Australia
Accredited for compliance with ISO/IEC 17025 - Calibration. Laboratory No. 1301

CERTIFICATE OF CALIBRATION

Certificate No: CAU2300941

CALIBRATION OF:

Sound Level Meter:	Brüel & Kjær	2250	No: 2759405
Microphone:	Brüel & Kjær	4189	No: 2983733
Preamplifier:	Brüel & Kjær	ZC-0032	No: 22666
Supplied Calibrator:	None		
Software version:	BZ7224 Version 4.7.4	Pattern Approval:	-
Instruction manual:	BE1712-22	Identification:	N/A

CUSTOMER:

EMM Consulting Pty Limited
20 Chandos Street
St Leonards NSW 2065

CALIBRATION CONDITIONS:

Preconditioning: 4 hours at 23 °C

Environment conditions: *see actual values in **Environmental conditions** sections*

SPECIFICATIONS:

The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC61672-1:2013 class 1.
Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
The measurements included in this document are traceable to Australian/National standards.

PROCEDURE:

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System B&K 3630 with application software type 7763 (version 8.6 - DB: 8.60) and test procedure 2250-4189.

RESULTS:

	Initial calibration		Calibration prior to repair/adjustment
X	Calibration without repair/adjustment		Calibration after repair/adjustment

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor k = 2 providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of Calibration:20/12/2023

Certificate issued:21/12/2023

Calibration Technician: Sajeeb Tharayil

Approved signatory: Sajeeb Tharayil

Reproduction of the complete certificate is allowed. Part of the certificate may only be reproduced after written permission.

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Appendix 4 – KEQ IEA 2023: Status Update

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response – Project Approval (MP09_0175)			
No	*Requirement*	*2023 IEA Assessment & Recommendation*	*2023 KEQ Response / Action*
S2, C11	The Applicant must pay Council, in accordance with Council's Great Lakes Wide Development Contributions Plan (November 2007) – Amended: (a) a one-off Headquarters Building contribution of $1.00 per $1,000.00 of capital value of the development; and (b) Annual road maintenance contributions of $.037 per tonne per km, for every tonne of quarry products transported from the site on local roads in accordance with Council's Great Lakes Wide Development Contributions Plan (November 2007) – Amended. Each payment must be: i. paid to Council at the end of each calendar year. ii. Based on weighbridge records of the quantity of quarry products transported from the site; and iii. Increased annually over the life of the development in accordance with the CPI. *Note: If the parties are not able to agree on any aspect of the road maintenance contributions, either party may refer the matter to the Planning Secretary for resolution.*	**Assessment:** (a) An invoice for payment was issued by MidCoast Council to "Branch Land Pty Ltd" in relation to Application No. DA-09-0175 on 11 April 2022 for a value of $5,000. Remittance Advice for the same amount with the matching supplier invoice reference number (20221212) was provided from MidCoast Council on 10 June 2022. ERM has not been provided with evidence to determine how this contribution amount was calculated and thus cannot verify that compliance with this condition has been met. (b) Road Maintenance Contributions were provided in one invoice to MidCoast Council, with remittance advice prepared on 30 June 2023 for the following amounts: ▪ FY2018: $3,438.77; ▪ FY2019: $14,876.66; ▪ FY2020: $112,797.25; ▪ FY2021: $65,794.58; and ▪ FY2022: $130,498.26. **Recommendation:** It is recommended that KEQ provide further evidence (e.g. a cost calculation and/or evidence of Council acceptance) that the payments made: ▪ Correctly represent the value of the Headquarters Building contribution; and ▪ Are based on weighbridge records and increased annually over the life of the development in accordance with the CPI. Should any contribution shortfalls be identified, it is recommended that KEQ make an additional payment to cover this amount as soon as practicable.	**RESPONSE:** KEQ can confirm: (a) Headquarters building contribution was provided to Council based on the capital investment value of the project. No concerns have been raised by Council. (b) Road maintenance contributions for FY18 to FY22 was provided to Council on 30 June 2023. This was subject to compensatory cost escalation in accordance with CPI as per the intent of the Condition. The CPI increases were completed in accordance with the methodology provided by the former Great Lakes Council on 13 April 2010 in relation to affiliated quarry, Karuah Hard Rock Quarry (DA 265-10-2004). Given the close relationship between the two quarry sites, KEQ considers it appropriate to apply the same methodology. On 30 June 2023, Council advised the matter had been provided to the Manager Finance for review. No further correspondence has been received from Council regarding this matter. FY23 was provided to Council on 03 August 2023 (remittance advice date). Council acknowledged receipt of the payment on 28 August 2023. No concerns have been raised by Council regarding the provision of Developer Contributions from the Karuah East Quarry. **STATUS:** KEQ considers this 2023 finding to be resolved.
S3, C11 (d) (ii)	The Applicant must: (d) Not undertake blasting within 500 metres of: ii. Any land outside the site not owned by the Applicant, unless: • The Applicant has a written agreement with the relevant landowner to allow blasting to be carried out closer to the land, and the Applicant has advised the Department in writing of the terms of this agreement, or • the Applicant has: ○ Demonstrated to the satisfaction of the Planning Secretary that the blasting can be carried out closer to the land without compromising the safety of the people or livestock on the land, or damaging the buildings and/or structures on the land; and ○ Updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the land, to the satisfaction of the Planning Secretary.	**Assessment:** ERM review the Blast Management Plan (BMP) prepared by SLR Consulting Ltd in May 2019. The following potential non-compliance in the BMP was observed: (d) (ii) A property is situated approximately 340 m north-north-west to the closest perimeter of the quarry. It is understood that the property is unoccupied, however the land is privately owned. As a result, it is considered that blasting activities during the audit period would have occurred within 500m of privately owned land without a written agreement or as to the satisfaction of the Planning Secretary. **Recommendation:** It was confirmed that the sale of the property within 500 m of the KEQ quarry pit took place. Therefore, no further actions are required in relation to this non-compliance.	**RESPONSE:** KEQ can confirm the property (Lot 4, DP838128) has been acquired. **STATUS:** KEQ considers this 2023 finding to be resolved.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

<table>
<tr><th colspan="4">KEQ 2023 IEA Findings and KEQ Response – Project Approval (MP09_0175)</th></tr>
<tr><th>No</th><th>Requirement</th><th>2023 IEA Assessment & Recommendation</th><th>2023 KEQ Response / Action</th></tr>
<tr><td>S3, C12</td><td>The Applicant must prepare a Blast Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
(a) Be prepared by a suitably qualified expert whose appointment has been approved by the Planning Secretary;
(b) Be prepared in consultation with Council and EPA, and submitted to the Planning Secretary for approval prior to the commencement of construction activities.
(c) Describe the measures that would be implemented to ensure:
• best management practice is being employed; and
• compliance with the relevant conditions of this consent;
(d) Include a road closure protocol if blasting occurs within 500 metres of a public road
(e) Include a specific blast fume management protocol, to demonstrate how emissions will be minimised including risk management strategies if blast fumes are generated; and
(f) Include a monitoring program for evaluating the performance of the development including:
• Compliance with the applicable criteria; and
• Minimising fume emissions from the site.
The Applicant must implement the plan as approved by the Planning Secretary.</td><td><u>Assessment:</u>
ERM reviewed the Blast Management Plan (BMP) prepared by SLR Consulting Ltd in May 2019. The following potential non-compliance in the BMP was observed:

(b) The BMP includes evidence of consultation with the EPA and Council and DPE approval occurring in 2015. There is no evidence of consultation provided for the May 2019 update.

(c) Best management and control measures are discussed in section 6 of the BMP including operating conditions, blast design, public safety, road closure management, monitoring of meteorological conditions, avoidance of concurrent blasts with nearby quarrying operations, and consultation with neighbouring residences.

For most conditions of this consent, the BMP describes measures to be implemented to ensure compliance is met, however in relation to condition 11 (d), the BMP does not describe the details of measures implemented to ensure a blast is not carried out within 500m of land outside the site not owned by the Applicant.

<u>Recommendation:</u>
The BMP is recommended to be updated to account for control measures carried out in order to meet compliance with Condition 11 d) ii and approved by the Planning Secretary. The BMP is recommended to be updated in consultation with the Council and EPA and be submitted to the Planning Secretary.</td><td><u>ACTION:</u>
KEQ to complete a comprehensive review of the Blast Management Plan and submit the revised document to the Planning Secretary for approval.

<u>DUE:</u>
28 May 2024 in accordance with Schedule 5, Condition 5(c).

<u>STATUS:</u>
Underway – draft revision of the management plan has been completed by IEMA. Further revisions are to be assessed in accordance with these recommendations.

<u>2024 Annual Review Update:</u>
Completed.
Revised Blast Management Plan approved by NSW Planning on 29 April 2024.</td></tr>
<tr><td>S3, C13</td><td>The Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not exceed the criteria in Tables 7 to 9 at any residence on privately-owned land.
Table 7: Long-term impact assessment criteria for particulate matter
<table><tr><th>Pollutant</th><th>Averaging period</th><th>[d] Criterion</th></tr><tr><td>Total suspended particulates (TSP)</td><td>Annual</td><td>[a] 90 µg/m^3</td></tr><tr><td>Particulate matter < 10 µm (PM_{10})</td><td>Annual</td><td>[a] 30 µg/m^3</td></tr></table>
Table 8: Short-term impact assessment criteria for particulate matter
<table><tr><th>Pollutant</th><th>Averaging period</th><th>[d] Criterion</th></tr><tr><td>Particulate matter < 10 µm (PM_{10})</td><td>24 hour</td><td>[a] 50 µg/m^3</td></tr></table>
Table 9: Long-term Impact Assessment Criteria for Deposited Dust
<table><tr><th>Pollutant</th><th>Averaging period</th><th>Maximum increase in deposited dust level</th><th>Maximum total deposited dust level</th></tr><tr><td>[c] Deposited dust</td><td>Annual</td><td>[b] 2 g/m^2 /month</td><td>[a] 4 g/m^2 /month</td></tr></table></td><td><u>Assessment:</u>
Annual reviews report the measured particulate matter (PM) and depositional dust (DD) results against the approved criteria of this condition. The Short-term impact assessment criteria for particulate matter was exceeded on one occasion during the audit period and there were two “failure to monitor” events which ERM consider having been appropriately responded to. Additional detail relating to compliance with this CoC is provided in Appendix A1.

<u>Recommendation:</u>
It is recommended to continue the monitoring per the AQMP as only one low-range exceedance was recorded during the audit period. Should additional exceedances reoccur, examine additional mitigation measures in conjunction with a review of the AQMP.</td><td><u>ACTION:</u>
KEQ to include this recommendation into the comprehensive review of the Air Quality Management Plan.

Refer to the response under Schedule 3, Condition 16 for further details.

<u>2024 Annual Review Update:</u>
Completed.
Revised Air Quality Management Plan approved by NSW Planning on 18 June 2024.</td></tr>
</table>

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response – Project Approval (MP09_0175)			
No	*Requirement*	*2023 IEA Assessment & Recommendation*	*2023 KEQ Response / Action*
S3, C16	The Applicant must prepare an Air Quality Management Plan for the development to the satisfaction of the Planning Secretary. This plan must: (a) Be prepared by a suitably qualified expert whose appointment has been approved by the Planning Secretary. (b) Be prepared in consultation with Council and EPA and submitted for approval to the Planning Secretary prior to the commencement of construction activities. (c) Describe the measures that would be implemented to ensure: • Compliance with the relevant air quality conditions of this consent; • best management practice is employed; and • The air quality impacts of the development are minimised during adverse meteorological conditions and extraordinary events. (d) Describe the proposed air quality management system; and (e) Include a monitoring program that: • Can evaluate the performance of the development. • Includes a protocol for determining any exceedances of the relevant conditions of consent. • Effectively supports the air quality management system; and • Evaluates and reports on the adequacy of the air quality management system. The applicant must implement the plan as approved by the Planning Secretary	**Assessment:** The AQMP was most recently updated in May 2019 by SLR Consulting. Whilst ERM consider KEQ are generally compliant with conditions (a) to (e), implementation of the plan requires a period review in accordance with Schedule 5 Condition 5 meaning that the 2019 version of the AQMP is now outdated. Additional detail relating to compliance with this CoC is provided in Appendix A1. **Recommendation:** Refer to recommendation under Schedule 5 Condition 4 in relation to updates of strategies, plans and programs required under this consent.	**ACTION:** KEQ to complete a comprehensive review of the Air Quality Management Plan and submit the revised document to the Planning Secretary for approval. **DUE:** 28 May 2024 in accordance with Schedule 5, Condition 5(c). **STATUS:** Underway – draft revision of the management plan has been completed by IEMA. A further revision is to be assessed in accordance with these recommendations. **2024 Annual Review Update:** Completed. Revised Air Quality Management Plan approved by NSW Planning on 29 April 2024.
S3, C19	The Applicant must comply with the discharge limits in any EPL, or with Section 120 of the POEO Act.	**Assessment:** There are three Licenced Discharge Points (LDP) associated with the site. This includes LDP001 (Dam 1), LDP002 (Dam 2) and LDP003 (Dam 3). Discharge results are recorded within the KEQ Discharge Register. Heavy rainfall, particularly in 2021 and 2022 resulted in multiple uncontrolled and non-compliant discharges during the audit period. A review of the WMP has not been carried out as required following the multiple exceedances of the discharge limits. Additional detail relating to compliance with this CoC is provided in Appendix A1. **Recommendation:** Conduct a review the effectiveness of the WMP and TARP to ensure that the response plans can be effectively implemented to prevent exceedances of relevant water quality assessment criteria and ensure sufficient capacity is available in dams. The review should consider the multiple surface water discharge exceedances which took place in 2020, 2021 and 2022 and the effectiveness of associated response procedures. The review should be conducted by a suitable qualified specialist and recommendations should be reflected within an update to the WMP.	**ACTION:** KEQ to include these two recommendations into the comprehensive review of the Water Management Plan. Refer to the response under Schedule 3, Condition 21 for further details. **2024 Annual Review Update:** Completed. Revised Water Management Plan submitted to NSW Planning on 10 September 2024.
S3, C21	The Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must: (a) Be prepared in consultation with the EPA and DPE Water by suitably qualified and experienced person/s whose appointment has been approved by the Planning Secretary. (b) Be submitted to the Planning Secretary for approval prior to the commencement of construction activities. (c) Include: i. A Site Water Balance that includes details of: • Sources and security of water supply, including contingency planning;	**Assessment:** The KEQ Water Management Plan (WMP) was prepared by SLR Consulting Ltd and most recently updated in May 2019. There is no evidence to confirm a review has taken place due to exceedances in surface water discharge limits (refer Section 3 Condition 19). Additional detail relating to compliance with this CoC is provided in Appendix A1.	**ACTION:** KEQ to complete a comprehensive review of the Water Management Plan and submit the revised document to the Planning Secretary for approval. **DUE:** 28 May 2024 in accordance with Schedule 5, Condition 5(c).

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response – Project Approval (MP09_0175)			
No	*Requirement*	*2023 IEA Assessment & Recommendation*	*2023 KEQ Response / Action*
	• Water use on site; and • Measures that would be implemented to minimise use of clean water and maximise recycling of dirty water on the site. ii. A Surface Water Management Plan, that includes: • Baseline data on surface water flows and quality in the watercourses that could be affected by the development. • A detailed description of the surface water management system on the site, including the design objectives and performance criteria for the: ○ clean water diversions; ○ erosion and sediment controls; ○ water storages (including Maximum Harvestable Rights requirements); and ○ control of water pollution from areas of the site that have been rehabilitated. • Surface water impact assessment criteria, to be developed following analysis of baseline data, including trigger levels for investigating any potentially adverse surface water quality impacts. • A program to monitor: ○ any surface water discharges; ○ the effectiveness of the water management system; ○ surface water flows and quality in local watercourses; and ○ ecosystem health of local watercourses; and • An assessment of appropriate options to improve storage and retention times in accordance with Managing Urban Stormwater: Soils and Construction (Landcom); iii. A Groundwater Monitoring Program that includes: • Baseline data of groundwater levels surrounding the site. • Groundwater impact assessment criteria, to be developed following analysis of baseline data, including trigger levels for investigating any potentially adverse groundwater impacts; and • A program to monitor and/or validate the impacts of the development on groundwater resources; and iv. A Surface and Ground Water Response Plan that describes the measures and/or procedures that would be implemented to: • Respond to any exceedances of the surface water impact assessment criteria and groundwater impact assessment criteria; and • Mitigate and/or offset any adverse impacts on surface water and groundwater resources located within and adjacent to the site. The Applicant must implement the plan as approved by the Planning Secretary	**Recommendation:** The following recommendations are made in relation the WMP: ▪ Updates to the WMP should include details of a contingency plan; ▪ It is recommended that KEQ implement a framework to log all steps and actions to be taken in accordance with the TARP, in particular when a 'Condition Amber' or 'Condition Red' Trigger Response is enacted. ▪ WMP updates are to be undertaken in consultation with the EPA and DPE Water and be submitted to the Planning Secretary. Additional recommendations which are applicable to this condition are made in relation to Adaptive Management (refer Schedule 5 Condition 2).	**STATUS:** Underway – IEMA has been engaged to draft a revision of the management plan. These water-themed recommendations will be incorporated. **2024 Annual Review Update:** Completed. Revised Water Management Plan submitted to NSW Planning on 10 September 2024.
S3, C23	The Applicant must keep accurate records of all laden truck movements to and from the site (including time of arrival and dispatch) and publish a summary of records on its website every 6 months and in the Annual Review.	**Assessment:** Monitoring of product transport is recorded and uploaded to Hunter Quarry's website under Karuah East Quarry. The monitoring data includes hourly truck movements for every day of each calendar year. Laden truck movements are not recorded within the KEQ Annual Reviews. **Recommendation:** It is recommended to publish a summary of laden truck movements to and from site in future Annual Reviews.	**ACTION:** KEQ to include laden truck movements in the Annual Reviews for all future submissions. **DUE:** 31 March 2024 in accordance with Schedule 5, Condition 4. **STATUS:** Completed – Product transport report has been included in the 2023 Annual Review document template.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response – Project Approval (MP09_0175)

No	*Requirement*	*2023 IEA Assessment & Recommendation*	*2023 KEQ Response / Action*
S3, C28	The Applicant must, prior to the commencement of vegetation clearing activities for Modification 10, finalise the Biodiversity Offset Strategy, as described in documents listed in condition 2 of Schedule 2, summarised in Table 10 and Table 11 and shown conceptually in Figure 1 of Appendix 4, in consultation with BCD and Council, and to the satisfaction of the Planning Secretary. *Table 10: Biodiversity Offset Strategy – land-based offsets* ***Area*** | ***Offset Type*** | ***Minimum Size (ha)*** Offset Area | Existing vegetation to be managed and enhanced | 130.36 ha *Table 11: Biodiversity Offset Strategy – ecosystem and species credit requirements* ***Credit Type*** | ***Credits Required*** **Ecosystem Credits** PCT 1619: Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia heathy open forest of coastal lowlands | 188 PCT 695: Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion | 7 **Total** | **195** **Species Credits** *Tetratheca juncea* (Black-eyed Susan) | 260 *Grevillea parviflora subsp. parviflora* (Small-flower Grevillea) | 250 Squirrel Glider (*Petaurus norfolcensis*) | 260 Southern Myotis (*Myotis macropus*) | 107 **Total** | **877** *Notes:* *1. The Biodiversity Offset Strategy must direct that the land proposed as the Offset Area must be free of any dwelling-houses and associated sheds, bushfire asset protection zones and other related utilities or structures so as to preserve the integrity and function of that offset area. The Biodiversity Offset Strategy must also provide details of the revegetation of any parts of the offset area that are cleared of native vegetation or are in an otherwise substantially modified state, other than required management trails and boundary fencing buffer distances.* *2. Credits required for impacts to EPBC Act listed species and associated habitats must be like-for-like.*	**Assessment:** As Table 10 pre-existed Modification 10, in accordance with Condition 5 of Schedule 5, the Biodiversity Offset Strategy should have been updated within 3 months of any modification to the conditions of this consent. It is noted that latest version of the BOS is dated July 2013. At the time of writing, as confirmed by Site Management, the updated Biodiversity Offset Strategy is pending Commonwealth EPBC Approval. It was confirmed by Site Management and observed by the auditors during the site visit that no vegetation clearing activities have taken place for Modification 10 and thus an assessment of compliance against Table 11 of this condition is Not Triggered. **Recommendation:** Consultation with the BCD and Council in relation to this condition is recommended to be published in the latest Biodiversity Offset Strategy and uploaded to the Hunter Quarries website. Review and update the BOS when the consent is modified.	**ACTION:** KEQ to complete a comprehensive review of the Biodiversity Offset Strategy and submit the revised document to the Planning Secretary for approval. **DUE:** TBD – pending the receipt of Commonwealth Approval for MOD10 (EPBC 2022 – 9164) under the Commonwealth EPBC Act 1999. **STATUS:** Table 10 – Underway: ▪ KEQ is continuing to engage with NSW Planning regarding the mechanism used for the land-based offset. Table 11 (Ecosystem Credits) – Underway: ▪ PCT1619 have been secured. ▪ PCT695 have been secured. Table 11 (Species Credits) – Underway: ▪ Black-eyed Susan – in-principle sale agreement for 25x credits has been reached. KEQ are continuing to review credit purchase options for the outstanding credits. ▪ Small-flower Grevillea – KEQ are continuing to review credit purchase options. ▪ Squirrel Glider – purchase agreement has been executed with the Credit Supply Taskforce. ▪ Southern Myotis – KEQ are continuing to review credit purchase options. **2024 Annual Review Update:** Subject to on-going consultation with NSW & Commonwealth Agencies. Further approvals are likely and therefore will be subject to separate reporting.
S3, C32	Within 6 months of the date of approval of Modification 1, the Applicant must prepare a Landscape and Rehabilitation Management Plan for the development to the satisfaction of the Planning Secretary. This Plan would relate to the area of the quarry and all perimeter lands. This plan must: (a) Be prepared by a suitably qualified expert whose appointment has been approved by the Planning Secretary. (b) Be prepared in consultation with BCD and Council, and submitted to the Planning Secretary for approval prior to the commencement of construction activities; (c) Describe how the implementation of the Tetratheca juncea Translocation Program would be integrated with the overall rehabilitation of the site; (d) Describe the short, medium and long-term measures that would be implemented to: • Manage remnant vegetation and habitat on the site; and • Ensure compliance with the rehabilitation objectives and progressive rehabilitation obligations of this consent. (e) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, including triggers for any remedial action;	**Assessment:** The Landscape and Rehabilitation Management Plan (LRMP) was most recently updated in March 2020. The LRMP has not been updated within a 3 year period as required by clause (f) of this condition. Additional detail relating to compliance with this CoC is provided in Appendix A1. **Recommendation:** Ensure the LRMP is updated every 3 years and that implementation of measures detailed in the plan have been reviewed and updated where required. Scheduled reminders should be implemented to ensure that future updates of the LRMP are undertaken within the required 3 year period. Where required, update associated monitoring programs to ensure the effectiveness of the procedures can be effectively measured.	**ACTION:** KEQ to complete a comprehensive review of the Landscape and Rehabilitation Management Plan and submit the revised document to the Planning Secretary for approval. **DUE:** 28 May 2024 in accordance with Schedule 5, Condition 5(c). NOTE – this may be delayed, subject to the receipt of Commonwealth Approval for MOD10 (EPBC 2022 – 9164) under the Commonwealth EPBC Act 1999. **STATUS:** Underway – The rehabilitation component of the management plan is complete; and the landscape component is currently being reviewed by KEQ's ecologist. However, this may be delayed, subject to Commonwealth approval.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response – Project Approval (MP09_0175)			
No	*Requirement*	*2023 IEA Assessment & Recommendation*	*2023 KEQ Response / Action*
	(f) Include a detailed description of the measures that would be implemented over the next 3 years (to be updated for each 3 year period following initial preparation of the plan), including the procedures to be implemented for: • Ensuring compliance with the rehabilitation objectives and progressive rehabilitation obligations of this consent; • Enhancing the quality of remnant vegetation and fauna habitat; • Restoring native endemic vegetation and fauna habitat within the rehabilitation area, including details of the target revegetation communities of the rehabilitated landform; • Coordinating the relocation of native fauna to protected habitats associated with preclearing fauna surveys; • Maximising the salvage of environmental resources within the approved disturbance area - including tree hollows, vegetative and soil resources - for beneficial reuse in the enhancement of the rehabilitation area; • Collecting and propagating seed; • Ensuring minimal environmental consequences for threatened species, populations and habitats; • Minimising the impacts on native fauna on site, including the details and implementation of appropriate pre-clearance surveys; • Minimising the impacts on fauna movement between undisturbed areas of the site and nearby vegetation (including potential fauna crossings); • Controlling weeds and feral pests; • Controlling erosion; • Controlling access and providing for management trails; and • Bushfire management and implementation of ecologically appropriate bushfire intervals. (i) Include a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria. (j) Identify the potential risks to successful implementation of the Tetratheca juncea translocation Program and rehabilitation of the site, and include a description of the contingency measures that would be implemented to mitigate these risks. (k) Include details as to how the rehabilitated land would be permanently conserved and managed as part of the broader Biodiversity Offset Area approved in these conditions. (l) Include details of who would be responsible for monitoring, reviewing, and implementing the plan; and (m) Include details as to the timing of actions set out in the plan The Applicant must implement the plan as approved by the Planning Secretary.		**2024 Annual Review Update:** Completed. Revised Landscape & Rehabilitation Management Plan approved by NSW Planning on 11 February 2025.
S3, C33	The Applicant must prepare a Biodiversity Offset Area Management Plan for the development to the satisfaction of the Planning Secretary. This Plan would relate to the area of the Biodiversity Offset Area required in these conditions. This plan must: (a) Be prepared by a suitably qualified expert whose appointment has been approved by the Planning Secretary (b) Be prepared in consultation with BCD and Council (c) Describe how the implementation of the Tetratheca juncea Translocation Program would be integrated with the Biodiversity Offset Area management. (d) Describe the short, medium and long-term measures that would be implemented to manage remnant vegetation and habitat on the Biodiversity Offset Area (e) Include detailed performance and completion criteria for evaluating the performance of the conservation, restoration and management of the Biodiversity Offset Area, including triggers for any remedial action.	**Assessment:** The Biodiversity Offset Area Management Plan (BOAMP) was most recently updated in April 2021. A number of outstanding actions recommended within the latest Ecological Monitoring Report (included within the 2022 Annual Review) have not been closed out and constitutes a non-compliance against clause (h) of this condition. Additional detail relating to compliance with this CoC is provided in Appendix A1. **Recommendation:** ERM notes that KEQ have implemented a "BOA Completion Status and Action Plan" and recommends that the status of actions be reviewed and updated as soon as practicable.	**ACTION:** KEQ to continue implementing the 2022 BOA Monitoring Actions in accordance with the developed action plan. This action plan will need to be consolidated to include actions from the 2023 monitoring period. **DUE:** As soon as practicable. **STATUS:** Underway – The key action of repairs to fauna fencing surrounding Dam 1 commenced 30 January 2024.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response – Project Approval (MP09_0175)			
No	*Requirement*	*2023 IEA Assessment & Recommendation*	*2023 KEQ Response / Action*
	(f) Providing for the transfer of environmental resources from the approved disturbance area - including tree hollows, vegetative and soil resources - for beneficial reuse in the enhancement of the Biodiversity Offset Area. (g) Providing for the incorporation of the final rehabilitated landform into the Biodiversity Offset Area and its management. (h) Include a detailed description of the measures that would be implemented over the next 3 years (to be updated for each 3-year period following initial preparation of the plan), including the procedures to be implemented for: • Enhancing the quality of remnant vegetation and fauna habitat • Restoring native endemic vegetation and fauna habitat within the parts of the Biodiversity Offset Area that are cleared or modified, including details of the target revegetation communities of the restored landform. • Coordinating the relocation of native fauna to protected habitats associated with preclearing fauna surveys. • Collecting and propagating seed • Maximising the protection and restoration of threatened species, populations and habitats in the Biodiversity Offset Area • Maximising fauna movement between the Biodiversity Offset Area and adjacent habitats. • Controlling weeds and feral pests • Controlling erosion • Controlling access and providing for management trails; and • Bushfire management and implementation of ecologically appropriate bushfire intervals. (i) Include a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria. (j) Identify the potential risks to successful implementation of the Biodiversity Offset program and include a description of the contingency measures that would be implemented to mitigate these risks. (k) Include details of who would be responsible for monitoring, reviewing, and implementing the plan. (l) Include details of the indicative costs of management actions; and (m) Include details as to the timing of actions set out in the plan.		**2024 Annual Review Update:** Completed. Fencing surrounding Dam was completed in February 2024.
S3, C39	The Applicant must ensure that the storage, handling, and transport of dangerous goods and hazardous materials is conducted in accordance with the relevant Australian Standards, particularly AS1940 and AS1596, and the Dangerous Goods Code.	**Assessment:** KEQ have developed a Hazardous Substances (SDS) Register, most recently updated in December 2022, which describes the list of products, quantities, location on site, type of application, SDS issue and expiry dates, and "stability and reactivities" classification. Based on a review of tank compliance plates, tank brochures and site observations, the auditors are satisfied that dangerous good and hazardous materials are stored in accordance with AS1940, AS1596 ad the Dangerous Goods Code. However, it is noted that neither of the Diesel ASTs are included on the Hazardous Substances Register. **Recommendation:** The hazardous materials storage container should be repaired (to ensure it does not allow rainfall to fill the bund – making it inoperable) to ensure it complies with AS1940. It is recommended to update the Hazardous Subsidence Register to ensure it includes both diesel ASTs.	**ACTIONS:** 1. KEQ to review repair options to the storage container and implement as needed. 2. KEQ to review Hazardous Substances Register and include in KEQ reporting processes to ensure routine updates and revisions are carried out. **DUE:** As soon as practicable. **2024 Annual Review Update:** 1. Completed in early 2024. 2. Completed in 2023.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

2024 Annual Review Status Update

KEQ 2023 IEA Findings and KEQ Response – Project Approval (MP09_0175)			
No	*Requirement*	*2023 IEA Assessment & Recommendation*	*2023 KEQ Response / Action*
S5, C1	The Applicant must prepare an Environmental Management Strategy for the development to the satisfaction of the Planning Secretary. This strategy must: (a) Be submitted to the Planning Secretary for approval prior to the commencement of construction activities (b) Provide the strategic framework for environmental management of the development. (c) Identify the statutory approvals that apply to the development. (d) Describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development. (e) Describe the procedures that would be implemented to: • Keep the local community and relevant agencies informed about the operation and environmental performance of the development. • Receive, handle, respond to, and record complaints; • resolve any disputes that may arise during the course of the development; • respond to any non-compliance; and • Respond to emergencies; and (f) Include: • Copies of any strategies, plans and programs approved under the conditions of this consent; and • Clear plan depicting all the monitoring required to be carried out under the conditions of this consent. The Applicant must implement the strategy as approved by the Planning Secretary.	**Assessment:** The latest version of the Environmental Management Strategy (EMS) was prepared in December 2015. It is noted that there are references to management plans within the EMS which are now superseded, therefore the version is not considered up to date as required by clause (f) of this condition. Additional detail relating to compliance with this CoC is provided in Appendix A1. **Recommendation:** It is recommended that a review of the EMS be undertaken and updated where required to ensure it is current. This includes but not limited to updates in statutory requirements and references to updated management plans and monitoring programs.	**ACTION:** KEQ to complete a comprehensive review of the Environmental Management Strategy and submit the revised document to the Planning Secretary for approval. **DUE:** 28 May 2024 in accordance with Schedule 5, Condition 5(c). **STATUS:** Underway – draft revision of the management plan has been completed by IEMA. A further revision is to be assessed in accordance with this recommendation. **2024 Annual Review Update:** Completed. Revised Environmental Management Strategy approved by NSW Planning on 19 August 2024.
S5, C2	The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in this consent. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity: (a) Take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur. (b) Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and (c) Implement remediation measures as directed by the Planning Secretary.	**Assessment:** (a) During the audit period, there have been multiple exceedances of the surface water discharge limits, however it is not clear to the auditors whether feasible measures (including a review of appropriate Management Plans) have been taken to ensure the exceedance ceases. (b) Example incident reports have been issued to the DPE and reviewed by ERM. Some incident reports have not been issued to the Department immediately after an incident occurred. (c) There have been no specific remediation measures directed by the Planning Secretary within this audit period. **Recommendation:** Conduct a review of short term adaptive management processes to consider whether temporary solutions such as pumping and storage of water to enable short term provisioning of additional capacity is recommended. The above recommendations should be incorporated within an update to the Water Management Plan.	**RESPONSE:** (a) VGT completed a water management review of the KEQ site on 14 September 2023, which concluded no reasonable short-term measures could be completed without securing further approvals. Therefore, KEQ disagrees with the non-compliance findings. **ACTION:** KEQ to include these two recommendations into the comprehensive review of the Water Management Plan. Refer to the response under Schedule 3, Condition 21 for further details. **2024 Annual Review Update:** Completed. Revised Water Management Plan submitted to NSW Planning on 10 September 2024.
S5, C4	By the end of March each year, the Applicant must review the environmental performance of the development to the satisfaction of the Planning Secretary. This review must: (a) describe the development (including rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year.	**Assessment:** The Annual Reviews which are applicable within this audit period are for the years 2020, 2021 and 2022. The auditors reviewed the Annual Reviews and confirm each contain the required details as listed within (a) to (f) of this condition.	**RESPONSE:** KEQ acknowledges the 2022 Annual Review was subject a late submission. KEQ has since implemented improved reporting processes to ensure submission of documents to external stakeholders is completed.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response – Project Approval (MP09_0175)			
No	*Requirement*	*2023 IEA Assessment & Recommendation*	*2023 KEQ Response / Action*
	(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against: • The relevant statutory requirements, limits or performance measures/criteria; • The monitoring results of previous years; and • The relevant predictions in the documents referred to in condition 2(d) of Schedule 2 of this consent. (c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance. (d) identify any trends in the monitoring data over the life of the development; (e) identify any discrepancies between the predicted and actual impacts of the development and analyse the potential cause of any significant discrepancies; and (f) describe the measures that would be implemented over the current calendar year to improve the environmental performance of the development.	Following consultation with the Planning Secretary and as captured within the 2022 Annual Review and "Post Approval Document Received" email notification, the 2021 Annual Review was identified to have been lodged in October 2022 therefore considered a late submission in accordance with this condition. **Recommendation:** It is recommended that all Annual Reviews are submitted to the Planning Secretary by the end of March each year.	**STATUS:** Completed – no further actions required.
S5, C5	Within 3 months of: (a) The submission of an annual review under Condition 4 above. (b) The submission of an incident report under Condition 7 below. (c) The submission of an audit report under Condition 9 below; or (d) Any modification to the conditions of this consent, (unless the conditions require otherwise), the Applicant must review the strategies, plans, and programs required under this consent, to the satisfaction of the Planning Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted for the approval of the Planning Secretary. *Note: The purpose of this condition is to ensure that strategies, plans and programs are regularly updated to incorporate any measures recommended to improve environmental performance of the development.*	**Assessment:** The management plans and strategies which are applicable to this condition are as follows: ▪ Environmental Management Strategy – dated Dec 2015 ▪ Air Quality Management Plan –dated May 2019 ▪ Blast Management Plan – dated May 2019 ▪ Noise Management Plan – dated April 2022 ▪ Heritage Management Plan – dated December 2015 ▪ Water Management Plan – dated May 2019 ▪ Traffic Management Plan – dated December 2015 ▪ Tetratheca Juncea Translocation Plan – dated January 2019 ▪ Biodiversity Offset Strategy – dated July 2013 ▪ Landscape and Rehabilitation Management Plan – dated March 2020 ▪ Biodiversity Offset Area Management Plan – dated April 2021 There is no evidence within the respective strategies, plans and programs required under this consent to demonstrate that a review has taken place within the requirements of this condition. **Recommendation:** Ensure that all strategies, plans and programs required under this consent are updated to include a document control or similar so that revision dates are clear to the reader. Opportunities to improve notification systems are recommended to be reviewed to ensure programs are revised within the timeframes as required under this consent.	**RESPONSE:** KEQ acknowledges the review, revision, completion of agency consultation and re-submission of statutory management plans requires significant improvement. In 2023, KEQ has implemented a new document template, document control system (inclusive of Document ID and version numbers, and a consolidated document history table) as well as a new Management Plan register to enable improved timeliness of document updates when revision triggers are reached. **ACTIONS:** Refer to constituent management plan conditions for individual actions. **STATUS:** Completed – document management system.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response - Environment Protection Licence (EPL 20611)				
No	*Requirement*	*2023 IEA Assessment*	*2023 IEA Recommendation*	*2023 KEQ Response / Action*
L1.1, L2.1, L2.2	L1.1 – Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997. L2.1 – For each monitoring/discharge point or utilisation area specified in the table/s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table. L2.2 – Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.	From the review of the Annual Returns and Surface Water Monitoring Discharge Register it is noted that numerous reoccurring uncontrolled discharges of surface waters that exceed the concentration limits have occurred during the audit period. According to the Discharge Register, the following discharges were recorded which exceeded the concentration limits defined in EPL 20611 [summary]: 2020 – a total of 11 discharges non-compliant with the EPL concentration limits. 2021 – a total of 18 discharges non-compliant with the EPL concentration limits. 2022 – a total of 29 discharges non-compliant with the EPL concentration limits. All discharges exceeding the concentration criteria have been reported within the Annual Returns. Heavy rainfall, particularly in 2021 and 2022 resulted in multiple uncontrolled and non-compliant discharges during the audit period. A review of the WMP has not been carried out as required following the multiple exceedances of the discharge limits. It is not clear whether the response procedures described in the WMP are effective in preventing non-compliant discharges during heavy rainfall.	Conduct a detailed review of the effectiveness of the WMP, inclusive of the TARP to ensure that management measure are appropriate to ensure sufficient storage capacity of the KEQ dams is effectively maintained, such that uncontrolled discharges do not occur. The review should consider the multiple surface water discharge exceedances which took place in 2020, 2021 and 2022 and the effectiveness of associated preventative measures and procedures, such as scheduling of dam desedimentation works prior to forecast rainfall events. The review should be conducted by a suitably qualified specialist and recommendations should be reflected within an update to the WMP. It is recommended that KEQimplement a framework to log all steps and actions to be taken in accordance with the TARP, in particular when a 'Condition Amber' or 'Condition Red' Trigger Response is enacted.	Duplicate recommendations. Refer to water-related conditions of the Project Approval for further details.
O1.1, O5.1, O5.2	O1.1 – Licensed activities must be carried out in a competent manner. This includes: (a) The processing, handling, movement and storage of materials and substances used to carry out the activity; and (b) The treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity. O5.1 – All tanks and storage areas for drums containing material that has potential to cause environmental harm must be bunded or have an alternative spill containment system in-place. The bunding and/or spill containment systems must be properly designed, engineered, and constructed to be suitable for the material types and quantities stored therein in accordance with all appropriate standards, including Australian Standards (AS)1940 and AS1596. O5.2 – Bunds must: (a) have walls and floors constructed of impervious materials; (b) Be of sufficient capacity to contain 110% of the volume of the tank (or 110% volume of the largest tank where a group of tanks are installed); (c) Have floors graded to a collection sump; (d) Not have a drain valve incorporated in the bund structure; or be constructed and operated in a manner that achieves the same environmental outcome.	Lubricants and associated materials were stored within a hazardous material storage container that was no longer structurally sound and open to the weather which results in the bund being filled with water, this considered non-compliant with this condition. There are two aboveground storage tanks (ASTs) containing diesel onsite, both of which comprise a double walled construction. The primary storage area has been constructed with a drainage system to sump, but the sump was noted to be under-sized and it would offer limited containment in the event of a spill.	The hazardous materials storage container should be repaired (to ensure it does not allow rainfall to fill the bund – making it inoperable) to ensure it complies with AS1940.	Duplicate recommendation. Refer to the Schedule 3, Condition 39 for further details.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response - Environment Protection Licence (EPL 20611)				
No	*Requirement*	*2023 IEA Assessment*	*2023 IEA Recommendation*	*2023 KEQ Response / Action*
O3.1, O3.2, O3.3	O3.1 – The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises. O3.2 - Any activity carried out in or on the premises must be carried out by such practical means as to prevent dust or minimise the emission of dust to the air. O3.3 – Any plant operated in or on the premises must be operated by such practical means to prevent or minimise dust or other air pollutants.	Central control room to manage dust suppression sprays at each transfer point and stockpile within crushing and screening plant. Water spray truck actively wets internal roads and product stockpiles. Biggest observable issue during the site visit was noted to be from main drop point to boot – jaw crusher. Across the audit period it was noted that dust was generally managed in accordance with this condition, although an exceedance of the air quality limits stated in the Project Approval, as below: • Short term PM: One exceedance of the short-term criteria for PM10, occurring on 16 June 2023 with a PM10 monitoring value of 51 µg/m3. This result is considered a low-range exceedance with the PM10 limit of 50 µg/m3 and as this is the only exceedance recorded within this audit period, no further actions are recommended at this stage.	As only a single incident of a lowrange exceedance occurred during the audit period, no specific recommendations are made beyond continuing to monitor for exceedances as per the requirement of the EPL. If exceedances reoccur examine additional measure to manage.	Duplicate recommendations. Refer to air quality-related conditions of the Project Approval for further details.
O7.1	All acoustic bunds necessary to achieve compliance with the noise limits specified in this licence must be constructed prior to the commencement of quarrying activities and be maintained throughout the operational life of the premises to the height and location described in the Noise Management Plan.	It was noted in the Annual return for the reporting period 26-08-2020 to 25-08-2021 that acoustic bunding was not constructed as required by condition O7.1 as it was deemed to be ineffective. Enclosures were built around the crushers which meets noise limit protection requirements. The EPL was varied on 02/09/2022, removing the requirement for bunding and amending condition O7.1. The noncompliance noted for this condition was limited to the previous version of the EPL. The site is compliant as at the close of the audit period.	As the original requirement has been removed from the EPL condition, no further action is recommended.	**RESPONSE:** KEQ disagrees with this finding as the implementation of noise enclosures as part of MOD8 addressed the intent of this condition which was not removed at the time due to administrative oversight.
M2.1, M3.1	M2.1 – For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns. M3.1 – Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with: (a) Any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or (b) If no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or (c) If no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place. *Note: The Protection of the Environment Operations (Clean Air) Regulation 2021 requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".*	Monitoring of discharges is outlined in Section 8.1.3 of the WMP. The monitoring frequency is generally conducted in accordance with Condition M2.1. Examples of air quality monitoring for deposited dust, TSP and PM10 during the audit period were viewed. Sampling from reports reviewed is undertaken in accordance with the stated methods. A review of the Annual Returns noted 2 separate non-compliances against condition M2.1 & M3.1. The first was reported as being due to a HVAS sample jar being shattered twice (03/06/2021 and 05/07/2021) at the laboratory prior to analysis. KEQ stated the action taken was to instruct laboratory /field technicians to take greater care when handling sample jars. The second was reported as a failure of HVAS equipment failing during periods of extreme rainstorms	Ensure monitoring is undertaken in accordance with requirements of M2 conditions.	**RESPONSE:** KEQ acknowledges the finding, but considers no further actions are required.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response - Environment Protection Licence (EPL 20611)				
No	*Requirement*	*2023 IEA Assessment*	*2023 IEA Recommendation*	*2023 KEQ Response / Action*
		(22/03/2021, 28/03/2021 and 03/04/2021) resulting in scheduled runs not being able to be undertaken. Make up runs were subsequently undertaken to make up for the missed runs. Beyond the above noted issues, air quality monitoring is undertaken as per the methodology prescribed by the NSW Environment Protection Authority (EPA) in their document, Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2022) (Approved Methods).		
M8.1	To assess compliance with the noise limits for this premises attended noise monitoring must be undertaken in accordance with all noise condition and: a) During a period of normal quarry operations. b) at each one of the locations listed in the noise limits table of this licence c) Occur quarterly in the reporting period. d) Occur during each day period as defined in the NSW Noise Policy for Industry. *Note: Quarterly attended noise monitoring must be completed (unless otherwise agreed by the Planning Secretary) to determine whether the development is complying with the relevant conditions of this consent. The frequency of noise monitoring will be reviewed, upon request.*	A review of the Quarterly Monitoring Reports, prepared by EMM Consulting, across the audit period identified the methodology includes the requirements of this condition. Recorded Weather and Operating Conditions as reported stated monitoring was conducted in accordance with the stated criteria a), b) and d). A review of the Annual Returns noted 1 noncompliance for c) Noise monitoring not undertaken during the 26-08-2020 to 25-08-2021 reporting period. KEQ stated due to statistically wet year, monitoring under the required meteorological conditions proved difficult and therefore the last quarter monitoring was not conducted in time. KEQ stated in response to the failure to monitor they were amending the process of planning for quarterly monitoring to account for weather impacts. It is noted that the incident has not reoccurred during the audit period.	Following the incident KEQ amended quarterly monitoring planning and the failure to conduct quarterly monitoring has not reoccurred. Therefore, no further action is recommended.	**RESPONSE:** KEQ acknowledges the finding, but considers no further actions are required.
R1.5	The Annual Return for the reporting period must be supplied to the EPA via eConnect EPA or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').	A review of the submission dates of the Annual Returns noted that the Annual Return for the reporting period 26-08-21 to 25-08-2022 was submitted on 26-10-2022, 2 days after the due date of 24-10-2022. All other Annual returns for the audit period were noted to have been submitted within the required time period.	Ensure Annual Returns are submitted within the 60 days and the due date as notified by the EPA.	**RESPONSE:** KEQ acknowledges the 2021/22 Annual Return was subject a late submission. KEQ has since implemented improved reporting processes to ensure submission of documents to external stakeholders is completed. **STATUS:** Completed – no further actions required.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response – Opportunities for Improvement				
No	*Requirement*	*2023 IEA Assessment*	*2023 IEA Recommendation*	*2023 KEQ Response / Action*
S3, C27	The Applicant must develop a translocation program for Tetratheca juncea to the satisfaction of the Planning Secretary. This program must: (a) be prepared in consultation with BCD, by a suitably qualified and experienced ecologist whose appointment has been approved by the Planning Secretary; (b) be submitted to the Planning Secretary for approval prior to the commencement of construction activities that involve clearing of or potential harm to Tetratheca juncea; (c) include measures for the translocation of all Tetratheca juncea stems in the area of disturbance to nearby areas with similar physical and biological habitat features; (d) include a monitoring program to study the Tetratheca juncea stems before and after translocation; (e) include short and long-term goals and performance criteria to measure the effectiveness of the program; and (f) provide for the transfer of information obtained as a result of implementing the program to BCD and the Department.	The Tetratheca juncea Tanslocation Management Plan (TjTMP) (sic) was most recently updated in January 2019. Whilst no non-compliances have been identified specific to this condition, recommendations are made in relation to the success of the program. (a) The TjTMP was prepared in consultation with the Office of Environment and Heritage (OEH) with evidence of the consultation attached to Appendix B of the TjTMP. Evidence is provided within Appendix A of the TjTMP confirming a suitably qualified expert was approved by the Planning Secretary to prepare the TjTMP. (b) A letter from the DPE provided confirms the TjTMP was approved in accordance with the Project Approval. (c) Section 6 and Section 7 of the TjTMP describe measures for the translocation of Tetratheca juncea (T. juncea) stems in the area of disturbance to nearby areas. More specifically, the TjTMP describes that all clumps of T. juncea identified during the original Project Approval had already been translocated to the translocated area. The translocation of additional T. juncea identified within "Site 2" as part of the modification to the original "Part 3A approval" was scheduled to take place in 2018 and 2020. Further details in Section 7 of the TjTMP describes the translocation process, ecologicsl inspection requirements and after planting care. (d) The TjTMP describes a monitoring program in Section 9, including for the original Development Approval and for "Site 2". Monitoring Actions are listed in the monitoring program and include a timing for completion of each action. Examples of actions to be undertaken include: ▪ Count flowers, ▪ Count fruits, ▪ Observe general plant health, and ▪ Photo points. The most recent T. juncea Monitoring Report was prepared in February 2021 by Firebird ecoSultants following a site visit undertaken in October 2020. The Report confirms that "*the year 2020 was to be the final year of monitoring of the translocation project*" and states "*the translocation site does not present suitable habitat*", due to the low level of success of the translocation project at the Site. Additional contributing factors have been raised in relation to the low survival rate of T. juncea following translocation, such as lower long term average rainfall, however, the primary factor being the translocation site is not representative of the habitat that T. juncea typically occur in. (e) Short Term and Long Term goals are described in Section 8 of the TjTMP, include references to performance criteria described in Section 9. Section 9 lists the monitoring actions for translocation and states that this information "*will be used to report and measure the general health and success of the translocated T. juncea sections*" and that *"reports should be provided annually to OEH and DPE on the success of translocation methods and recommendations made to assist in future translocation efforts".*	Whilst the auditors have collected sufficient evidence to demonstrate KEQPL are compliant with the scope and intent of the condition, due to the low survival rate of T. juncea following translocation (less than the 25% target), a review of the T. juncea Translocation Program should be undertaken by a suitably qualified ecologist in consultation with BCS. This review will identify if the approved methodologies and performance criteria were applicable to the site conditions. A Trigger Action Response Plan should be considered in any future translocation plans to support the targeted short and long term success rate goals. In the event any future tanslocations of T. juncea are triggered, the results of this current translocation event must be considered and amendents made to the site selection criteria (including soil type, slope and aspect). The requirement for long term weed control, reduced grazing pressures and any prescribed burns, or other measures to stimulate seed germination, should be clearly identified as part of the adaptive management measures. Any future translocation plan will need to be prepared in consultation with BCS and approved by the Planning Secretary.	**Response:** KEQ has sought legal advice regarding the TjTP and has confirmed that the program ceased in 2020. Therefore, KEQ considers that the program is now completed, with no further action required.

KEQ IEA 2023 – Response to Audit Recommendations (revised)

KEQ 2023 IEA Findings and KEQ Response – Opportunities for Improvement				
No	*Requirement*	*2023 IEA Assessment*	*2023 IEA Recommendation*	*2023 KEQ Response / Action*
S3, C41	The Applicant must: (a) ensure the development is suitable equipped to respond to any fires on site; (b) assist the Rural Fire Service and emergency services as much as possible if there is a fire in the surrounding area; and (c) ensure new construction complies with Australian Standard AS3959-2018 'Construction of buildings in bush fire-prone areas' or the relevant requirements of the NASH Standard – Steel Framed Construction in Bushfire Areas (incorporating amendment A - 2015); and the construction requirements in Section 7.5 of 'Planning for Bush Fire Protection 2019'.	(a) KEQPL have a Bushfire Evacuation Plan (undated) which describes the procedures in relation to notifications to site personnel and constructures, communication methods, and evacuation and assembly. The plan also describes the allocation of responsibilities and response instructions for quarry supervisors and personnel. An Emergency Contacts sheet document lists the contact information of local Emergency Services such as Police, Fire Brigade, Ambulance, Hospitals, EPA, SES and Mines Rescue, as well as the names and numbers of internal emergency contacts. First Aid Kits, Fire Extinguishers and Water Carts were all observed to be available during the site audit. The Emergency Management Flip Chart describes the site evacuation procedures for a range of emergencies including fire, explosion, persons trapped and major trauma. The Flip Chart provides further details of the responsibilities of the site Emergency Controllers (which are allocated at each daily toolbox meeting) as well as maps and procedures which identify the Emergency Assembly procedures and locations. (b) Based on review of the NPWS Fire History – Wildfires and Prescribed Burns, no bushfires have occurred in the near vicinity of the Site during the audit period, this not triggering compliance with Condition 41(b). (c) It was confirmed by Site Management that no new construction has occurred during the audit period.	Whilst this condition is deemed compliant, it is recommended that the Bushfire Evacuation Plan is updated with a version control including date of review to ensure it is current and can be periodically reviewed.	**ACTION:** KEQ to review the Bushfire Evacuation Plan document template and update as considered necessary. **DUE:** 31 March 2025. **2024 Annual Review Update:** Completed. Bushfire Evacuation Plan will be managed as part of the sites WHS Management System.

Appendix 5 – Biodiversity Offset Area Monitoring Report

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Karuah East Quarry

Biodiversity Offset Area Monitoring Report

Karuah East Quarry Biodiversity Offset Area

Report prepared for:
Karuah East Quarry Pty Limited

Rev 1

Karuah East Quarry

Biodiversity Offset Area Monitoring Report

Karuah East Quarry Biodiversity Offset Area

Report Prepared for Karuah East Quarry Pty Limited

Version Control

Rev. No.	Revision Date	Author/s	Reviewer	Details
Rev 1	16 December 2024	Rachel Neal	Mark Dean	Draft
Rev 2	26 February 2025	Rachel Neal	Mark Dean	Final

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1. INTRODUCTION

1.1 BACKGROUND

The Karuah East Quarry (KEQ) Project was subject to an assessment under part 3A of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). The project was approved by the Planning Assessment Commission on 17 June 2014 subject to conditions set out in Schedules 2 to 5 of the Project Approval (09_0175). Subsequent modification was approved on 27 April 2018 (Modification 1) and 19 December 2018 (Modification 2) under Section 75J of the EP&A Act (Modification 1). A referral under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) for the project was also lodged with the Department of the Environment (DotE) (now known as Department of Agriculture, Water and the Environment - DAWE) on 29 July 2014 (EPBC 2014/7282). On 25 August 2014 the project was determined as a Controlled Action under the EPBC Act requiring further assessment subject to the controlling provision 'listed threatened species and communities'. The action was approved by DotE on 20 March 2015 subject to 17 conditions of approval.

Condition 33 of the NSW Project Approval and Condition 9 of the EPBC Act approval require the implementation of a Biodiversity Offset Area Management Plan (BOAMP) for the KEQ biodiversity offset area (BOA), which is a 138.22 ha consolidated land parcel (part Lot 13 DP1024564, Lot 14 DP1024564, Lot 5 DP838128) adjoining the western boundary of the project disturbance area (Figure 1). The BOAMP was prepared by Kleinfelder (2015) and subsequently approved by the NSW Department of Planning and Environment (DP&E) on 14 December 2015, and approved by the DotE on 16 March 2016. The BOAMP has since been updated in consideration of Modification 1 (February 2019) and Modification 2 (June 2021). Establishment of a Conservation Agreement or Stewardship Site Agreement for the BOA is currently in progress (with the Biodiversity Conservation Trust) as required under the project approval - Condition 29.

Baseline ecological surveys and monitoring were undertaken in October 2015 prior to commencement of clearing and construction as required under Section 3 of the BOAMP. The baseline monitoring surveys involved the establishment of 13 permanent monitoring sites within the Karuah East BOA in accordance with the BOAMP. An additional five permanent monitoring sites were also established on the adjoining Lot 12 DP 1024564 as per Sections 3.2 and 4.1 of the Statement of Commitments in accordance with Section 11.1.3 of the Landscape and Rehabilitation Management Plan (L&RMP) (SLR 2015). In addition to establishing the permanent monitoring sites, the surveys also involved baseline assessment of fencing, access tracks, erosion, weeds and vertebrate pests in accordance with Section 3 of the BOAMP. The baseline ecological surveys and monitoring report (Kleinfelder 2016) was submitted as an addendum to the BOAMP in January 2016 (available from https://hunterquarries.com.au/reporting/)

The first year of annual monitoring of the BOA and Lot 12 was undertaken in October 2016. This report provides the results of the ninth annual monitoring event undertaken in September/October 2024. Monitoring including analysis of monitoring data to date to evaluate changes in vegetation condition and threatened flora populations in the BOA.

This report also provides a summary of management actions completed within the BOA to date and recommendations for implementation of management actions in Year 9 of the BOAMP implementation to ensure compliance with relevant performance criteria.

Karuah East Quarry Approved Disturbance Area

Biodiversity Offset Area

National Parks & Reserves

Minor watercourse

Primary Road

Arterial Road

Sub-Arterial Road

Local Road

Figure 1: Karuah East Quarry & Biodiversity Offset Area

100 200 300 400 500 m

N

GDA94 / MGA zone 56
EPSG:28356

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Map Produced: 05/12/2024
Produced By: Kane Blundell

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1.2 SCOPE

Section 3 of the BOAMP details the annual monitoring requirements for the Karuah East Quarry BOA. Additionally, Section 12.1 of the L&RMP details the ecological monitoring requirements for the Karuah East Quarry project area, adjoining vegetation within 50 m of the project area boundary on Lots 12 and 13, and along Yalimbah Creek (Lot 12). A summary of the Karuah East Quarry annual ecological monitoring requirements is provided in **Table 1.** It is noted that not all monitoring activities listed in **Table 1** are required for the 2024 monitoring (refer to the timing/frequency).

Table 1: Summary of annual monitoring requirements for Karuah East Quarry BOA and Lot 12

Monitoring Requirements	BOAMP / L&RMP Section(s)	Timing / Frequency	Completed in 2024
Vegetation and Threatened Flora Monitoring The 18 permanent monitoring sites established in the BOA and Lot 12 during the baseline are to be surveyed annually in accordance with Section 3.13 of the BOAMP and Section 12.1.3 of the L&RMP. Monitoring is to be undertaken during spring to coincide with the flowering times of threatened flora species in the BOA.	Section 3.13 of BOAMP Section 12.1.3 of L&RMP	Annually for the life of quarry (LOQ)	Completed
Fencing Inspections of boundary fencing will be undertaken as part of annual monitoring to identify maintenance requirements and record fencing activities undertaken in previous year. The effectiveness of fencing in excluding stock and unauthorised activities (e.g. rubbish dumping) will also be evaluated during annual monitoring and any additional controls will be identified if required.	Section 3.2 of BOAMP Section 12.1.2 of L&RMP	Annually for LOQ	Completed
Tracks Inspections of retained and redundant access tracks will be undertaken as part of annual monitoring to identify maintenance requirements and record maintenance activities undertaken in previous year.	Section 3.3 of BOAMP	Annually for LOQ	Completed
Erosion Inspections of erosion sites will be undertaken as part of annual monitoring to identify maintenance requirements and record maintenance activities undertaken in previous year. Erosion and sediment control structures installed within the project disturbance area to protect retained vegetation will be inspected as part of annual ecological monitoring.	Section 3.4 of BOAMP Section 12.1.2 of L&RMP	Annually for LOQ	Completed

Monitoring Requirements	BOAMP / L&RMP Section(s)	Timing / Frequency	Completed in 2024
Existing Dwellings Inspections of the dwellings, access tracks, and asset protection zones (APZs) will be undertaken as part of annual monitoring to identify maintenance requirements. These inspections will focus on fencing, weeds, and unauthorised access / disturbance.	Section 3.5 of BOAMP	Annually for LOQ	Completed
Habitat Augmentation and Nest Boxes Nest boxes will be inspected and maintained (or replaced) every two years following installation: Nest boxes 1 – 30 installed in April 2016 Nest boxes 31 – 125 installed in February 2018 Nest boxes 126 – 318 installed in July-August 2020 Nest boxes 319 – 375 installed in February 2023.	Section 3.8 of BOAMP	Boxes 1-375 monitoring required in 2024.	Monitoring completed for nest boxes 1-375 in 2024 and further monitoring will be required in 2026.
Weeds Target weed species will be mapped on an annual basis within the Project Disturbance Area and adjoining vegetation on Lots 12 and 13 (within 50 m of the project disturbance area boundary). Additionally, weed mapping along Yalimbah Creek will also be undertaken as part of the ecological monitoring program.	Section 12.1.1 of L&RMP	Annually (KEQ, 50 m buffer and Yalimbah Creek)	Completed (KEQ, 50 m buffer, Yalimbah Creek)
Weed mapping for the BOA will be undertaken every two years and compared to the previous mapping to assess changes in the extent and density of target weeds. Monitoring results will be used to develop a control strategy for the following two years, identifying target locations and timing for primary and follow-up control.	Section 3.10 of BOAMP	Every 2 years from baseline survey for LOQ (BOA)	Weed mapping for BOA updated in this report (2024).
Vertebrate Pest Assessment Monitoring of vertebrate pests will be undertaken using the same methods, locations and effort as the baseline assessment unless otherwise recommended in the annual monitoring reports. This will enable results to be accurately compared to the baseline assessment.	Section 3.11	Every 2 years from baseline survey for LOQ (BOA)	Pest management to be conducted.

Monitoring Requirements	BOAMP / L&RMP Section(s)	Timing / Frequency	Completed in 2024
Aerial Fauna Crossings A 12-month monitoring program of the two aerial fauna crossings will be undertaken using remote motion sensing cameras mounted on each pole (four cameras in total) once the crossings have been installed.	Section 12.1.4 of L&RMP	12 months from installation of the crossings	Aerial fauna crossings installed 2022. Monitoring program started awaiting results.
Threatened Flora Translocation – refer to *Tetratheca juncea* Translocation Management Plan (TjMP; Firebird 2015).	Refer to TjMP	Refer to TjMP	Completed – refer to Tj Translocation Monitoring Report (Firebird 2021)

1.3 KARUAH EAST QUARRY PROGRESS

The Karuah East Quarry (KEQ) Project commenced operations in May 2019 after the plant's construction in 2018. Vegetation clearing commenced in April 2016, and the majority of the KEQ project area was primarily cleared between April and June 2016, with some additional clearing also occurring in November 2016, May 2018, July 2018, October 2019, November 2019, September 2020, March 2021, June 2021, October 2021 and May 2022. Much of the disturbance area has been cleared to date. Major earthworks have also been completed, including the construction of the haul road, detention basins, and other infrastructure areas.

The current extent of clearing within the KEQ project area is shown in **Figure 2**.

Karuah East Quarry
Approved Disturbance Area

National Parks & Reserves

Minor watercourse

Primary Road

Local Road

Figure 2:
Current Extent of Clearing within the Karuah East Quarry Project Area

50 100 150 200 250 m

N

GDA94 / MGA zone 56
EPSG:28356

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Map Produced: 05/12/2024
Produced By: Kane Blundell

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1.4 BIODIVERSITY VALUES

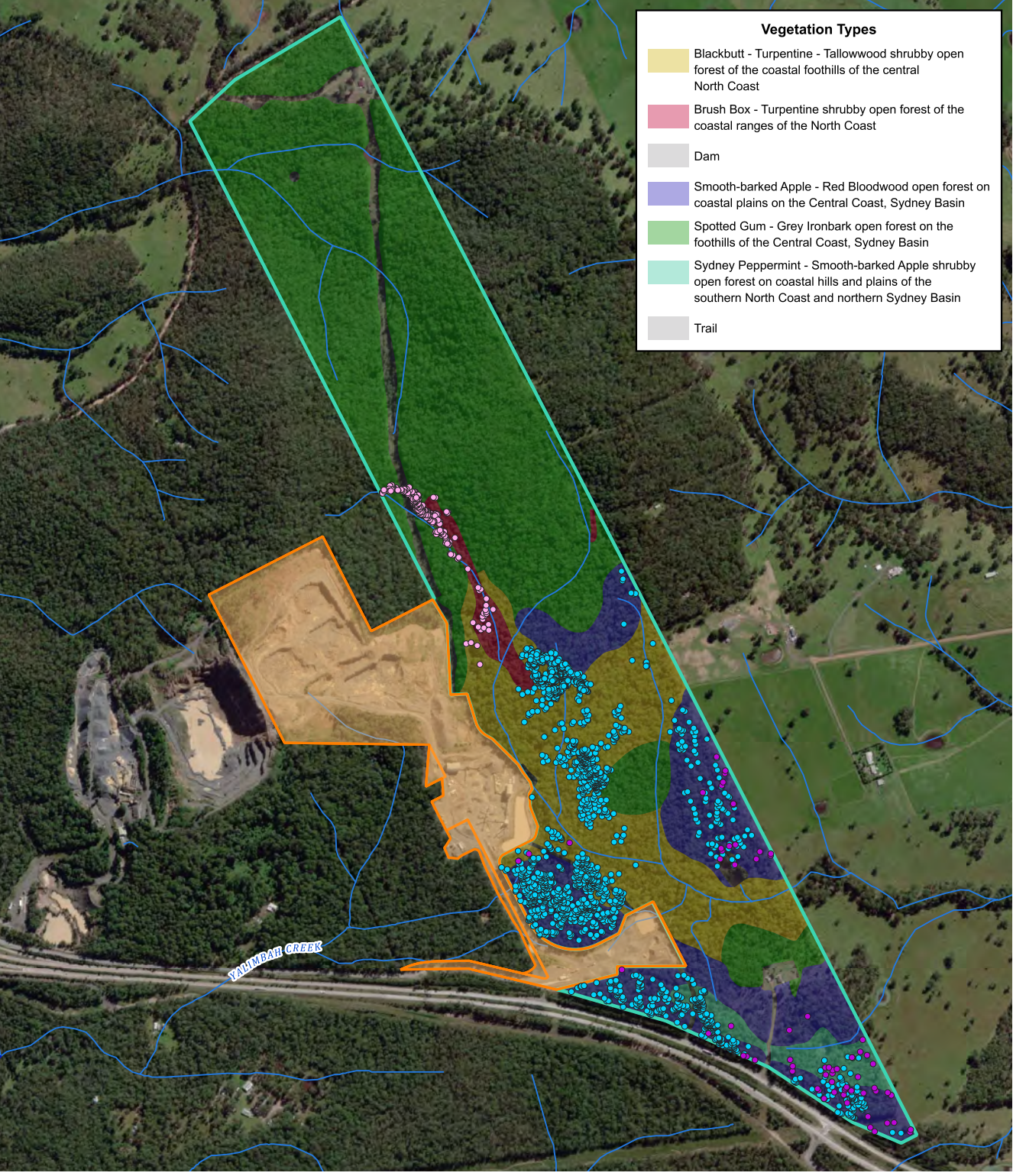
Section 2.3 of the BOAMP provides a detailed description of the biodiversity values identified in the Karuah East Quarry BOA during previous assessments (RPS Australia Pty Ltd 2013; Eco Logical Australia (ELA) 2013, 2014). Additional baseline ecological surveys were also undertaken within the BOA in October 2016 (Kleinfelder 2016). A summary of the key biodiversity values present (or previously recorded) within the site is provided in **Table 2** The locations of threatened flora species and the distribution of vegetation communities across the BOA are shown in **Figure 3**.

Table 2: Key Biodiversity Values Recorded within the Karuah East BOA

	Biodiversity Values	Area (ha) / No. of individuals
Vegetation Communities	Spotted Gum – Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin.	69.98
	Sydney Peppermint – Smooth barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin.	3.96
	Smooth-barked Apple - Red Bloodwood open forest on coastal plains on the Central Coast, Sydney Basin.	26.58
	Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast.	28.30
	Brush Box - Turpentine shrubby open forest of the coastal ranges of the North Coast.	2.62
Threatened Flora Species	*^*Tetratheca juncea* (Black-eyed Susan)	6,907
	*^*Grevillea parviflora subsp. parviflora* (Small-flower Grevillea)	100+
	*^*Asperula asthenes* (Trailing Woodruff)	399
Threatened and Migratory Fauna Species	* *Falsistrellus tasmaniensis* (Eastern Falsistrelle)	-
	* *Miniopterus australis* (Little Bent-winged Bat)	-
	* *Miniopterus orianae oceanensis* (Eastern Bent-winged Bat)	-
	* *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat)	-
	* *Myotis macropus* (Southern Myotis)	-
	* *Vespadelus troughtoni* (Eastern Cave Bat)	-
	* *Calyptorhynchus lathami* (Glossy Black-Cockatoo)	-
	* *Daphoenositta chrysoptera* (Varied Sittella)	-

	Biodiversity Values	Area (ha) / No. of individuals
	* *Ninox strenua* (Powerful Owl)	-
	+ *Rhipidura rufifrons* (Rufous Fantail)	
	* *Petaurus norfolcensis* (Squirrel Glider)	

** = listed as Vulnerable under the BC Act 2016*
^ = listed as Vulnerable under the EPBC Act 1999
+ = listed as Migratory under the EPBC Act 1999



Karuah East Quarry Approved Disturbance Area

Biodiversity Offset Area

Major watercourse

Minor watercourse

Asperula asthenes

Grevillea parviflora subsp. *parviflora*

Tetratheca juncea

Figure 3:
Vegetation Types and Threatened Flora Locations

100 200 300 400 500 m

N

GDA94 / MGA zone 56
EPSG:28356

WEDGETAIL PROJECT CONSULTING

Map Produced: 05/12/2024
Produced By: Kane Blundell

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2. METHODS

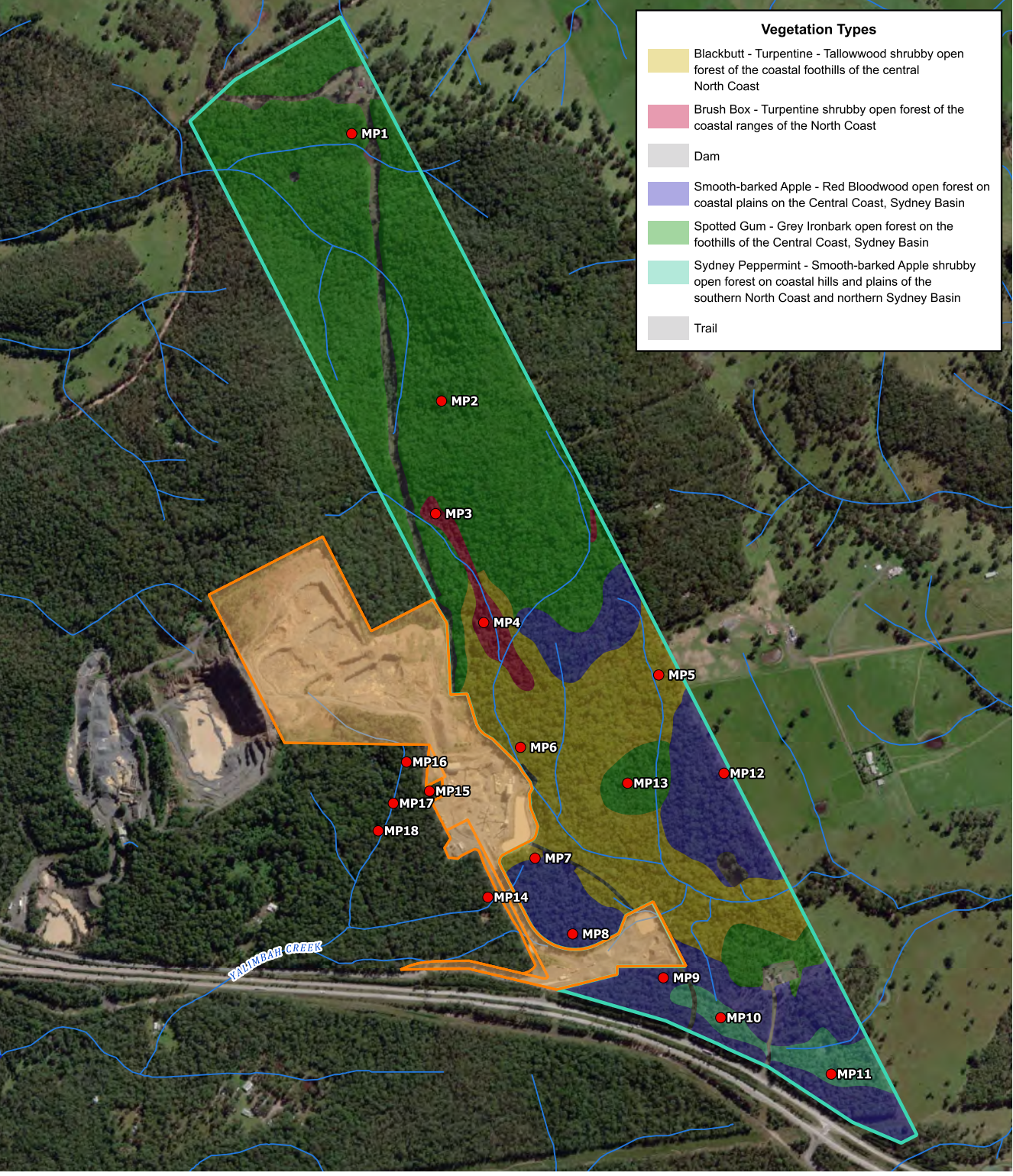
2.1 VEGETATION AND THREATENED FLORA MONITORING

A total of 18 monitoring sites were established in October 2015, including 13 sites within the Biodiversity Offset Area (BOA), and five sites on Lot 12 DP 1024564 within 50 m of the project disturbance area and along Yalimbah Creek. The location of each monitoring site was recorded with a handheld GPS (Terraflex) and permanently marked with a capped star picket (see **Figure 4**).

Baseline surveys were completed across the 18 monitoring sites in October 2015 and subsequently surveyed from 2016 to 2024 (24th and 25th September 2024). Vegetation condition monitoring was conducted across all 18 monitoring sites. Threatened flora monitoring was carried out at ten of the monitoring sites in 2024, including MP16 where *Asperula asthenes* was first identified in 2021 (**Table 3).**

Table 3: Summary of vegetation and threatened flora monitoring sites

Monitoring Site	Location	Vegetation Community	Threatened Flora Species Monitored
MP 1	BOA – Lot 5	Spotted Gum - Grey Ironbark open forest	-
MP 2	BOA – Lot 5	Spotted Gum - Grey Ironbark open forest	-
MP 3	BOA – Lot 5	Brush Box - Turpentine shrubby open forest	*Asperula asthenes*
MP 4	BOA – Lot 13	Brush Box - Turpentine shrubby open forest	*Asperula asthenes*
MP 5	BOA – Lot 14	Blackbutt - Turpentine - Tallowwood shrubby open forest	-
MP 6	BOA – Lot 13	Blackbutt - Turpentine - Tallowwood shrubby open forest	-
MP 7	BOA – Lot 13	Smooth-barked Apple - Red Bloodwood open forest	*Tetratheca juncea*
MP 8	BOA – Lot 13	Smooth-barked Apple - Red Bloodwood open forest	*Tetratheca juncea* and *Grevillea parviflora subsp. parviflora*
MP 9	BOA – Lot 13	Smooth-barked Apple - Red Bloodwood open forest	-
MP 10	BOA – Lot 14	Sydney Peppermint - Smooth-barked Apple shrubby open forest	-
MP 11	BOA – Lot 14	Sydney Peppermint - Smooth-barked Apple shrubby open forest	*Grevillea parviflora subsp. parviflora* and *Tetratheca juncea*
MP 12	BOA – Lot 14	Smooth-barked Apple – Red Bloodwood open forest	*Grevillea parviflora subsp. parviflora*
MP 13	BOA – Lot 14	Spotted Gum – Grey Ironbark open forest	-
MP 14	Lot 12	Smooth-barked Apple - Red Bloodwood open forest	-
MP 15	Lot 12	Blackbutt - Turpentine - Tallowwood shrubby open forest	*Tetratheca juncea*
MP 16	Lot 12	Spotted Gum – Grey Ironbark open forest	*Asperula asthenes*
MP 17	Lot 12	Brush Box - Turpentine shrubby open forest	*Asperula asthenes*
MP 18	Lot 12	Brush Box - Turpentine shrubby open forest	*Asperula asthenes*



Karuah East Quarry Approved Disturbance Area

Biodiversity Offset Area

Major watercourse

Minor watercourse

Monitoring Point

Figure 4:
Vegetation and Threatened Flora Monitoring Locations

100 200 300 400 500 m

N

GDA94 / MGA zone 56
EPSG:28356

WEDGETAIL PROJECT CONSULTING

Map Produced: 05/12/2024
Produced By: Kane Blundell

Wedgetail Project Consulting\Hunter Quarries - Documents\KEQ - BOAMP Monitoring\@GIS\KEQBOAMP_ByTHEME.qgz

2.1.1 Vegetation Condition Assessment

A qualitative assessment of vegetation condition and photo monitoring was undertaken at each of the 18 monitoring points, involving collection of the following data:

- Vegetation type and structure, including dominant species and estimated percentage foliage cover of each stratum (within 20 m radius of monitoring point);
- General health and condition of vegetation, including evidence of foliage die-off;
- Weed species and abundance; and
- Any management issues or indirect impacts from the project area or adjoining lands.
- One photograph (facing north) was taken at each of the monitoring points.

2.1.2 Threatened Flora Monitoring

Monitoring of threatened flora species was undertaken at the previously observed nine monitoring sites as per the BOAMP and L&RMP as well as MP16, where *Asperula asthenes* was identified in 2021. At these sites, all threatened flora individuals within 10 m of the monitoring point were recorded. The bearing and distance of each clump / individual from the star picket recorded during the baseline survey was used to accurately re-locate known individuals in the survey area. The bearing (degrees) for each clump was measured using a Suunto compass, and the distance was determined using a tape measure attached to the star picket. Additionally, each clump/individual was permanently marked with a steel peg (positioned 20 cm to the south of each clump/individual to avoid damaging plants); a metal tag was attached to each peg which provides a unique ID number. Note separate individual plants were delineated based on criteria described in **Table 4.**

Table 4: Criteria for delineation of "individual" plants

Species	Definition of “individual”
Asperula asthenes	Individual plants were delineated based on the methodology used by ELA (2014) during previous targeted surveys to ensure a consistent approach for population surveys and monitoring across the BOA. Based on this method, stems (or groups of stems) of Asperula asthenes occurring 40 cm or more apart are considered separate individuals.
Tetratheca juncea	Individuals or ‘clumps’ were delineated and counted in accordance with the standardised method described by Payne et al. (2002), in which individual clumps occurring 30 cm or more apart are considered separate, individual plants.
Grevillea parviflora subsp. *parviflora*	Stems occurring 30 cm or more apart were considered separate individuals.

For each individual identified in the survey area, the following information was recorded:

- Clump/individual ID number;
- Distance and bearing from centre star-picket to the clump;
- The size of the clump measured across the widest and narrowest points (cm) (for *A. asthenes* and *T. juncea*) or max height (for *G. parviflora* subsp. *parviflora*);
- Presence or absence of flowers (for *A. asthenes* and *G. parviflora* subsp. *parviflora*). The number of flowers and fruit on *T. juncea* plants were recorded to enable monitoring of reproductive output of this species; and
- Notes on general health of the plant, including any die-back or disease.

Following assessment of all previously recorded individuals, an additional survey of the area was performed at each site to identify any new individuals. For all new individuals identified within the survey area, the above listed information was collected.

2.2 SITE WALKOVER AND INSPECTION

Inspection of key management features was undertaken across the BOA and Lot 12 (within 50 m of the project area and along Yalimbah Creek) in September 2024 in accordance with Section 3 of the BOAMP. The following features were inspected and assessed:

- Internal and external fencing;
- Access tracks and gates;
- Areas of active erosion and sedimentation;
- Areas surrounding the two existing dwellings within the BOA;
- Redistribution of habitat resources salvaged during clearing for the KEQ Project;
- Extent and density of priority and environmental weeds within the project disturbance area, adjoining vegetation within 50 m of the disturbance area boundary on Lots 12 and 13, and along Yalimbah Creek.

2.2.1 Weed Mapping

Weeds for which detailed mapping was undertaken (i.e. target weed species) are those:

- Listed under the Biosecurity Act 2015 as priority weeds within the MidCoast Council control area;
- Identified as a Weed of National Significance (WoNS); and / or
- Environmental weeds which represent major infestations and / or have the potential to adversely affect ecological values within the BOA.

The most widespread and abundant weed species across the site is *Lantana camara* (Lantana). Four categories were used during field surveys to map areas of different Lantana density based on the percentage foliage cover:

- Nil: no Lantana observed;
- Scattered: ≤20% Lantana cover;
- Moderate: 21-60% Lantana cover; and
- High: >60% Lantana cover.

Other target weed species occurring outside moderate to high Lantana areas were mapped separately (i.e. weeds which may not be identified and treated as part of Lantana control).

3. RESULTS AND DISCUSSION

3.1 ENVIRONMENTAL CONDITIONS

Monitoring point field surveys were conducted on the 24th and 25th September 2024. Rainfall was variable with higher than average rainfall occurring from April to June inclusive (**Table 5** and **Plate 1**). Rainfall thus far is notably higher (1075ml) when compared to the dry conditions recorded throughout 2023 (855.9ml).

Table 5: Local Rainfall Data in mm (Clarence Town (Prince Street) Station – BOM Station 61010) (BOM 2024)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2015	134.2	32.0	128.2	451.8	130.6	54.0	25.2	35.6	85.6	48.6	162.8	147.4	**1436.0**
2016	472.2	38.6	36.4	43.0	14.8	113.0	54.6	68.2	55.0	50.0	64.6	83.6	**1094.0**
2017	62.4	88.8	218.0	91.2	14.8	121.6	8.6	17.4	8.0	91.0	41.2	53.2	**816.2**
2018	16.2	79.2	149.2	83.4	15.4	153.6	1.0	28.4	49.8	143.2	90.2	87.0	**896.6**
2019	23.4	73.6	152.0	53.8	36.0	77.6	16.8	36.0	85.0	19.6	21.0	3.0	**597.8**
2020	78.0	274.0	110.0	26.8	82.4	56.6	141.8	44.0	34.6	169.2	48.2	163.2	**1228.8**
2021	200.4	141.4	363.8	31.0	61.2	72.2	35.0	60.6	62.0	72.0	236.4	92.6	**1428.6**
2022	85.0	94.6	307.0	104.6	82.0	19.2	282.8	54.0	121.0	89.6	54.4	28.4	**1322.6**
2023	158.4	38.3	123.7	65.2	37.7	7	42.9	60.7	11.2	97.2	81.4	132.2	**855.9**
2024	66.2	98.0	68.8	140.4	166.8	94.8	46.6	53.0	73.6	39.0	47.0	23.2	917.4
Mean	130	96	166	109	64	77	66	46	59	82	85	88	**1075**

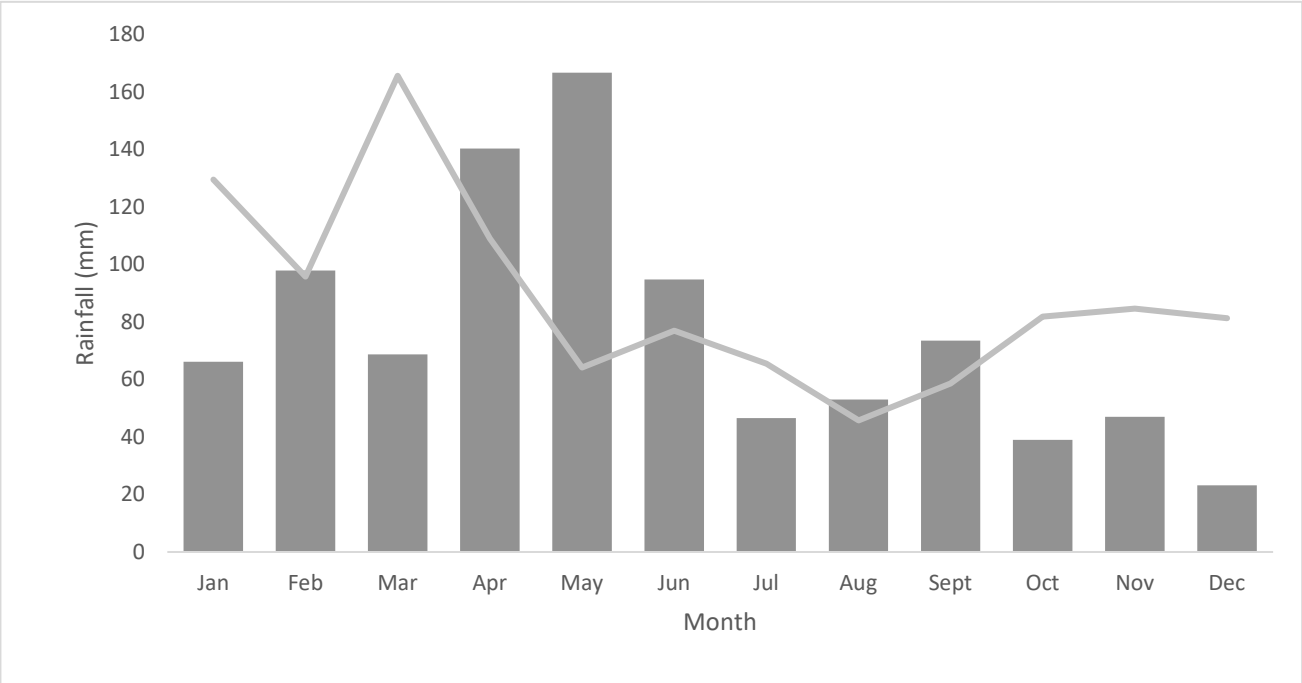


Plate 1: Local Rainfall Data (BOM Station 61010) (BOM 2024) – Columns (2024 rainfall data), Line (Long-term mean rainfall)

3.2 VEGETATION AND THREATENED SPECIES MONITORING

3.2.1 Vegetation Condition

The 2024 KEQ vegetation condition assessment was completed over two days (24th and 25th September) across all 18 monitoring sites and represents the Ninth annual inspection of vegetation condition within the KEQ BOA and Lot 12, with baseline data collected in 2015.

Vegetation condition, exotic species cover, and records of disturbance are summarised in the results below. Site-specific results and photo monitoring results are detailed further in **Appendix A** and **Appendix B.**

General health of vegetation

Vegetation condition across KEQ BOA and Lot 12 monitoring sites remain relatively stable since the previous monitoring event in 2024 with almost all monitoring sites recording signs of regeneration.

Canopy condition, measured as Projected Foliage Cover (PFC%), continues to slowly increase and is approaching pre-mine operations PFC (see **Plate 2**). Results from the current monitoring event indicate that canopy cover has largely stabilized, with small increases within the communities, recovering from the drought conditions on 2019/2020. Further monitoring events will identify any longer-term trends in canopy condition. Signs of dieback have decreased since monitoring in 2023. Trees also show signs of recovery, with new growth recorded in 2023 and having stabilized in 2024 possibly due to increase rainfall in 2024.

There has been little change in PFC across the midstory strata in recent years with some communities experiencing marginal decline at the current monitoring event (2024). A notable decline was seen in all vegetation communities from 2019 to 2020, presumably due to the drier conditions at that time. It appears that the midstory of these communities have recovered poorly since 2020, though PFC has stabilized (see **Plate 3**).

Shrub strata PFC has increased steadily since monitoring first began in 2015 with the largest improvements observed in *Brush Box – Turpentine shrubby open forest* (14% in 2015 and 23% in 2020). The remaining communities experienced similar trends which were observed to have stabilized in the previous monitoring event in 2023. Similarly, little variation was seen at the current monitoring event compared to 2023 (**Plate 4**). Most communities have exceeded pre-mine operations PFC targets though continued monitoring is needed for more accurate measures. The shrub strata across all vegetation communities has plateaued since 2022.

Grass cover across all communities has significantly decreased since monitoring began in 2015, and continues to decline, with the largest decline occurring over the 2018-2020 period. In recent years the PFC for this stratum has stabilized, though remains well below pre-mine operation values (**Plate 5**). This is unlikely to be the result of any direct or indirect impacts of quarry operations, instead is more likely from increasing competition from shrub/mid-story species as well as a small level of variability expected between surveyors. Additionally, non-grass groundcover, has recovered since a substantial decrease in 2020, likely due to surveyor variability, and is approaching pre-mine operation values (**Plate 6**).

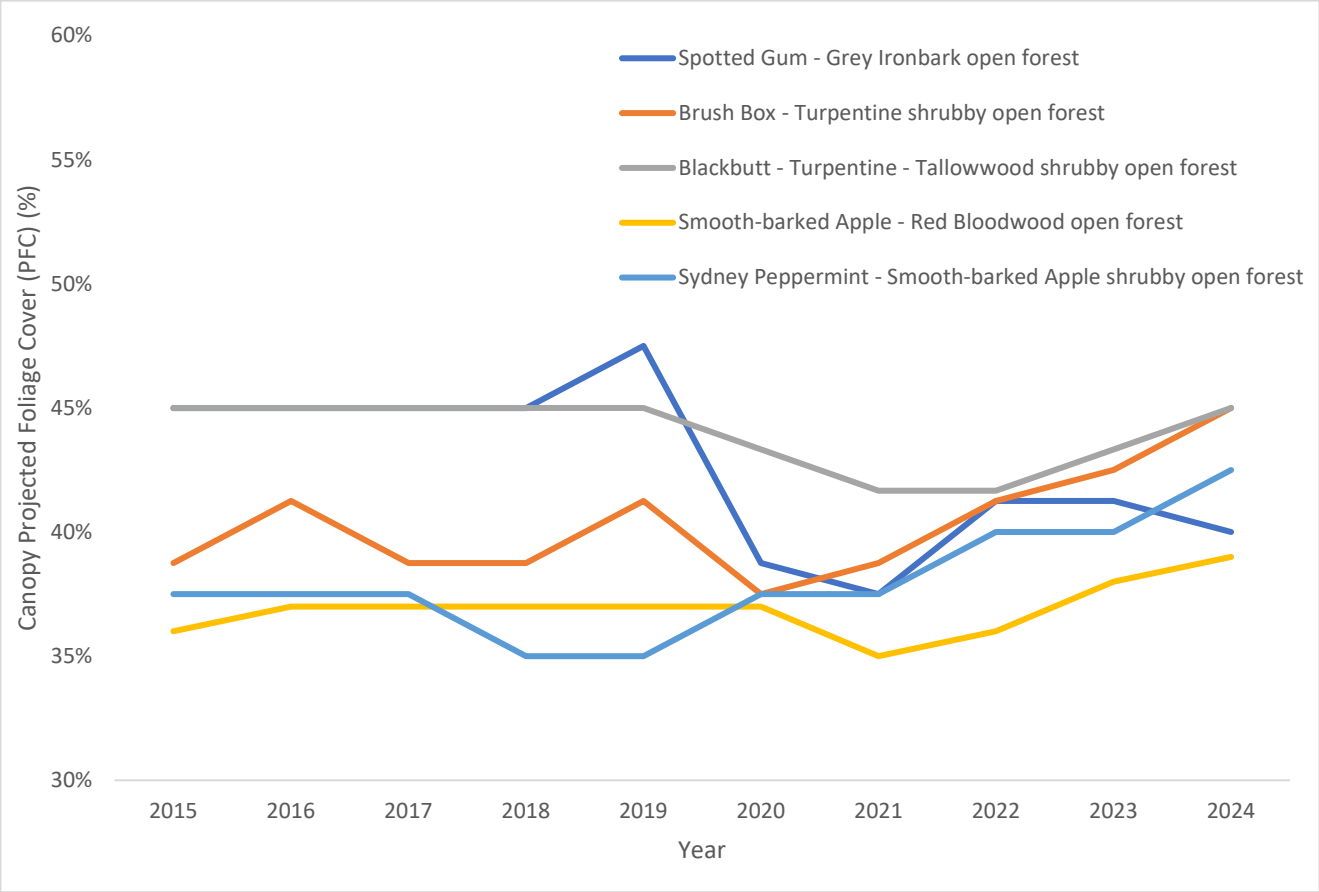


Plate 2: Mean Canopy Projected Foliage Cover (%) by vegetation community (2015-2024)

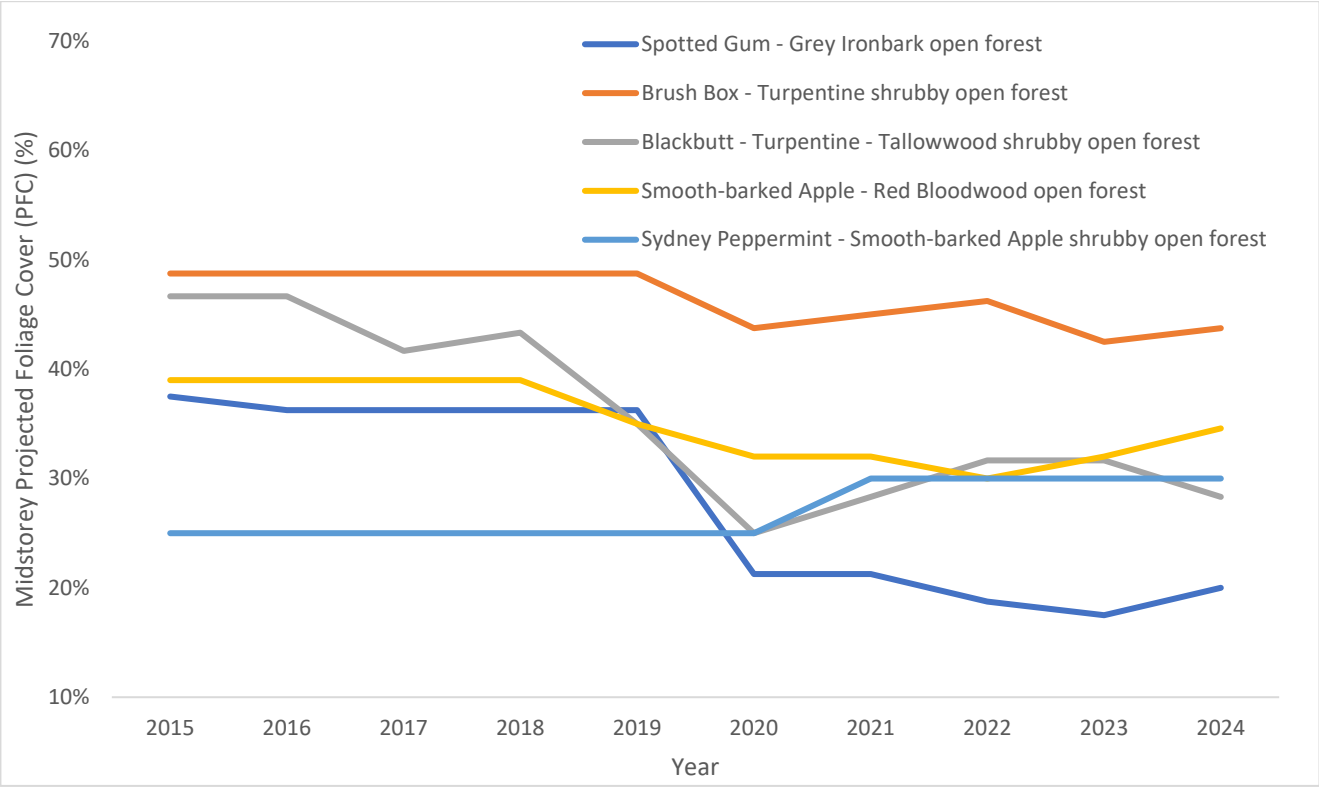


Plate 3: Mean Mid-storey Projected Foliage Cover (%) by vegetation community (2015-2024)

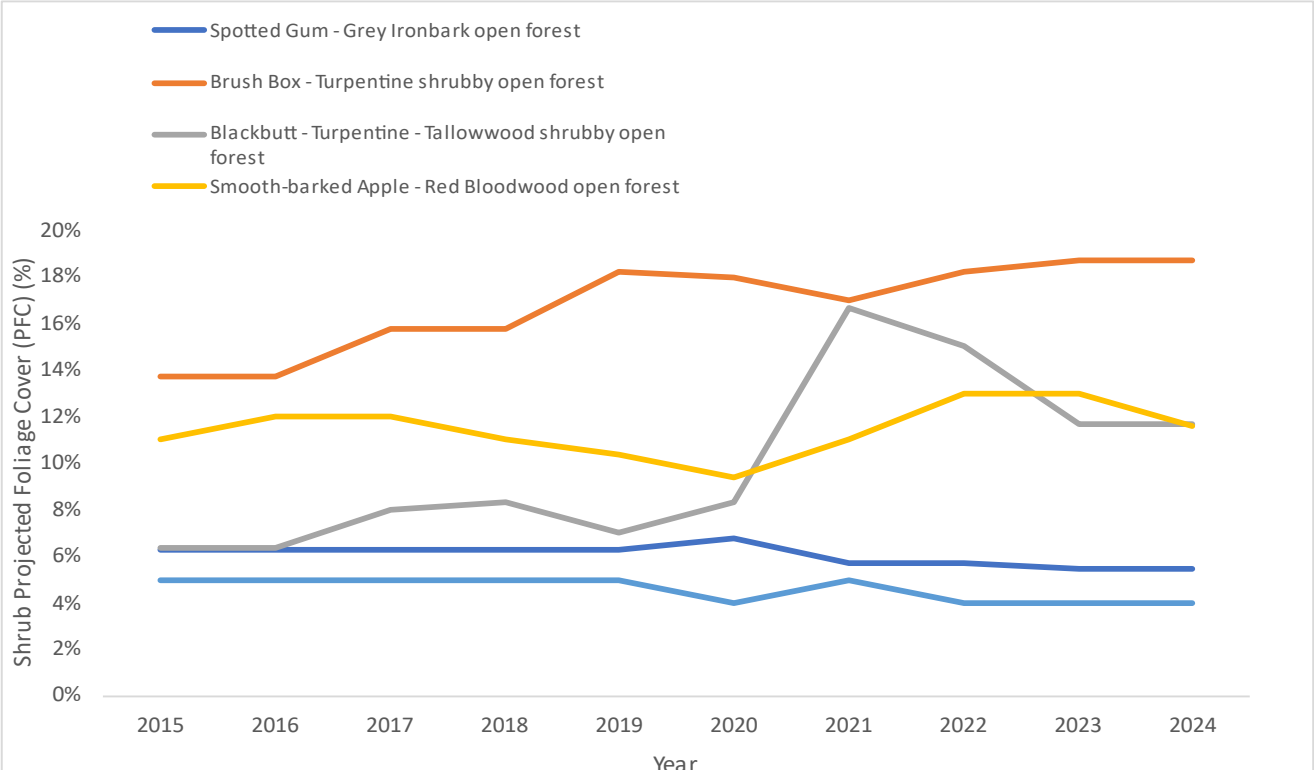


Plate 4: Mean Shrub Projected Foliage Cover (%) by vegetation community (2015-2024)

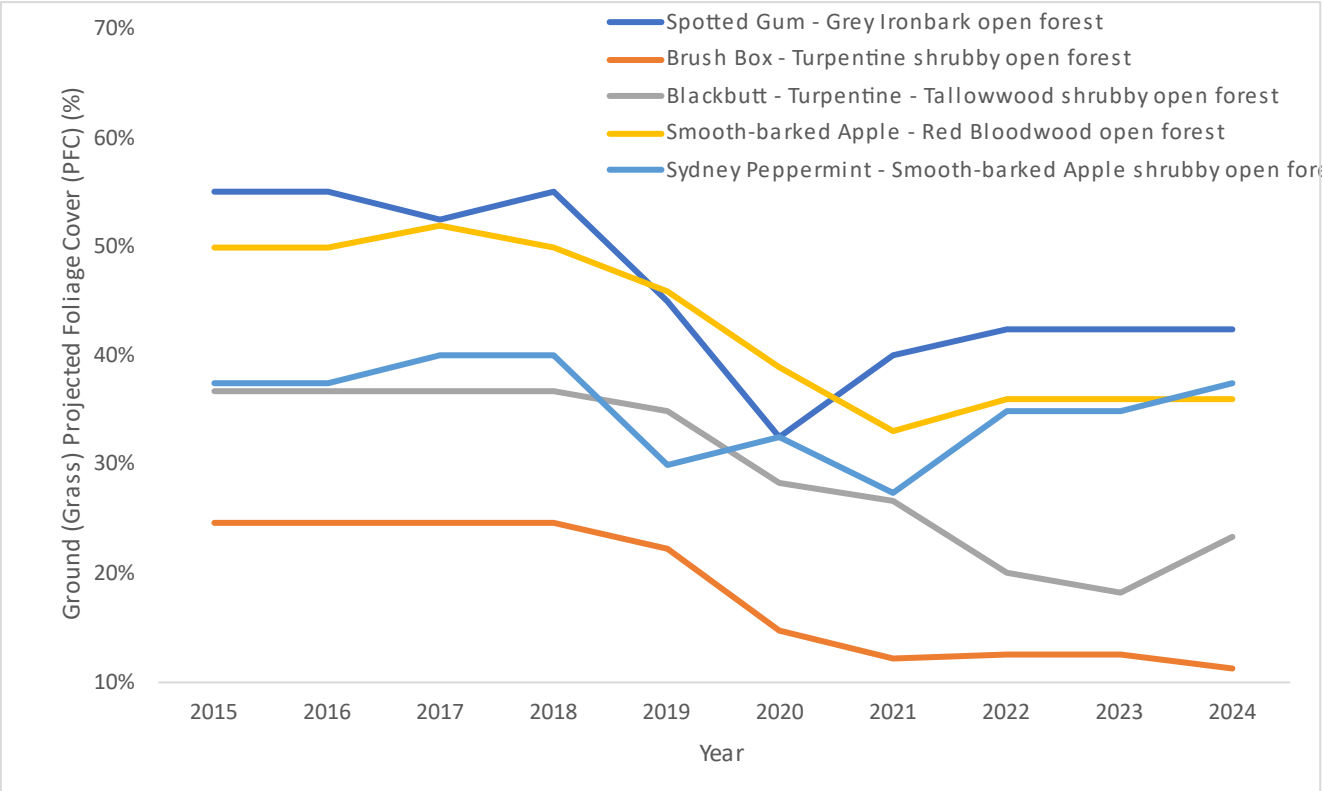


Plate 5: Mean Ground (Grass) Projected Foliage Cover (%) by vegetation community (2015-2024)

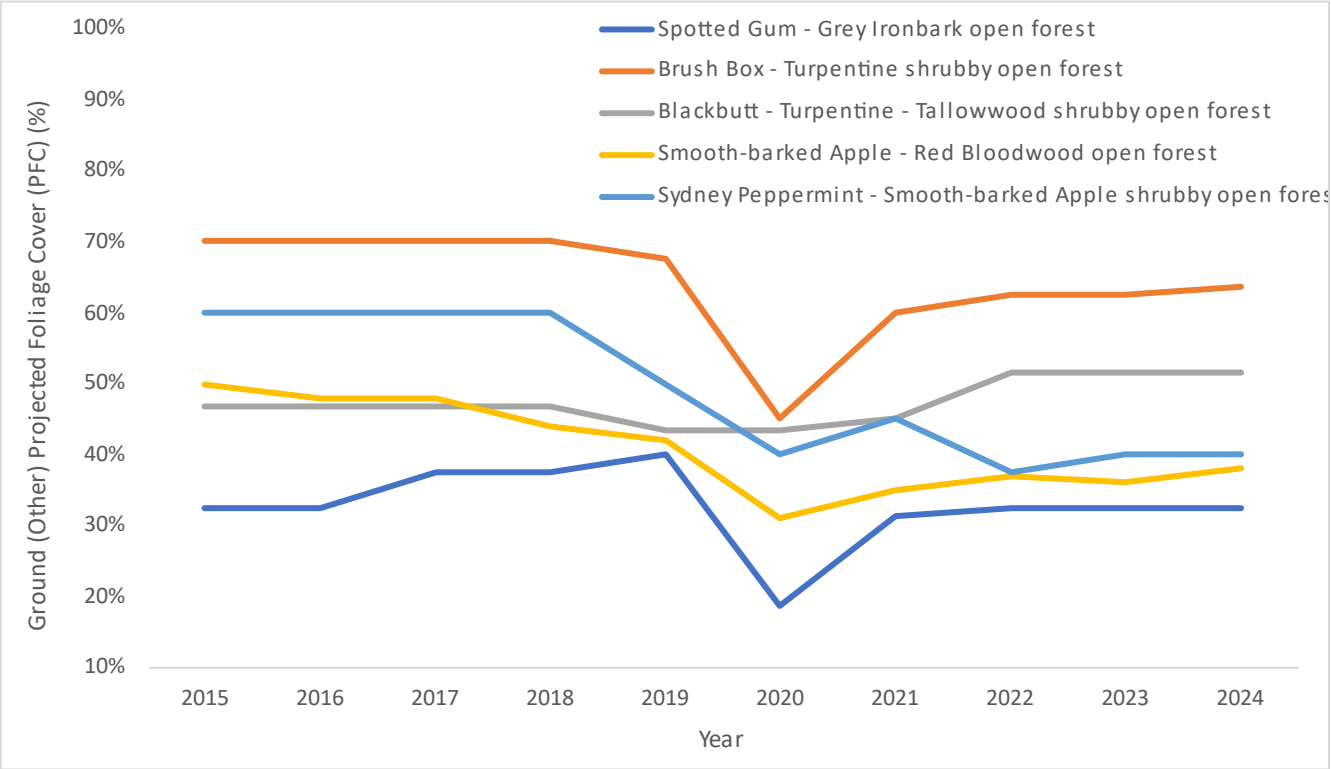


Plate 6: Mean Ground (Other) Projected Foliage Cover (%) by vegetation community (2015-2024)

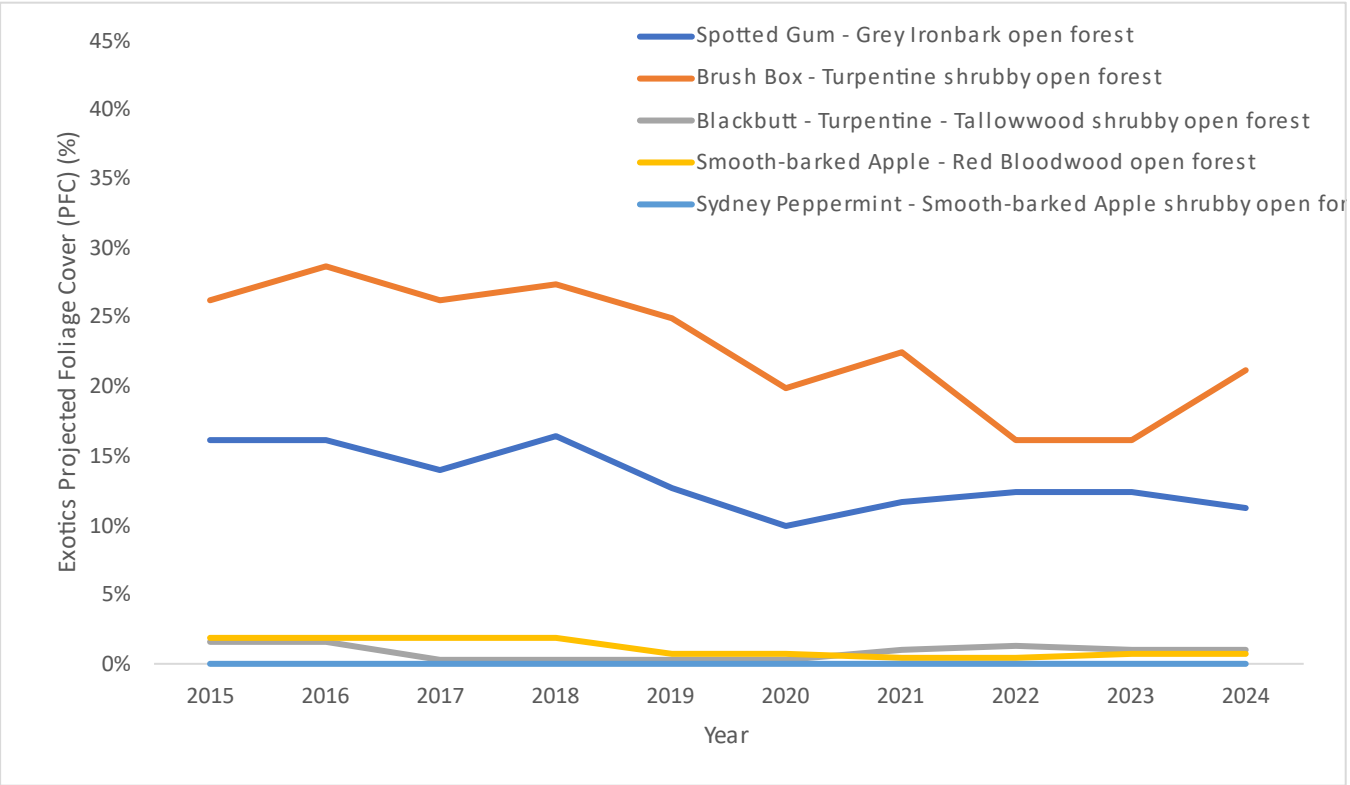


Plate 7: Mean Exotics Projected Foliage Cover (%) by vegetation community (2015-2024)

Exotics

PFC of exotic species has remained consistent with pre-mine operation values across most vegetation communities. A significant reduction in exotics were observed in the *Brush box – Turpentine shrubby open forest* community from 2015, though is increasing since previous monitoring events (**Plate 7**). There remains no recorded exotics in the *Sydney Peppermint – Smooth-barked apple shrubby open* forest community. The highest level of exotic species cover continues to occur within *Brush Box – Turpentine shrubby open forest* sites and includes large thickets of *Lantana camara* var. *camara*. Weed coverage is further discussed and mapped in **Figure 5.**

Disturbance

Minor disturbance was recorded at several monitoring sites. These are detailed in **Appendix A**, however, the following key observations are noted below:

- Heavy *Lantana camara* var. *camara* (Lantana) infestation remains in the vicinity of MP2 with small increases compared to 2023 monitoring.
- Heavy *Lantana camara* var. *camara* (Lantana) infestation occurs at MP3 and has increased substantially since previous monitoring events. This infestation was seen to impact the remaining *Asperula asthenes* at that location (**Appendix D**).
- Heavy rainfall occurring in 2022 at MP 4 had previously removed leaf litter and likely some *Asperula asthenes* individuals. Dense leaf litter has since returned to the monitoring point in 2023, and no further disturbance has occurred to the remaining *Asperula asthenes* in 2024.
- Past clearing at MP 12 is beginning to show signs of regeneration, despite continued maintenance of the accessway. The stockpiled timber of removed trees had impacted several *Grevillea parviflora* individuals that were not observed in 2023. This has not improved as even less individuals were recording at the current monitoring event in 2024.
- Sedimentation occurring in creek water from quarry operations likely initiated by rainfall runoff at MP6 and MP17.
- Similar to the 2023 monitoring, minor scouring of creek bank was recorded at MP18, MP17 within a gully to the west of the quarry. This is likely the result of high rainfall events during 2021. High rainfall occurring earlier in 2024 has exacerbated the scouring and likely contributed to the removal several of *Asperula asthenes* individuals growing along the creek banks.
- High levels of dust were observed on foliage (see **Photo 1)** and on the ground at several monitoring sites along the boundaries of quarry operations. Dust levels have increased compared to previous years and remnant vegetation is deteriorating. Monitoring of this disturbance should be continued to assess further impact on remnant vegetation.
- Evidence of sedimentation and erosion has been observed in a few locations including MP14, and around the extent of the quarry along the south eastern edge of the extraction area and along the western side of the haul road into the Karuah Quarries Conservation Area **(Photo 2, Photo 3** and **Photo 4).**

Photo 1: Dust Cover on Foliage recorded near MP6 in 2024

Photo 2: Sedimentation and Erosion into the Karuah Quarry Conservation Area into Dam (2024).

Photo 3: Erosion into the Karuah Quarry Conservation Area Dam and the area overgrown with *Setaria sphacelata* 2024.

Photo 4: Area overgrown with *Setaria sphacelata* 2024.

3.2.2 Threatened Flora

The 2024 threatened species monitoring identified a total of 51 individual *Asperula asthenes* plants, 25 clumps of *Tetratheca juncea*, and 17 *Grevillea parviflora* subsp. *parviflora* shrubs.

Species specific results are discussed below, for more detailed threatened flora results including site specific observations on abundance and condition see **Appendix C.**

Asperula asthenes

Monitoring for *A. asthenes* was completed at the four original monitoring sites; MP 3, MP 4, MP 17, and MP 18, as well as MP16, where the species was identified during the 2021 surveys. MP16 and MP 18 experienced small increases in *A. asthenes* abundance since 2023 with MP 6 identifying two new plants and MP18 identifying one new plant. However, MP 3 had lost two individuals. MP 4 and MP 17 were unchanged since 2023 (**Plate 8**). It is likely that many new individuals that germinated in 2020 (82 individual plants) in response to favourable conditions, have subsequently been outcompeted following the return of other groundcover species (51 individual plants in 2024). Additionally, several of the individuals residing on the banks of a creek may have been removed by heavy rainfall events especially seen within MP4 and MP17. Subsequent leaf litter that had washed away has since returned in the 2024 monitoring event for MP 4.

The decrease in abundance for the species across many of the monitoring sites continues a pattern of fluctuating abundance results for the species since 2015. There is no discernible pattern to suggest impacts from quarry operations in relation to *A. asthenes* abundance.

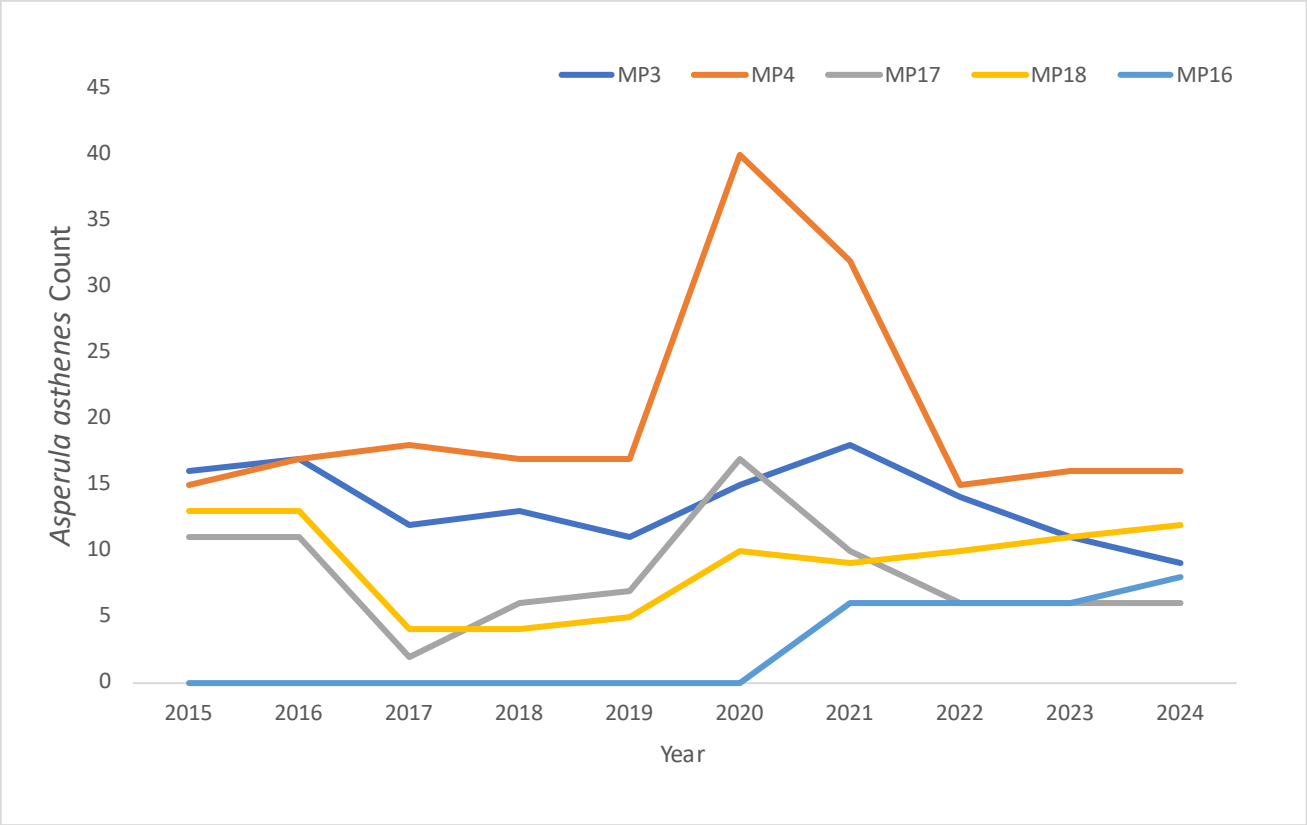


Plate 8: *Asperula asthenes* abundance at monitoring sites, including MP16 where it was first detected in 2021. (2015-2024)

Tetratheca juncea

Monitoring for *T. juncea* was completed at four monitoring sites; MP 7, MP 8, MP 11 and MP 15. The overall population remains consistent with the 2023 monitoring, though with a loss of two individuals. The population at MP 7 has decreased marginally (12 to 10 plants) with populations at MP 8 unchanged (9 plants) and one new plant recorded at MP 11, bringing the total to two since previous years. Monitoring point 15 continues to decline (5 to 4 plants). *Tetratheca juncea* abundance has generally remained stable across three of the monitoring sites (MP 7, MP 8, and MP 11) from 2015 to 2024. Though reductions have occurred, population numbers are similar to those recorded pre-mining operations.

Unfortunately, a major reduction in population numbers was observed at MP15, in which roughly 13% of the original plants remain. A thick layer of dust was observed on the foliage which has seemingly increased over the years. It is likely that the reduction in plant numbers could be linked to edge effects from quarry operations, i.e. increasing dust pollution. No other major disturbances were noted during monitoring (**Plate 9**).

Flowering was recorded for the species across all four monitoring plots (MP 7, MP 8, MP 11 and MP 15) during the 2023 monitoring event. Monitoring points 7, 8 and 11 were in particularly good condition, displaying an abundance of new shoots and plentiful flowers. A high density of fruits was observed at MP 8 and MP 11. Overall, with the exception of MP15, the results indicate *Tetratheca juncea* is in good reproductive condition (see **Appendix C**).

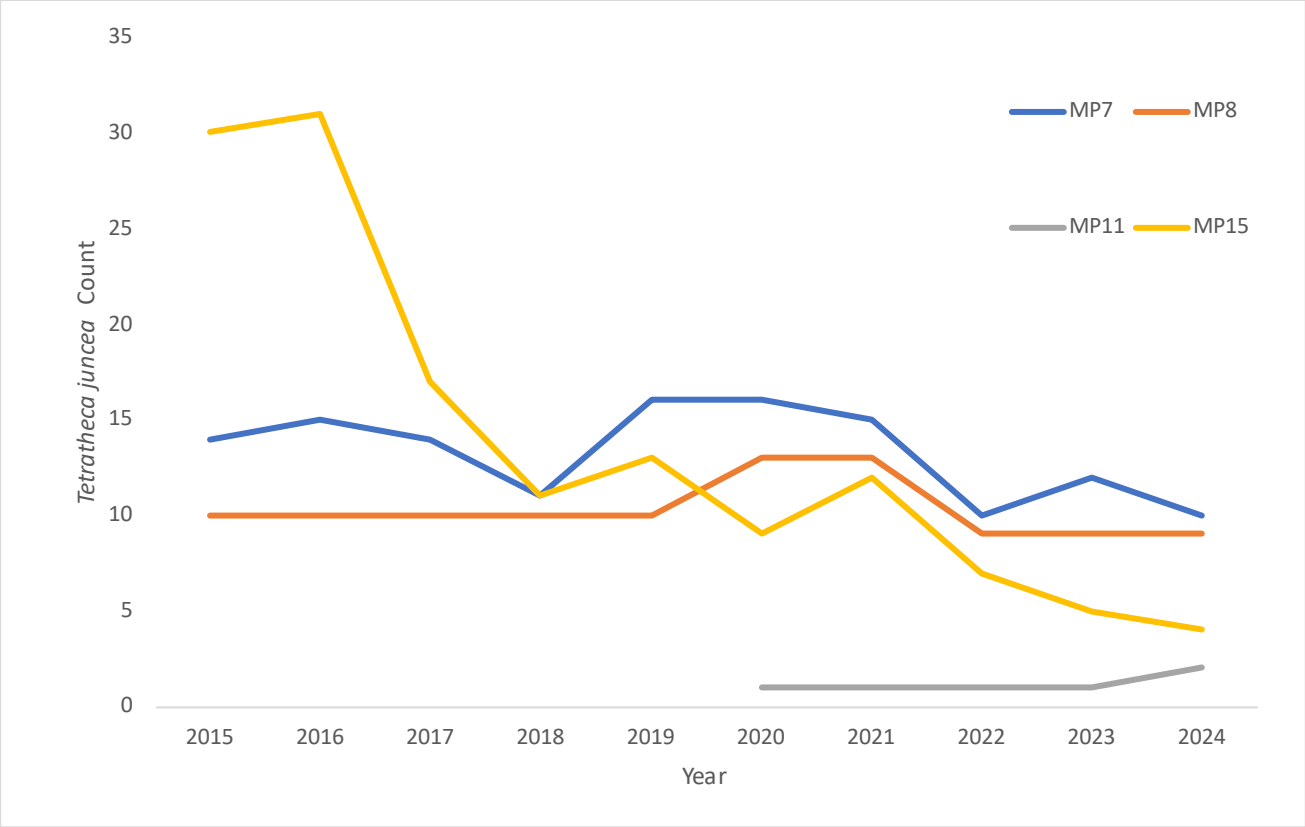


Plate 9:***Tetratheca juncea* abundance at monitoring sites (2015-2024)**

Grevillea parviflora subsp. parviflora

Monitoring for *G.parviflora* subsp. *parviflora* was completed at three monitoring sites; MP 8, MP 11 and MP 12. Since the previous monitoring event in 2023, MP11 recorded two more individuals, whereas MP12 lost two individuals . MP 11 and MP 12 displayed 5 and 4 flowering plants respectively (**Plate 10**). The total number of *G. parviflora* subsp. *parviflora* individuals across all monitoring sites is lower than that recorded in 2015, though remains stable since 2022.

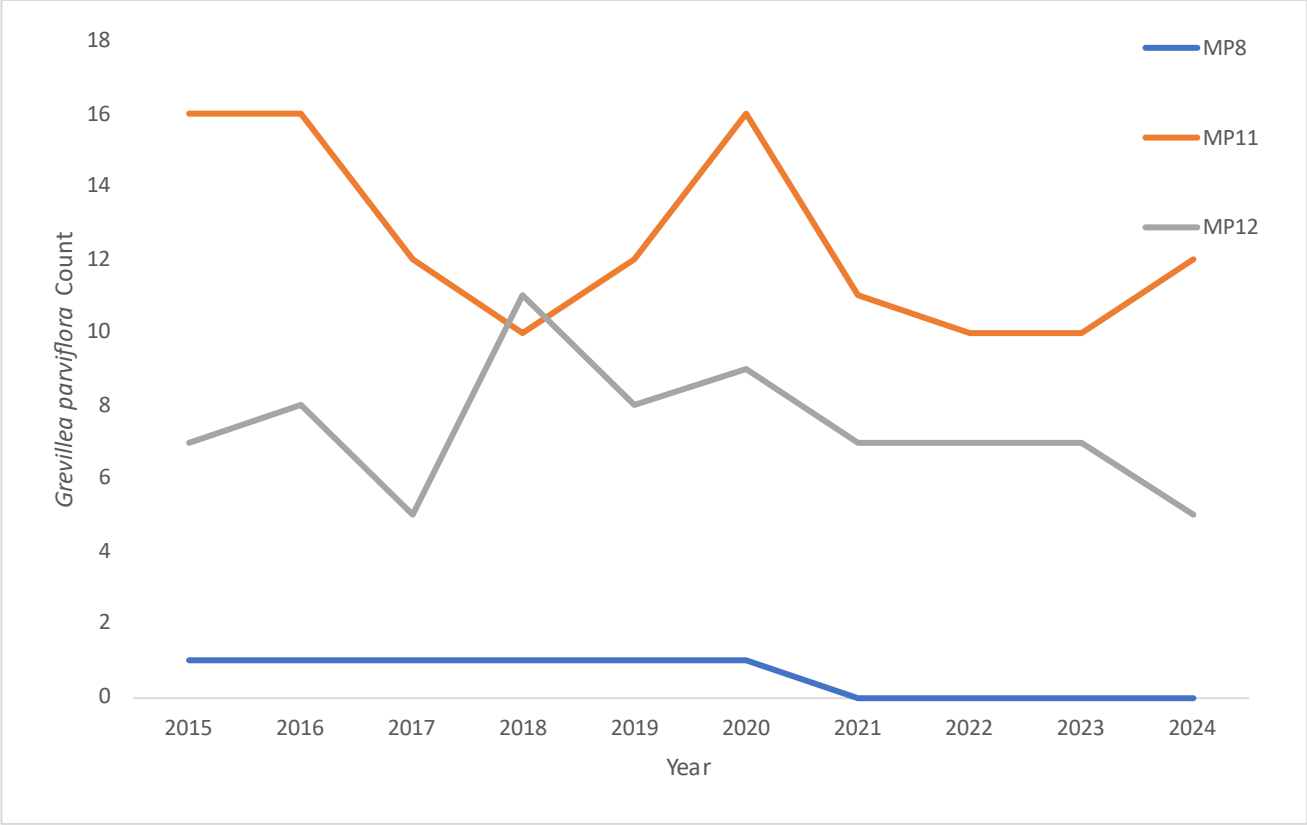


Plate 10: *Grevillea parviflora* subsp. *parviflora* abundance at monitoring sites (2015-2024)

3.2.2.1 Threatened Species abundance over time

The current monitoring event (2024) displayed a decrease in threatened flora abundance for all species, at the majority of monitoring locations. The table below (**Table 6**) illustrates the percent of decline in threatened flora since baseline surveys were conducted in 2015. It should be noted that *Asperula asthenes* at MP 16 was first identified in 2021 and calculations have been adjusted to reflect this new baseline. Similarly, *Tetratheca juncea* was first identified in MP 11 in 2020.

The monitoring points MP4, MP7, MP8, MP15, MP16 and MP17 are considered close to the impact area (as per BOAMP) and MP3, MP11, MP12 and MP18 are located further away from the impact area.

High levels of decline (<10%) were observed at locations both close and further away from the impact area, and thus this decline cannot be specifically attributed to disturbance from quarry operations. Rather, *Lantana camara* infestation may be contributing to the decline of *Asperula asthenes* individuals in particular, at MP3 and in Lot 12 (MP, 17, MP18).

Tetratheca juncea continues to steadily decline which may be a result of lower-than-average rainfall occurring in recent years (**Table 5**) and proximity to quarry operations, where substantial dust accumulation was observed on foliage (MP15 and MP7).

Substantial decline was observed for *Grevillea parviflora subsp. Parviflora,* though for MP 8 this is not an accurate reflection of overall population decline. One individual was originally recorded at this location and has not been detected since monitoring occurred in 2020. *Grevillea parviflora subsp. Parviflora* individuals at MP 12 however, have likely declined due to the flattening of clumps from timber waste that has been deposited there from track maintenance operations. Many individuals at this monitoring point cannot be located due to this obstruction, though it is possible that individuals persist underneath.

Table 6: Threatened Species percent change from baseline surveys (2015-2024)

Monitoring Point	Species	Change from baseline	Average Change
MP3 (Away from impact area)	*Asperula asthenes*	-43.75	11.38% Decline
MP4 (Close to impact area)		6.67	
MP16 (Close to impact area)		33.33 (since 2021)	
MP17 (Close to impact area)		-45.45	
MP18 (Away from impact area)		-7.69	
MP7 (Close to impact area)	*Tetratheca juncea*	-28.57	6.31% Decline
MP8 (Close to impact area)		-10.00	
MP11 (Away from impact area)		100.00 (since 2020)	
MP15 (Close to impact area)		-86.67	
MP8 (Close to impact area)	*Grevillea parviflora subsp. parviflora*	-100.00	51.19% Decline
MP11 (Away from impact area)		-25.00	
MP12 (Away from impact area)		-28.57	

3.3 SITE WALKOVER AND INSPECTION

3.3.1 Weed Infestations

Weed mapping was conducted across the BOA during field surveys on the 24th and 25th September 2024, within the project disturbance area, within 50 m of the project disturbance area, and along Yalimbah Creek on Lot 12. The resulting weed map (**Figure 5**) illustrates the cover of the most abundant weed species across the site, *Lantana camara* var. *camara* (Lantana) (Priority Weed within the MidCoast LGA). As with previous monitoring events, major infestations occur throughout the site, with most infestations occurring across the northern extent of the BOA (**Figure 5**). Lantana infestations were observed to spread to the southern extent of the BOA. The majority of the BOA including Lot 12 can be said to suffer moderate lantana densities.

One other Priority Weed species was identified in the BOA: *Senecio madagascariensis* (Fireweed). This species only occurs as small discrete patches in a few locations in the BOA.

Notable areas of exotic perennial grasses previously mapped along road and track sides, were recorded again in 2024 (**Figure 5**). The dominant exotic grass species in these areas include *Setaria sphacelata* (South African Pigeon Grass), *Andropogon virginicus* (Whisky Grass), and *Axonopus fissifolius* (Narrow-leafed Carpet Grass), as well as a variety of annual and perennial exotic herbs. The areas dominated by exotic grasses are primarily restricted to the power line easement, around existing dwellings, track edges, perimeter of quarry disturbance area, perimeter of the run-off dam in Lot 12, and previously cleared regrowth areas on the southern part of Lot 14.

While the dense areas of exotic grasses have been mapped, they are not considered target weed species at this stage. They represent a relatively low threat to the integrity of ecological values within the site. The exotic grasses occurring in the areas of native regrowth are also likely to be shaded out over time as the canopy, and midstorey cover continues to regenerate. However, the distribution of exotic grasses will continue to be monitored, and any increases will be evaluated to determine if management is required.

It is strongly recommended that weed control works for the next 12 months should focus on the Lantana infestations in Lot 5, northern section of Lot 12 and north-east part of Lot 13, especially within the vicinity of MP 3 and MP 4, to protect *Asperula asthenes* individuals. *Asperula asthenes* within MP3 is particularly suffering and requires immediate attention. Priority should also be given to controlling infestations alongside waterways where Lantana has become most abundant. These weed control activities must be undertaken in spring in accordance with the procedures detailed in Section 3.10 of the BOAMP due to the presence of threatened flora (*Asperula asthenes*) in these areas.

3.3.2 Fencing and Tracks

The layout of existing and required fencing, gates and tracks across the BOA is shown in **Figure 6**. Boundary fencing is required around the entire KEQ project area. Fencing of KEQ project area / BOA boundary has commenced (approximately 70% completed in 2017). A new fence was installed along the eastern boundary of the BOA adjoining Lot 10 in 2017. New fencing was installed along the haul road within Lot 13 in 2017 and this was extended in 2024 with the installation of a new gate and fencing around the KEQ entrance of the rock crushing area (**Photo 6)**. Fencing along the remaining 30% of project area / BOA boundary, and Lot 5 / Lot 14 boundary is required. Key fencing requirements within the site include:

- Internal fencing is also required around the existing dwellings on Lot 5 and Lot 14.
- The barbed-wire fence alongside the far northern boundary of Lot 5 requires repair throughout due to the fence having either fallen, lost tension or damage from fallen trees (**Figure 6**).
- Fencing alongside the north-eastern boundary of Lot 5 has been removed with the intention of replacing it.
- Fencing is absent along the western boundary of Lot 5 and will need installation
- Fencing along the western boundary of Lot 13 and haul road has been repaired from prior damage (see **Photo 5**).
- Fencing (Koala Fence) has been removed from the large dam to the south-east of the rock crushing area due to dam wall repairs. Repairs have now been completed and the fence was re-installed in 2024 **(Photo 6).**

- Many timber stockpiles were observed outside of the disturbance area along fence lines and at the end of the access track southeast of the rock quarry (**Photo 8)**.
- All fencing works are required to be undertaken in accordance with **Section 3.2** of the BOAMP.

Several redundant sections of tracks within the southern part of the BOA are being successfully rehabilitated following the placement of branches, hollow logs / sections and other organic debris salvaged from the KEQ disturbance area during vegetation clearing. Minor erosion damage along an access track towards the south of the stockpile area has been rectified since it was first observed in 2022.

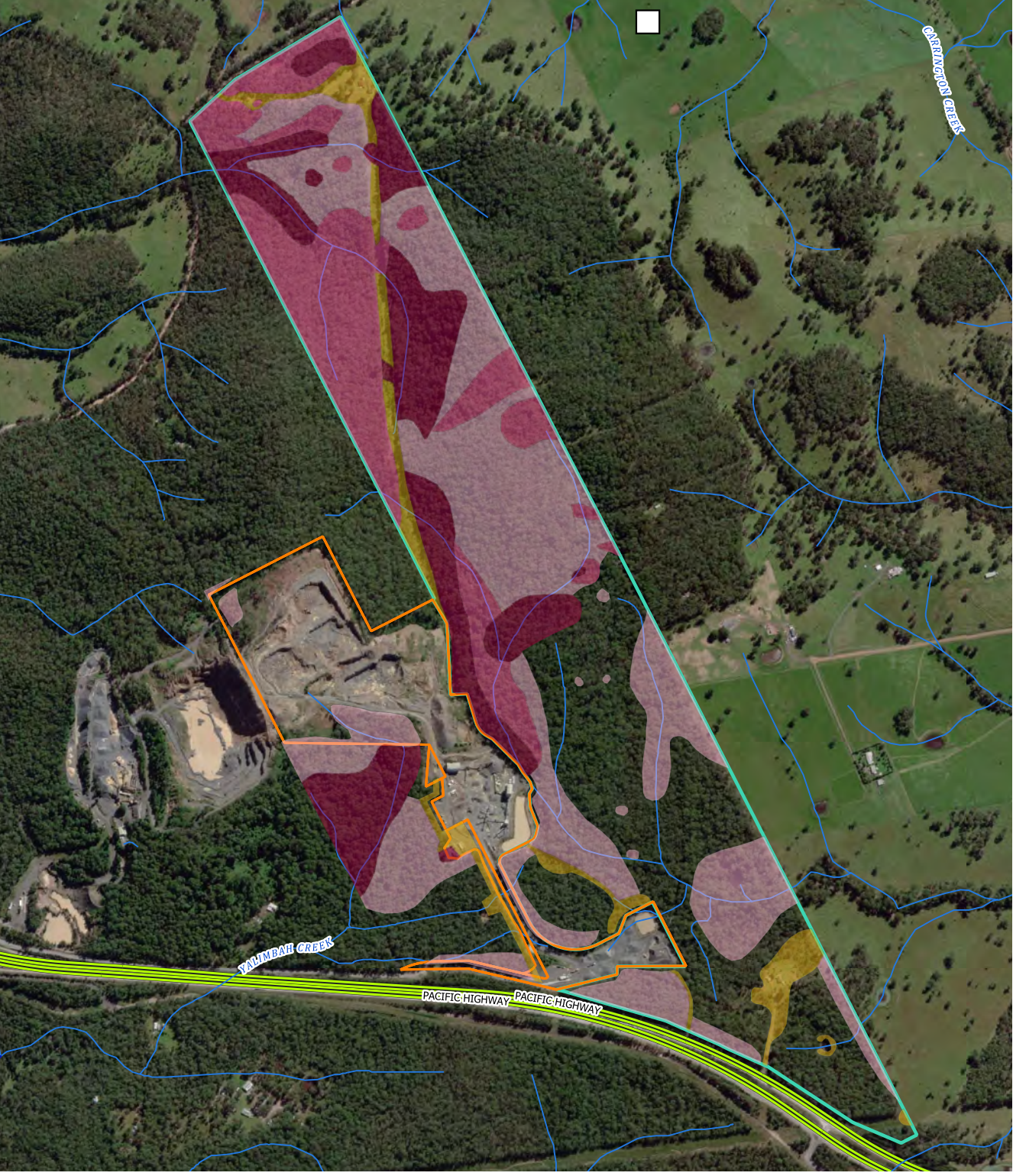
Additional maintenance is recommended at the access tracks along the north-western boundary of Lot 5, that have become overgrown and are no longer accessible by vehicle.

Photo 5: Fixed fence along western boundary of haul road

Photo 6: New gate and fencing installed in 2024 along a section of the eastern border of the quarry within Lot 13.

Photo 7: New gate and fencing installed in 2024 along the eastern border of the rock crushing area within Lot 13.

Photo 8: Large timber stockpile outside of the disturbance area towards the southeastern access track from the rock quarry.



Karuah East Quarry Approved Disturbance Area

Biodiversity Offset Area

Major watercourse

Minor watercourse

Primary Road

Weed Densities

Lantana - High

Lantana - Moderate

Lantana - Scattered

Exotic Grasses

Figure 5: Weed Mapping

100 200 300 400 500 m

N

GDA94 / MGA zone 56
EPSG:28356

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Map Produced: 05/12/2024
Produced By: Kane Blundell

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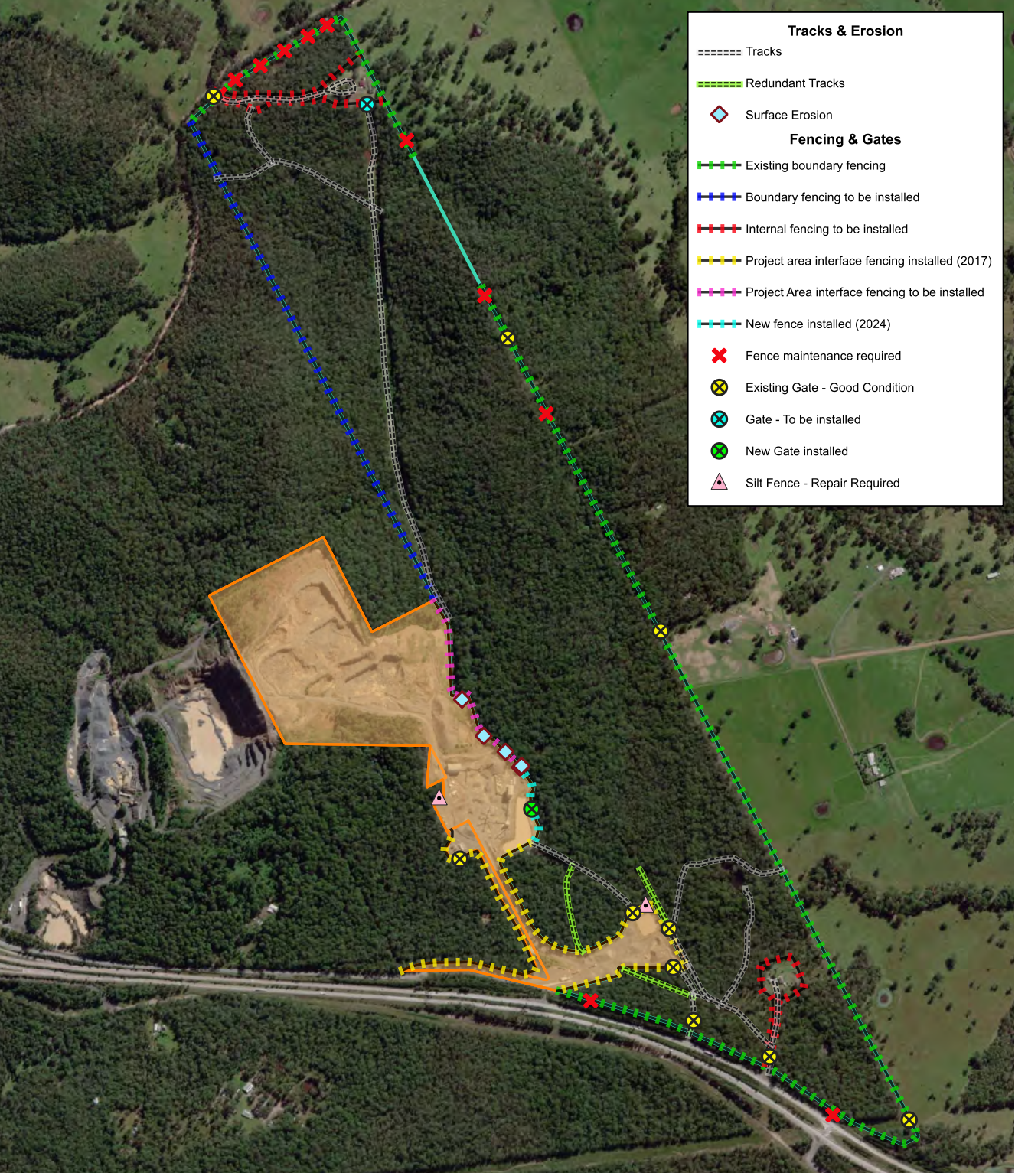

Karuah East Quarry
Approved Disturbance Area

Biodiversity Offset Area

Figure 6: Tracks, Erosion and Fencing

100 200 300 400 500 m

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GDA94 / MGA zone 56
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Map Produced: 05/12/2024
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3.3.3 Erosion

No areas of major active erosion were identified within the BOA during the 2024 monitoring. Areas of bare ground previously identified on the access tracks within the BOA predominantly appeared to be stable with no substantial active erosion or sedimentation observed. Minor scouring was still evident in several locations along the drainage lines within Lot 5 and within the vicinity of monitoring sites MP 17 and MP 18 in Lot 12, as recorded in the previous survey period. This scouring is considered to be natural stream bank erosion, as there was no evidence of unnatural disturbance in these areas, and overall the streams have relatively high ground vegetation cover and appear stable.

Certain areas of the BOA (primarily the steep slopes on Lot 5) have the potential to develop erosion following Lantana control works. The need for erosion or soil stabilisation measures following initial treatment of moderate and high density Lantana areas on steep slopes, will be assessed at each maintenance / monitoring event. No weed control had taken place within Lot 5 over the previous monitoring round, therefore no change of conditions was observed.

Sediment fencing and bund walls/diversion drains were in place in all areas downslope of disturbed areas except for the area north of Dam 1. However, the sediment fences installed along the eastern extent of the overburden stockpile and the area south east of Dam 1 had failed at the time of the 2018, 2019, 2020, 2021, 2022, 2023 and 2024 inspection. Active erosive processes are evident in several locations and can be observed along the wall of Dam 1 and the overburden stockpile wall. These processes are washing away sediments and rocks overtopping the sediment fence and spilling over the surrounding bushland. Many of these areas have begun to stabilise in some areas through the spread of exotic grass species over the disturbed areas, including roadsides and dam walls.

Key erosion and sedimentation issues were observed in multiple areas surrounding the quarry disturbance area:

- In three locations, the installed sediment fencing was overtopping (observed in 2018, 2019, 2020, 2021, 2022, 2023 and 2024) and, therefore, no longer provided active sediment control (**Figure 6**). It was observed in these locations that some sediment had been deposited within the surrounding environment. The overtopping sediment fencing along the western boundary of the quarry, within Lot 12, and adjacent to monitoring site MP 15 has fallen and is no longer adequately collecting sediment (**Photo 9**).
- It was noted during the 2017 monitoring event that the overflow for Dam 3 was depositing small amounts of sediment into the receiving environment with water being retained in the bushland east of the basin for a period. It was noted during the 2018 monitoring event that a small trough had been dug to allow the overflow from the dam to drain out of the area and into Bulga Creek. While some minor erosion and sedimentation was observed on the discharge side of the dam wall, it was still contained within the project disturbance area. This management action has remediated the waterlogging issue and no die-back or change in vegetation structure and composition was observed in 2018. No further changes have been noted since. Ongoing annual monitoring will be required to assess the effectiveness of the drainage and ensure no die-back or change in vegetation structure and composition occurs.
- It was observed in the 2021 monitoring event that excavated rock and sediment produced by the quarry operations has runoff the eastern boundary of the quarry into the BOA (**Photo 10).** This material forms a layer across this area where it is mixed in with organic material. It is recommended that silt fencing or bunding be installed to prevent the further introduction of this material into the BOA. Further excavated rock has been noted to the west of the haul road which has been deposited into the Karuah Quarry Conservation area into the dam (**Figure 6** and **Photo 2**).

- Moderate and high levels of dust were observed on foliage (see **Photo 1**) and on the ground at several monitoring sites along the boundaries of quarry operations. Dust levels are seemingly increased since the previous survey period. It is detrimentally impacting remnant vegetation and threatened species communities, particularly at MP15 and MP6.
- Erosion had formed a trough and sediment produced from the quarry had run off the eastern boundary into Lot 12 and into a dam. There is evidence of major sedimentation (**Photo 2 and Photo 3).**

Photo 9: Sediment fencing down and overtopping within Lot 12.

Photo 10: Excavated rock and sediment that has runoff from the eastern boundary of the quarry into the BOA.

3.3.4 Vertebrate Pests

No feral pests, or evidence thereof, were detected in the 2024 monitoring period. Feral pigs (*Sus scrofa*) were recorded during the 2020 site inspections along the powerline easement in Lot 5 and in proximity to monitoring site MP 4, supporting previous observations of suspected Feral Pig diggings recorded in the southern half of the BOA area during previous site inspections. Karuah East Quarry conducted Feral Pig trapping in Lot 14 in March 2019 and implemented a broader feral animal control baiting programme in the BOA during December 2020.

Additionally, the red fox (*Vulpes vulpes*) has been identified within the BOA and was also targeted in the December 2020 baiting programme. Further trapping is recommended on a scheduled basis to manage the population within the BOA.

3.3.5 Habitat Resources

Section 6.3.1 of the L&RMP and Section 3.8 of the BOAMP detail the protocol and requirements for salvaging habitat resources (i.e. logs, hollows and other large organic debris) during the KEQ project and redistributing into the rehabilitation or offset areas. Vegetation clearing undertaken in 2016 for the KEQ project has included the salvage of a large quantity of organic material (primarily large trees and logs). These resources were stockpiled on the boundaries of the KEQ project area (see **Figure 7**).

In addition to this, a total of 77 hollows and hollow log sections were previously salvaged and set aside for redistribution into the BOA. The location of the hollow logs to be redistributed throughout the BOA is shown on **Figure 7**. Inspections in 2020 indicated that most hollows are unsuitable for reinstallation due to cracks in hollow walls or the requirement to substantially modify the hollow for reinstallation. As such, in July/August 2020, 193 nest boxes were installed to compensated for the loss of 116 hollows and also compensate for the need to reinstall 77 salvaged hollows. It is recommended that the 77

salvaged hollows be redistributed terrestrially within the BOA to provide habitat for terrestrial fauna species.

Tree hollows removed as part of clearing works completed on site in November 2016, May and August 2018, and October and November 2019, have now been sufficiently replaced as per the requirements of the BOAMP.

Tree hollows removed as part of clearing works completed on site in September 2020, March, June, October and November 2021 and May 2022 (58 nest boxes) were replaced as per the requirements of the BOAMP in February 2023. Details on nest box installation are covered below.

Nest Boxes

Since 2016 a total of 375 nest boxes were installed in the Karuah East Quarry BOA. Monitoring of nest boxes is required every two years in which further monitoring is not required until 2026.

Details of nest box installation is outlined in **Table 7.**

Table 7: Nest box installation details across KEQ BOA (2016-2024)

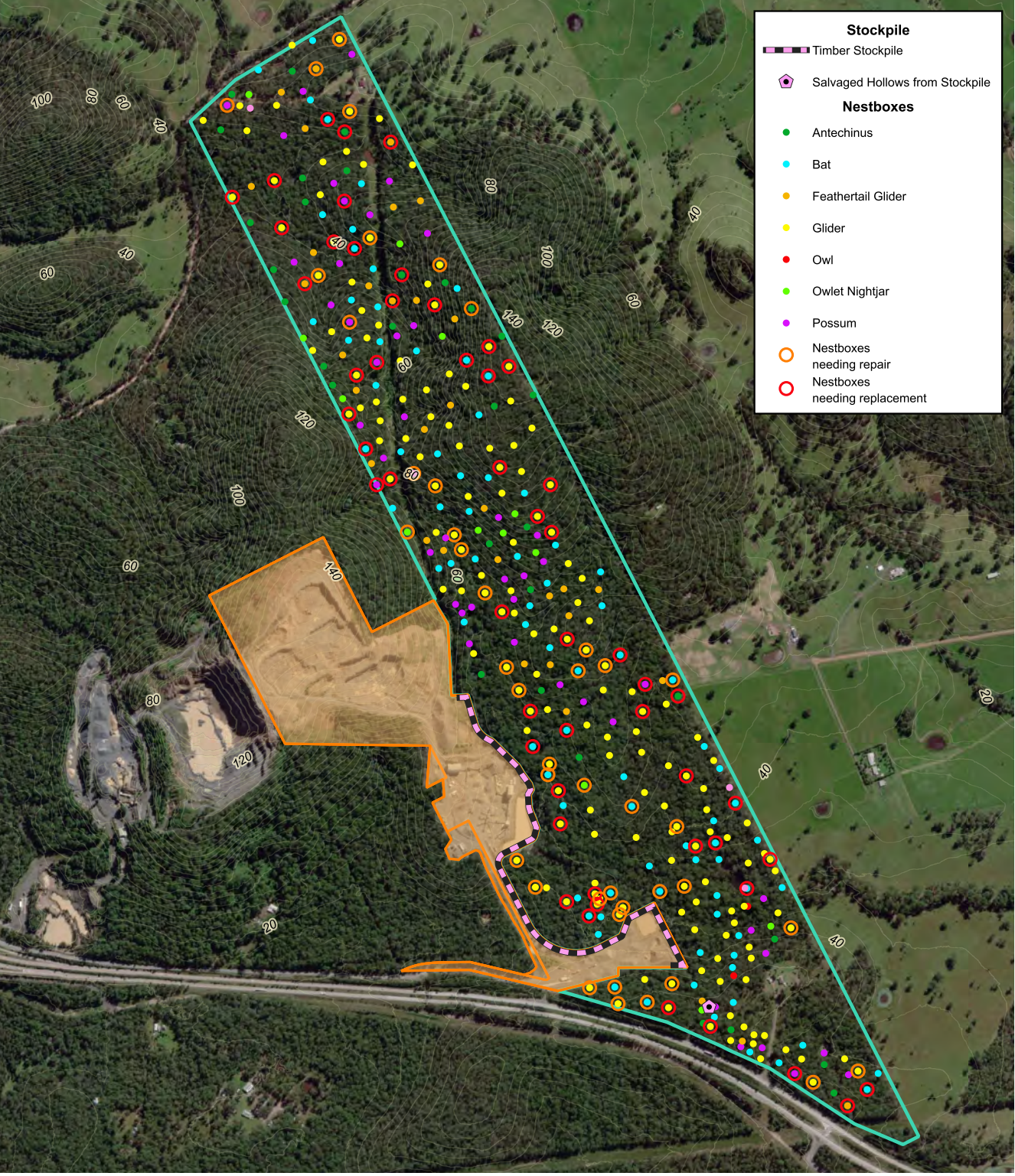
Installation Date	Installation Details	Box Type Installed
April 2016	30 nest boxes boxes were installed within the BOA in April 2016 as per Section 3.8 of the BOAMP.	• 20 Glider boxes • 10 Microchiropteran bat boxes
February 2018	93 nest boxes were installed between the 3rd and 6th of February 2018 and two large owl boxes were installed by quarry staff on 14 February 2018 (totaling 125) offsetting the original clearing works and loss of hollows at a 1:1 ratio assuming the 77 salvaged hollows are distributed throughout the BOA.	• 62 Glider boxes • 31 Microchiropteran bat boxes • Two owl nest boxes
July-August 2020	193 nest boxes were installed within the BOA to replace hollows removed during clearing undertaken on site in May and August 2018 at a ratio 1:1 as per the requirements of the L&RP and the BOAMP.	• 70 Glider boxes • 33 Possum boxes • 25 Antechinus boxes • 33 Microchiropteran bat boxes • 23 Feathertail Glider boxes • Nine Owlet Nightjar boxes
November-December 2022	Installation of 58 nest boxes were completed in February 2023 within the BOA to replace hollows removed during clearing undertaken on site, at a ratio 1:1 as per the requirements of the L&RP and the BOAMP.	• 14 Possum boxes • 10 Microbat boxes • 10 Feathertail boxes • 8 Sugar/squirrel Glider boxes • 7 Antechinus boxes • 5 Small Parrot boxes • 4 Owlet Nightjar boxes

Biennial nest box monitoring was completed by Kleinfelder in 2018, 2020 and Wedgetail in 2022 and 2024, results from these inspections are summarized below in **Table 8.**

Table 8: Nest box results across KEQ BOA (2016-2024)

Installation Date	Usage Rate	Details
2018 Inspection	**2016 Install of** 30 nest boxes (2yrs old) = 27% usage.	• 30 boxes were deemed to be available for use • No boxes recorded as damaged or unusable. • Eight Glider boxes showed signs of use including one being actively occupied by two Sugar Gliders (*Petaurus breviceps*). • None of the Microchiropteran bat exhibited signs of use during the survey.
2020 Inspection	**2016 Install of** 30 nest boxes (4yrs old) = 47% usage. **2018 Install of** 95 nest boxes (2yrs old) = 28% usage.	• 122 boxes were deemed to be available for use • Two boxes were found to be damaged and one unusable box (termite infested). • 40 Glider boxes showed signs of occupation, this included, three boxes occupied by Sugar Gliders (*Petaurus breviceps*) and 37 other boxes showing signs of use either from Sugar Gliders, Brown Antechinus (*Antechinus stuartii*) and Feathertail Gliders (*Acrobates pygmaeus*). • Almost half of all the glider nest boxes have either been utilised by or contain fauna species (usage rate of 49%). • None of the Microchiropteran bat boxes exhibited signs of use
2022 Inspection	**2016** Install of 30 nest boxes (6yrs old) = 40% usage. **2018** Install of 95 nest boxes (4yrs old) = 46% usage. **2020** Install of 193 nest boxes (2yrs old) = 46% nest boxes.	• 287 boxes were deemed to be available for use • Thirty-two boxes were found to be damaged and unusable boxes due to termite damage or European bee infestation. • 108 Glider boxes showed signs of occupation, this included, six boxes occupied by Sugar Gliders (*Petaurus breviceps*), one box occupied by a Squirrel Glider (*Petaurus norfolcensis*), one by Brown Antechinus (*Antechinus stuartii)* and 100 other boxes showing signs of use either from Sugar Gliders, Brown Antechinus (*Antechinus stuartii*) and Feathertail Gliders (*Acrobates pygmaeus*). • Almost three quarters of all the glider nest boxes have either been utilised by or contain fauna species (usage rate of 70%). • None of the Microchiropteran bat boxes exhibited signs of use
2024 Inspection	**2016** Install of 30 nest boxes (8yrs old) = 40% usage. **2018** Install of 95 nest boxes (6yrs old) = 46% usage. **2020** Install of 193 nest boxes (4yrs old) = 46% usage. **2022** Install of 58 nest boxes (2yrs old) = (70%) usage.	• 322 boxes were deemed to be available for use • Fifty-three boxes were found to be damaged and unusable boxes due to termite damage, European bee or wasp infestation. • 157 Glider boxes showed signs of occupation, this included, four boxes occupied by Sugar Gliders (*Petaurus breviceps*), one box occupied by a Squirrel Glider (*Petaurus norfolcensis*) and a further 152 boxes showing signs of use from Sugar Gliders (*Petaurus breviceps).* Squirrel Glider (*Petaurus norfolcensis*), Brown Antechinus (*Antechinus stuartii*), Feathertail Gliders (*Acrobates pygmaeus*) Brushtail Possum *(Trichosurus vulpecula)* and Ringtail possum *(Pseudocheirus peregrinus).*

		• Approximately half of the available boxes showed signs of occupancy (usage rate of 49%). • One of the Microchiropteran bat boxes exhibited signs of use, however the species was unable to be determined.



Karuah East Quarry Approved Disturbance Area

Biodiversity Offset Area

Figure 7: Habitat Resources and Nestbox Locations

100 200 300 400 500 m

N

GDA94 / MGA zone 56
EPSG:28356

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Map Produced: 05/12/2024
Produced By: Kane Blundell

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4. PERFORMANCE CRITERIA EVALUATION

Performance Criteria Evaluation

BOAMP performance criteria and an evaluation of the current status, relevant management actions completed or further works required are detailed below in **Table 9.** It is noted that the BOAMP was endorsed by all consent authorities (i.e. Council, NSW DP&E and Commonwealth DotE) as of March 2016. As such, all Year 1 management actions were due to be completed before March 2017 to ensure compliance with the relevant performance criteria.

Table 9: Current status of BOAMP performance criteria

Action	Performance Criteria	Current Status (2024)
Fencing, Gates and Signage		
Fence mapping	Completed by end of year 1	Baseline fence mapping completed in October 2015.
Boundary fencing, gates and signage installation / repairs	Completed by end of year 1	Outstanding Ongoing installation of boundary fencing, gates and signage required. Mostly restricted due to access (e.g. around uncleared areas of the extraction area).
Redundant fencing removal	Completed by end of year 3	N/A – no redundant fencing identified during baseline fence mapping.
Fencing inspections	Completed annually	Annual inspection completed.
Fencing maintenance	Maintain boundary fencing as direct by annal inspection	Maintenance required following 2024 inspection. Repair of boundary fencing, gates and signage is to be undertaken as required.
Access Tracks		
Access track mapping and assessment	Completed by end of year 1	Baseline track mapping and assessment completed in October 2015.
Access track repairs	Completed by end of year 3 Track repair does not impact on ecological values and is restricted to defined limits	No major track repair requirements identified. Access tracks assessed as being in suitable condition for 4WD access during the 2024 monitoring.
Redundant access track rehabilitation	Completed by end of year 3	Rehabilitation of redundant tracks completed and natural regeneration occurring.
Access track inspections	Completed annually	Annual inspection completed.
Erosion, Sedimentation and Soil Management		
Erosion and sedimentation mapping	Completed by end of year 1	Baseline assessment completed in October 2015.
Erosion repair and management	Completed by end of year 3 Repair of erosion within BOA does not impact on ecological values	The 2023 survey identified areas requiring repair and/or management and these were not observed to be rectified in the 2024 inspection. These

Action	Performance Criteria	Current Status (2024)
		actions should be undertaking immediately. The effectiveness of erosion and sediment control measures within the Karuah East Quarry project area ,such as silt fencing and diversion drains, should be inspected and maintained regularly and after rain events.
Erosion inspections	Completed annually	Annual inspection completed in September 2024.
Existing Dwellings		
Exclusion of existing dwellings from Conservation Agreement	Completed by end of year 1	The survey plan excluded the two existing dwellings.
Fencing and signage installation	Completed by end of year 1	Outstanding - Installation of fencing, gates and signage required.
Inspections	Completed annually	Annual inspection completed in September 2024.
Maintenance and weed control	No noxious weeds present within excised areas. No unauthorised disturbance outside of excised areas in the BOA.	Historically heavy *Lantana camara* infestations have been observed throughout the BOA. During the current monitoring event this infestation has worsened and is now impacting a number of monitoring points; particularly MP3 were *Asperula asthenes* is monitored. Control is recommended to prevent the spread of this species and the potential decline of vegetation integrity of the BOA. No unauthorised disturbance observed outside of excised areas in the BOA during 2024 monitoring.
Revegetation and Regeneration*		
Confirm extent of revegetation areas	Completed by end of year 1	Completed. No revegetation works were assessed as being required within the BOA during the 2015 to the 2024 monitoring events. The requirement for revegetation works within the BOA will be reassessed each year.
Habitat Augmentation		
Salvage and redistribution of habitat resources	Redistribution of salvaged resources by end of Year 3 Redistribution of salvaged resources does not impact on ecological values of BOA, including threatened flora	The 77 salvaged hollows were determined to be unsuitable for reinstallation. The installation of 193 nest boxes in July/August 2020 compensates for the loss of these hollows and recent clearing works undertaken on site.
Nest box installation	30 nest boxes installed in BOA prior to commencement of clearing.	Completed. A total of 375 nest boxes have been installed within the BOA. This includes' Thirty nest boxes

Action	Performance Criteria	Current Status (2024)
	Remaining nest boxes installed within three months following completion of clearing.	installed in the southern part of the BOA in April 2015 prior to commencement of clearing, an additional 95 were installed in February 2018, the installation of 193 nest boxes in July-August 2020 and 58 during February 2023.
Nest box monitoring and maintenance	Nest boxes are inspected every two years. Repairs / maintenance implemented within 6 months of biennial inspection.	Monitoring of nest box 1-30 was carried in April 2018. Monitoring of boxes 1-125 was carried out in June 2020. Monitoring of all (1-375) boxes occurred during October 2024. Further monitoring is not required until 2026.
Threatened Flora Translocation		
Tetratheca juncea translocation	Translocation completed by end of year 1 Maintenance and monitoring undertaken in accordance with the TjMP	Refer to Tj Translocation Monitoring Report (Firebird 2018).
Weed Control		
Baseline weed mapping	Completed by end of year 1	Baseline assessment completed in October 2015 (Kleinfelder 2015).
Delineation of threatened flora prior to weed control works	No impacts on threatened flora populations within BOA from weed control activities.	N/A – no weed control works undertaken surrounding threatened species locations to date.
Weed control	20% reduction in extent or density (cover) of target weeds per year compared to baseline mapping by end of Year 3. Weed control activities do not impact on ecological values.	Outstanding Small areas of Lantana along the creek line in Lot 14 were sprayed in September 2018. Substantial amount of dieback in this area has occurred by February 2019. Additional weed control was undertaken in February 2019. Further dieback was recorded in November 2019, so that only scattered individuals now occur. Weed control has been undertaken along the boundary fence of Lot 12 in February 2019, and along the entire perimeter of Lot 12 in November 2019. Little action has been seen since the efforts described above. Weed density has significantly increased across the majority of the BOA since the 2018 monitoring round. Heavy infestations occur throughout Lot 5, spreading into Lot 13. Heavy infestation also occur in the northern section of Lot 12. Further weed control is recommended to prevent the establishment of Lantana (low density areas) or control established patches (medium/high density areas).

Action	Performance Criteria	Current Status (2024)
Weed monitoring	Completed biennially (every two years) (for BOA). Completed annually (KEQ, 50 m buffer and Yalimbah Creek).	Weed mapping revisited for KEQ project area, adjoining vegetation within 50 m of the project area boundary on Lots 12 and 13, along Yalimbah Creek (Lot 12) and BOA in September 2024.
Vertebrate Pest Management		
Baseline vertebrate pest assessment	Completed by end of year 1	Baseline assessment completed in October 2015 (Kleinfelder 2015).
Vertebrate pest control	No non-target species affected by control works. Reduction in abundance of target species across BOA compared to baseline assessment.	Feral animal control was undertaken in February 2019.
Monitoring	Completed biennially (every two years).	Outstanding 2017 biennially vertebrate pest monitoring required. 1080 baiting was undertaken within Lot 5 during December 2020. No action has been seen since.
Fire Management		
Fire management strategy	Completed by end of year 1	Outstanding A fire management strategy is to be prepared for the BOA.
Bushfire mitigation	Bushfire mitigation measures in the L&RMP adhered to at all times	Refer to KEQ Annual Environmental Report.
Aerial Fauna Crossing		
Installation of aerial fauna crossings	Installed upon completion of Haul Road. A 12-month monitoring program of the two aerial fauna crossings will be undertaken using remote motion sensing cameras mounted on each pole (four cameras in total) once the crossings have been installed.	Completed Aerial fauna crossings installed at Karuah Hardrock Quarry in 2019, and KEQ in 2020. Remote Camera monitoring programmes for both crossings are underway and cameras need to be assessed.
Ecological Monitoring		
Additional baseline surveys	Completed prior to clearing	Baseline surveys completed (refer to Kleinfelder 2016).
Vegetation and threatened flora monitoring	Baseline ecological monitoring undertaken prior to clearing in year 1. Less than 10% decline in Tetratheca juncea, Grevillea parviflora subsp. parviflora and Asperula asthenes population sizes (at monitoring sites) compared to baseline assessment. No major changes in vegetation health or condition across BOA.	Baseline ecological monitoring completed (refer to Kleinfelder 2016). No major changes in vegetation health or condition were observed in the BOA in 2024. A small decline in threatened flora species at monitoring sites was observed during 2023 survey and this remains stable for the current monitoring event (2024).

*Criteria relating to revegetation within the project area is outlined in the Landscape and Rehabilitation Management Plan (L&RMP).

5. CONCLUSION

Results from the 2024 KEQ BOA annual monitoring indicate that the vegetation and fauna habitats within the Karuah East Biodiversity Offset Area (BOA) and Lot 12 are in good condition and have remained relatively stable since the previous monitoring event in 2023.

The 2024 monitoring programme has identified several key management actions that are required to be completed, which have been highlighted in **Section 3.2.1** of this report. Key results from the 2024 monitoring programme include:

- *Asperula asthenes, Tetratheca juncea* and *Grevillea parviflora subsp. parviflora* populations are in good condition, though several populations have seen decreases in size since the previous monitoring event. This is possibly due to many factors including natural environmental variation, edge effect from quarry operations (MP 15, MP6) or *Lantana camara* infestations (MP3). Others have experienced a small increase but have overall remained relatively stable since the previous monitoring event.
- Key disturbances recorded within the KEQ BOA and Lot 12 include minor sedimentation due to overtopping of a small number of sediment fences, the occurrence of dust on foliage within close proximity to quarry operations, and the runoff of excavated rock into the BOA from the eastern boundary and western boundary along the haul road of the quarry operations.
- Weed coverage across the KEQ BOA and Lot 12 has significantly increased – management is required to reduce Lantana cover, especially within the northern portion of the site (Lot 5 and spreading down into Lot 13), adjacent to the powerline easement (particularly MP 2, MP3 and MP 4). Lantana infestations were also seen in the northern section of Lot 12.
- Maintenance required to repair and install fencing and sediment fencing.
- Minor erosion and sedimentation of a dam in Lot 12 due to runoff from the eastern boundary of the quarry.
- No feral pigs and foxes, or evidence thereof, were observed during the 2024 monitoring event, however this species was identified near the powerline easement in 2020. Despite not having been identified since, it is likely this species persists within the BOA and therefore continued control programmes be carried out.
- A total of 375 nest boxes have been installed to date across the KEQ BOA. Monitoring of nest boxes have been carried out in 2018, 2020 2022 and 2024. No further nest boxes need to be installed until further clearing of hollow bearing trees occurs. Monitoring will be required in 2026.

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APPENDIX A. VEGETATION CONDITION ASSESSMENT RESULTS

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP1	Spotted Gum – Grey Ironbark open forest	• Observed increase in ground cover following drier conditions between 2019-2020. Ground cover is steadily increasing. • Midstorey regeneration present. • Low cover of fallen logs / timber. • Moderate to dense ground cover. • Low rock cover. • Dense litter cover. **Conclusion**: This years monitoring identified similar results in comparison to the previous survey (2023). Groundcover continues to increase in response to favorable weather conditions following drier conditions between 2019-2020.	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. • No signs of recent fire. • Some midstory die back. **Conclusion**: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2023).	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP2	Spotted Gum – Grey Ironbark open forest	• Ground cover in both 'grass' and 'other' categories have not significantly changed in recent years though there has been a decrease in grass cover since previous monitoring events. • Moderate cover of fallen logs / timber. • Rocky areas present. • Hollow-bearing trees and one stag present within vicinity of monitoring site. • Dense leaf litter cover. • Canopy and midstory regeneration present. **Conclusion**: Some decrease in 'grass' groundcover suggesting that the site has recovered from drier conditions experienced on site during 2019-2020. No other significant changes in vegetation and habitat condition since the previous survey (2023).	• No evidence of erosion and sedimentation within the monitoring point, though minimal erosion occurs southwest of the monitoring point due along the steep slopes. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. • No signs of recent fire. • Weed cover is stable within the monitoring point though Heavy *Lantana* infestation in the gully southwest of MP2 remains. **Conclusion**: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2023).	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP3	Brush Box – Turpentine shrubby open forest	• All vegetation strata within the monitoring site in healthy condition. • A small increase in canopy cover, though all other vegetation strata remain stable since previous monitoring events. • High structural complexity of vegetation. • High leaf litter. • Light-Moderate cover of fallen timber. • Weed cover (*Lantana* and Tradescantia) within the monitoring site has significantly increased, potentially in response to high rainfall in 2023. **Conclusion**: Excluding an increase in the abundance of exotic plants, no significant or notable changes in vegetation and habitat condition since the previous survey (2023).	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. • No signs of recent fire. **Conclusion**: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2023).	• There was a decrease in number of *Asperula asthenes* individuals within the monitoring site from 11 in 2023 to 9 in 2024. • Two *Asperula asthenes* plants were recorded flowering during monitoring. • All *Asperula asthenes* plants within the monitoring site were observed to be in healthy condition. • The population at MP 3 has declined significantly since 2021 (18 individuals recorded). **Conclusion:** Asperula asthenes continues to decrease since previous monitoring events despite appearing healthy. This may be due to being outcompeted by heavy exotic cover and smothering by high leaf litter.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP4	Brush Box – Turpentine shrubby open forest	• Large increase in *Doodia aspera* abundance within the understory of the monitoring plot. • Shrub cover remains table despite a decrease in previous monitoring events. • Apart from the minor shrub dieback all vegetation strata within the monitoring site in healthy condition. • Canopy and midstory remain stable. • High structural complexity of vegetation. • Moderate fallen timber. • Weed cover (*Lantana* and *Tradescantia*) within the monitoring site has increased slightly. **Conclusion**: A notable increase in the abundance of ferns in the understorey, since previous monitoring events. There has been a slight increase weed abundance. No other significant or notable changes in vegetation and habitat condition since the previous survey (2023).	• No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. • No recent evidence of disturbance from grazing, rubbish dumping, rock / timber removal. • Light dust cover observed on foliage. • No signs of recent fire. • Weed abundance slightly increased. • Flow of water from heavy rain has possibly some *Asperula asthenes* individuals. • High litter cover with no bare ground. **Conclusion**: No new disturbance or significant changes in existing disturbance severity were observed since the previous survey (2023).	• There was a decrease in number of *Asperula asthenes* individuals recorded in recent years from 32 in 2021 then to 16 in 2024. • Two *Asperula asthenes* plants were recorded flowering during monitoring. • All *Asperula asthenes* plants within the monitoring site were observed to be in healthy condition. • The population at MP 4 remains stable in recent monitoring events (16 individuals recorded) with a large decrease in population in 2021 likely the result of heavy rainfall and flow of water through the monitoring point removing some individuals. • Though some individuals were likely washed away, new growth and reshooting plants were observed in previous empty locations. **Conclusion:** Asperula asthenes abundance remain stable with small increased in exotic weed cover and light dust cover on surrounding foliage. Though plants appear healthy future monitoring may benefit to focus on minimizing dust and weed cover.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP5	Blackbutt – Turpentine – Tallowwood shrubby open forest	• No evidence of foliage die-back was observed in the canopy or ground layer • Some midstory dieback though regeneration is present. • Small decrease in 'grass' groundcover. • Moderate fallen logs / timber. • Dense leaf litter cover. • Ligh cover of rocks. **Conclusion**: No significant changes in vegetation and habitat condition since the previous survey (2023).	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal. • Light dust cover on surrounding foliage. • No signs of recent fire. **Conclusion**: No new disturbance or changes in existing disturbance severity were observed since the previous survey though future monitoring will benefit to focus on dust reduction (2023).	N/A
MP6	Blackbutt – Turpentine – Tallowwood shrubby open forest	• Some midstory dieback, particularly *Callistemon salignus* though regeneration is present. • Canopy remains in healthy condition. • Canopy and midstory regeneration present with an abundance of seedlings. • Low level of fallen logs / timber. • Ground cover is moderate. • Lantana remains in low abundance since previous survey. **Conclusion**: No significant changes in vegetation and habitat condition since the previous survey (2023).	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal was observed. • A very high dust cover observed on foliage. • Runoff observed within creek with sedimentation within water present. **Conclusion**: Very high dust cover on foliage has been observed within the monitoring site from 2020 to 2024. Future monitoring will benefit to focus on dust reduction.	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP7	Smooth-barked Apple - Red Bloodwood open forest	• Regeneration of foliage in canopy and midstory. • All vegetation strata in healthy condition. • Regrowth vegetation to the north and east that was previously cleared is now recovering satisfactorily. • Moderate litter cover within monitoring site, fallen timber present. • High leaf litter cover observed. • Canopy and midstory abundance have increase since previous monitoring. **Conclusion**: The monitoring point remains stable with signs of regeneration and increasing abundance in several stratum since the previous survey (2023).	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. • High dust cover observed on foliage. • No signs of recent fire. **Conclusion**: High dust cover continues to occur on foliage and has been observed within the monitoring site from 2020 to 2024.	• There was a decrease in the number of *Tetratheca juncea* clumps recorded within the monitoring site, from 15 in 2021 to 12 in 2023 and 10 plants remain in 2024. • No new *Tetratheca juncea* clumps were recorded in 2023, though existing clumps were proliferating with many new shoots. • Eight *Tetratheca juncea* plants were recorded flowering during monitoring with two plants bearing fruit. • Most *Tetratheca juncea* plants within the monitoring site were observed to be in healthy condition. • Three *Tetratheca juncea* plants displayed new shoots. **Conclusion**: The *Tetratheca juncea* population at MP 7 has reduced since previous monitoring events though proliferation of remaining clumps suggests healthy plants.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP8	Smooth-barked Apple - Red Bloodwood open forest	• Changes to groundcover composition, with a decrease in grass groundcover and an increase in 'other' with *Ptilotrix deusta* recorded higher than in previous years. • No exotic species identified within this plot. • No dieback of canopy stratum was observed. • Canopy and midstory regeneration present. • Low fallen timber • Dense ground cover and midstory **Conclusion**: Minor changes in vegetation and habitat condition since the previous survey with new growth observed in the canopy and midstory strata (2023).	• No evidence of erosion and sedimentation • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal. • High dust cover due to nearby quarry operations. **Conclusion**: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2023).	• The number of *Tetratheca juncea* clumps have remained stable since monitoring in 2022 with nine plants remaining in 2024. • No new *Tetratheca juncea* clumps was recorded in 2021. • Nine *Tetratheca juncea* plants were recorded flowering during monitoring. • Two *Tetratheca juncea* plants was recorded with fruits during monitoring. • Four plants were observed in healthy condition, displaying new growth and beginning to merge with neighboring plants. • One individual was observed to be yellowing. • The one *Grevillea parviflora* subsp. *parviflora* individual occurring within MP 8 in 2020 was absent during the 2024 monitoring surveys. **Conclusion:** *Tetratheca juncea* at MP8 has remain stable and healthy in recent years displaying new growth and an abundance of flowering plants.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP9	Smooth-barked Apple - Red Bloodwood open forest	• Increased ground cover compared to previous monitoring events. • There was no sign of foliage die-back in the understory. • Minimal dead wood was observed throughout the canopy. • Moderate fallen timber. • High leaf litter cover present. **Conclusion**: Minor changes in vegetation and habitat condition since the previous survey (2023).	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rock / timber removal. • Low evidence of dust on foliage. • No signs of recent fire. • Old track to south. **Conclusion**: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2023).	N/A
MP10	Sydney Peppermint - Smooth-barked Apple shrubby open forest	• Minor increase in canopy cover since previous monitoring. • All vegetation strata in healthy condition. • Canopy and midstory regeneration present. • Low-moderate fallen timber and high litter coverage. • Moderate to dense ground cover. **Conclusion**: No major changes in vegetation and habitat condition since the previous survey with some increases in canopy cover (2023).	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. • No signs of recent fire. • Three old dead stags present. **Conclusion**: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2023).	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP11	Sydney Peppermint - Smooth-barked Apple shrubby open forest	• Previous evidence of foliage die-back, though this appears to have stabilized. • All present vegetation strata is in healthy condition. • Canopy and midstory regeneration present. • Groundcover has increased since previous monitoring events. • Low fallen timber. • Moderate ground cover. • High leaf litter coverage. **Conclusion**: No significant or notable changes in vegetation and habitat condition since the previous survey (2023).	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. **Conclusion**: No recent disturbance was observed since the previous survey (2023).	• There was an increase in the number of *Grevillea parviflora* subsp. *parviflora* plants recorded within the monitoring site, from 9 in 2022 to 10 in 2023 and 12 in 2024. • Two *Grevillea parviflora* subsp. *Parviflora* plants were relocated having been unrecorded in previous years. • All *Grevillea parviflora* subsp. *parviflora* plants within the monitoring site were observed to be in healthy condition. • Five *Grevillea parviflora* subsp. *Parviflora* were flowering. • The one *Tetratheca juncea* clump recorded at MP 11 in 2020 continues to be in a healthy condition with 165 flowers and 56 fruits. One new T*etratheca juncea* clump was recorded in 2024 with 55 flowers. **Conclusion**: The *Grevillea parviflora* subsp. *parviflora* population at MP 11 has declined since 2015 baseline (16 individuals recorded). To 12 plants recorded in 2024. One new *Tetratheca juncea* plant was recorded in 2024.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP12	Smooth-barked Apple – Red Bloodwood open forest	• Midstorey reduced compared to surroundings due to vehicle tracks • Very high levels of fallen timber (from clearing). • High leaf litter coverage. • Moderate ground cover. • Evidence of regeneration in understory and midstory. **Conclusion**: Felled timber remains (from previous impact due to fence maintenance), however, no significant changes have occurred to vegetation and habitat condition since the previous survey (2023).	• No evidence of erosion and sedimentation. • Area has been previously subject to clearing due to fence line maintenance. • Clearing and log stockpiling in order to maintain an adjacent access track has impacted some of the vegetation including *Grevillea parviflora* individuals. **Conclusion**: Excluding the maintenance of an adjacent accessway, no evidence of new disturbance was observed since the previous survey (2023).	• There was a reduction of *Grevillea parviflora* subsp. *parviflora* plants recorded within the monitoring site, 2023 (7) to 2024 (5). • All *Grevillea parviflora* subsp. *parviflora* plants within the monitoring site were observed to be in healthy condition. • Four *Grevillea parviflora* subsp. *Parviflora* were observed flowering and one plant bore fruit. **Conclusion**: The *Grevillea parviflora* subsp. *parviflora* population at MP 11 has reduced by two plants since previous monitoring in 2023, possibly due to the continued impact of access track maintenance adjacent to the monitoring point.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP13	Spotted Gum – Grey Ironbark open forest	• Minimal dieback in mature *Allocasuarina torulosa* individuals although healthy regeneration is observed within the canopy and midstory. • Low level of fallen logs / timber. • Dense ground cover. • Low rock cover. • Eucalypt and Midstory seedlings present. **Conclusion**: Regeneration is occurring within the monitoring point with minimal dieback of *Allocasuarina torulosa.*	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. • Significant dust settlement recorded here in 2023, though this appears to have reduced at the current monitoring event 2024 **Conclusion**: No evidence of new disturbance was observed since the previous survey (2023).	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP14	Smooth-barked Apple - Red Bloodwood open forest	• One individual *Setaria sphacelata.* • Most vegetation strata in healthy condition. • Canopy and midstory regeneration present. • Low fallen/ timber. • Dense ground and lead litter cover. **Conclusion**: No significant or notable changes in vegetation and habitat condition since the previous survey (2023).	• Evidence of sedimentation of quarry rock material adjacent to monitoring plot from haul road into the nearby dam. • High occurrence of *Setaria sphacelata* occurring south of the monitoring point. • Dust accumulation on foliage from Quarry. • Sediment runoff occurring south of the monitoring point contaminating the dam. • Moderate cover of exotic grasses around dam to south and along access track. **Conclusion**: Prevailing evidence of sedimentation was observed and high weed coverage still persist within the area since the previous survey (2023).	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP15	Blackbutt - Turpentine - Tallowwood shrubby open forest	• Marginal increase in Canopy cover since the 2023 survey. • All vegetation strata in moderately healthy condition. • Moderate fallen timber. • Dense ground cover and leaf litter. • Rocky areas in low abundance. • Large hollow present. **Conclusion**: No significant changes in vegetation and habitat condition since the previous survey (2023).	• No evidence of erosion and sedimentation. • There are some edge effects from adjacent clearing. • Thick dust coating on foliage. **Conclusion**: Dust cover on foliage was observed within the monitoring site in 2023 and again in 2024 seemingly becoming thicker.	• There was a decrease in the number of *Tetratheca juncea* clumps recorded within the monitoring site, from 5 in 2023, to 4 in 2024. • One new *Tetratheca juncea* that has not been detected in more recent years was observed reshooting. • All 4 *Tetratheca juncea* plants were recorded flowering during monitoring. • One *Tetratheca juncea* plant was observed fruiting. • All *Tetratheca juncea* plants within the monitoring site were observed to be in healthy condition. **Conclusion**: The *Tetratheca juncea* population at MP 15 has declined since 2015 baseline (30 individuals recorded). This decline in the *T. juncea* at MP 15 is most likely due to the lower than average rainfall during 2019, exacerbated by the location of the monitoring point; upper slopes of exposed hill side and thick dust cover.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP16	Spotted Gum – Grey Ironbark open forest	• Increased 'grass' groundcover abundance that has stabilized since previous monitoring. • All vegetation strata in healthy condition. • Canopy and midstory regeneration present. • Moderate fallen timber. • Dense leaf litter and moderate ground cover. • Minor die back in the canopy • Decreased *Lantana camera* abundance since previous monitoring event. **Conclusion**: Minor changes, though not significant, in vegetation and habitat condition since the previous survey (2023).	• No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal. • Very high dust cover from edge affects of quarry operations. **Conclusion**: Very high dust cover that has increased since previous monitoring (2023). No evidence of new disturbance was observed with some reduction in *Lantana camera.*	• *Asperula asthenes* detected within monitoring plot for first time (2021). • Six individual plants identified in 2022 and all remain in 2023. • An additional two plants were identified during the current monitoring event (2024). • Five *Asperula asthenes* plants were recorded flowering during monitoring. • All *Asperula asthenes* plants within the monitoring site were observed to be in healthy condition **Conclusion:** Despite increased edge effects from nearby quarry operations, *Asperula asthenes* is proliferating and healthy.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP17	Brush Box - Turpentine shrubby open forest	• No evidence of foliage die-back, evidence of midstorey and canopy regeneration. • All vegetation strata in healthy condition. • Abundance of juvenile *Backhousia myrtifolia* in midstorey, subsequently increasing mid-storey cover. • Increased midstory has resulted in a decrease in ground cover. • *Lantana camara* abundance remains stable. • Moderate fallen timber. • Rocky areas along ephemeral creek. • Dense leaf litter. **Conclusion**: No significant changes in vegetation and habitat conditions since the previous survey (2023).	• Very minor scouring along creek bank. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal. • Moderate dust cover on foliage. • Stable exotic plant community (*Lantana camara*). • Dirty water running within the creek. **Conclusion**: No evidence of new disturbance observed since the previous survey (2023). Creek water remains high in sedimentation.	• There was a decrease in number of *Asperula asthenes* individuals within the monitoring site from 10 in 2021 to 6 in 2023 and 6 plants remain in 2024 • Some individuals appear to have been removed along the creek bed due to heavy rainfall events, though other individuals were observed that haven't been recorded in recent years. • Four *Asperula asthenes* plants were recorded flowering during monitoring. • All *Asperula asthenes* plants within the monitoring site were observed to be in healthy condition with no yellowing. **Conclusion**: The population at MP 17 has decreased since 2015 baseline (11 individuals recorded) though it has remained stable in recent years, with new growth occurring.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP18	Brush Box - Turpentine shrubby open forest	• All vegetation strata in healthy condition • Canopy and midstorey regeneration present • Low fallen timber • High level of leaf litter present. • High leaf litter and ground cover • Rocky areas along ephemeral creek. **Conclusion**: No significant or notable changes in vegetation and habitat condition since the previous survey (2023).	• Very minor scouring along creek bank. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. • reduced dust coverage on foliage when compared to previous years. **Conclusion**: No evidence of new disturbance was observed since the previous survey (2023).	• There was a small increase in number of *Asperula asthenes* individuals within the monitoring site from 11 in 2023 to 12 in 2024. • One new *Asperula asthenes* plants was recorded in 2024. • Five *Asperula asthenes* plant was recorded flowering during monitoring. • All *Asperula asthenes* plants within the monitoring site were observed to be in healthy condition. **Conclusion**: The population at MP 18 has remained stable since 2015 baseline (13 individuals recorded). Previous years of below average rainfall have likely impacted this population, however there are signs of plants reshooting and flowering, as well as plants sighted outside the monitoring point.

APPENDIX B. VEGETATION MONITORING DATA

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)									
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
MP 1	Canopy	*Eucalyptus propinqua* (Small-fruited Grey Gum), *E. microcorys* (Tallowwood), *E. acmenoides* (White Mahogany) and *Corymbia maculata* (Spotted Gum)	50%	50%	50%	50%	50%	40%	40%	35%	35%	35%
	Midstorey	*Allocasuarina torulosa* (Forest Oak) and *Glochidion ferdinandi var. ferdinandi* (Cheese Tree)	40%	40%	40%	40%	40%	15%	20%	15%	15%	10%
	Shrub	*Leucopogon juniperinus* (Prickly Beard-heath), Hibbertia aspera (Rough Guinea Flower) and *Breynia oblongifolia* (Coffee Bush)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	Ground (grass)	*Imperata cylindrica* (Blady Grass), *Oplismenus imbecillis* (Creeping Beard Grass), *Poa labillardierei* (Tussock) and *Themeda triandra* (Kangaroo Grass)	60%	60%	60%	60%	40%	20%	35%	35%	35%	40%
	Ground (other)	*Lomandra longifolia* (Spiny-headed Mat-rush), *Gonocarpus teucrioides* (Raspwort), *Carex longebrachiata* and *Adiantum aethiopicum* (Common Maidenhair)	50%	50%	50%	50%	50%	20%	30%	30%	25%	30%
	Exotic	*Lantana camara* (Lantana)	30%	30%	25%	25%	20%	10%	15%	15%	15%	15%
MP 2	Canopy	*Corymbia maculata* (Spotted Gum), *Eucalyptus microcorys* (Tallowwood), *E. canaliculata* (Grey Gum) *and E. paniculata subsp. paniculata* (Grey Ironbark)	40%	40%	40%	40%	40%	40%	35%	40%	40%	40%
	Midstorey	*Allocasuarina torulosa* (Forest Oak), *Bursaria spinosa (*Blackthorn) and *Exocarpos cupressiformis* (Cherry Ballart)	40%	35%	35%	35%	35%	30%	20%	20%	20%	20%
	Shrub	*Leucopogon juniperinus* (Prickly Beard-heath) and *Acacia ulicifolia* (Prickly Moses)	5%	5%	5%	5%	5%	10%	5%	5%	5%	5%
	Ground (grass)	*Themeda triandra* (Kangaroo Grass) and *Poa labillardierei* (Tussock)	50%	50%	50%	50%	40%	25%	40%	40%	40%	30%
	Ground (other)	*Lomandra longifolia* (Spiny-headed Mat-rush), *Gonocarpus tetragynus* and *Eustrephus latifolius* (Wombat Berry)	20%	20%	20%	20%	40%	5%	30%	35%	30%	30%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)									
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Exotic	*Lantana camara* (Lantana)	5%	5%	1%	1%	1%	0%	2%	5%	5%	5%
MP 3	Canopy	*Lophostemon confertus* (Brush Box), *Syncarpia glomulifera* (Turpentine), *Eucalyptus propinqua* (Small-fruited Grey Gum) and *E. microcorys* (Tallowwood)	40%	40%	40%	40%	40%	35%	35%	45%	50%	55%
	Midstorey	*Melaleuca styphelioides* (Prickly-leaved Tea Tree), *Livistona australis* (Cabbage Palm), *Allocasuarina torulosa* (Forest Oak) and *Elaeocarpus obovatus* (Hard Quandong)	60%	60%	60%	60%	60%	40%	40%	40%	40%	40%
	Shrub	*Pittosporum multiflorum* (Orange Thorn), *Diospyros australis* (Black Plum) and *Bursaria spinosa* (Boxthorn)	40%	40%	50%	50%	60%	60%	55%	60%	60%	60%
	Ground (grass)	*Oplismenus aemulus* (Australian Basket Grass)	<5%	<5%	<5%	<5%	<5%	<5%	<5%	5%	5%	5%
	Ground (other)	*Doodia aspera* (Prickly Rasp Fern), *Carex longebrachiata*, *Adiantum hispidulum* (Rough Maidenhair Fern) and *Cissus antarctica* (Kangaroo Vine)	90%	90%	90%	90%	90%	65%	70%	70%	70%	70%
	Exotic	*Lantana camara* (Lantana) and *Ageratina riparia* (Mistflower)	50%	50%	50%	50%	40%	20%	30%	30%	35%	45%
MP 4	Canopy	*Lophostemon confertus* (Brush Box), *Syncarpia glomulifera* (Turpentine), and *Eucalyptus propinqua* (Small-fruited Grey Gum)	30%	30%	30%	30%	40%	25%	30%	30%	30%	40%
	Midstorey	*Glochidion ferdinandi var. ferdinandi* (Cheese Tree), *Livistona australis* (Cabbage-tree Palm), *Melaleuca styphelioides* (Prickly-leaved Tea Tree), *Acmena smithii* (Lilly Pilly) and *Elaeocarpus obovatus* (Hard Quandong)	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
	Shrub	*Pittosporum multiflorum* (Orange Thorn)	5%	5%	3%	3%	3%	20%	3%	3%	5%	5%
	Ground (grass)	*Oplismenus aemulus* (Australian Basket Grass)	5%	5%	5%	5%	5%	15%	5%	5%	5%	5%
	Ground (other)	*Doodia aspera* (Prickly Rasp Fern), *Morinda jasminoides* (Sweet Morinda) and *Carex longebrachiata*	90%	90%	90%	90%	90%	20%	70%	70%	70%	80%
	Exotic	*Lantana camara* (Lantana), *Asparagus aethiopicus* (Ground Asparagus) and *Tradescantia fluminensis* (Wandering Jew)	35%	35%	25%	30%	30%	30%	30%	20%	10%	15%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)									
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
MP 5	Canopy	*Eucalyptus pilularis* (Blackbutt), *E. microcorys* (Tallowwood), *Angophora costata* (Smooth-barked Apple) and *E. globoidea* (White Stringybark)	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
	Midstorey	*Allocasuarina torulosa (*Forest Oak), *Glochidion ferdinandi var. ferdinandi* (Cheese Tree), *Persoonia linearis* (Narrow-leaved Geebung) and *Melaleuca linariifolia* (Flax-leaved Paperbark)	60%	60%	60%	60%	60%	40%	40%	40%	40%	35%
	Shrub	*Leptospermum polygalifolium* (Tantoon), *Hibbertia aspera* (Rough Guinea Flower), *Breynia oblongifolia (*Coffee Bush) and *Phyllanthus hirtellus* (Thyme Spurge)	5%	5%	10%	10%	10%	10%	25%	15%	15%	15%
	Ground (grass)	*Entolasia stricta* (Wiry Panic) and *Oplismenus imbecillis* (Creeping Beard Grass)	60%	60%	60%	60%	60%	40%	35%	15%	15%	20%
	Ground (other)	*Doryanthes excelsa* (Gymea Lily), *Pteridium esculentum* (Common Bracken), *Ptilothrix deusta* and *Lomandra longifolia* (Spiny-headed Mat-rush)	50%	50%	50%	50%	50%	50%	50%	60%	60%	55%
	Exotic	*Lantana camara* (Lantana)	-	-	-	-	-	-	-	1%	-	-
MP 6	Canopy	*Eucalyptus microcorys* (Tallowwood), *E. propinqua* (Small-fruited Grey Gum), *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus pilularis* (Blackbutt)	50%	50%	50%	50%	50%	45%	45%	45%	45%	45%
	Midstorey	*Melaleuca styphelioides* (Prickly-leaved Tea Tree), *Allocasuarina torulosa* (Forest Oak), *Acmena smithii* (Lilly Pilly), *Callistemon salignus* (Willow Bottlebrush) and *Backhousia myrtifolia* (Grey Myrtle), *Acacia sp*.	60%	60%	50%	55%	30%	20%	35%	45%	45%	40%
	Shrub	*Hibbertia aspera* (Rough Guinea Flower), *Breynia oblongifolia* (Coffee Bush) and *Zieria smithii* (Sandfly Zieria)	<5%	<5%	<5%	5%	1%	5%	10%	15%	10%	10%
	Ground (grass)	*Imperata cylindrica* (Blady Grass), *Calochlaena dubia* (Rainbow Fern), *Oplismenus imbecillis* (Creeping Beard Grass) and *Poa labillardierei* (Tussock)	20%	20%	20%	20%	20%	20%	20%	20%	15%	20%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)									
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Ground (other)	*Lomandra longifolia* (Spiny-headed Mat-rush), *Doryanthes excelsa* (Gymea Lily), *Adiantum aethiopicum* (Common Maidenhair) and *Morinda jasminoides* (Sweet Morinda)	30%	30%	30%	30%	30%	30%	30%	40%	40%	40%
	Exotic	*Lantana camara* (Lantana)	-	-	-	-	-	-	2%	2%	2%	2%
MP 7	Canopy	*Angophora costata* (Smooth-barked Apple), *Eucalyptus eugenioides* (Thin-leaved Stringybark) and *Corymbia gummifera* (Red Bloodwood)	35%	35%	35%	35%	35%	40%	40%	40%	40%	45%
	Midstorey	*Allocasuarina littoralis* (Black She-oak), *Leptospermum polygalifolium* (Tantoon) and *Allocasuarina torulosa* (Forest Oak)	40%	40%	40%	40%	40%	40%	40%	40%	40%	45%
	Shrub	*Pultenaea euchila* (Orange Pultenaea)	5%	5%	5%	5%	5%	5%	10%	10%	15%	10%
	Ground (grass)	*Themeda triandra* (Kangaroo Grass) and *Entolasia stricta* (Wiry Panic)	50%	50%	50%	50%	40%	25%	25%	35%	30%	25%
	Ground (other)	*Lomandra longifolia* (Spiny-headed Mat-rush), *Ptilothrix deusta* and *Gahnia radula*	70%	60%	60%	60%	60%	35%	40%	45%	50%	55%
	Exotic	*Setaria sphacelata* (South African Pigeon Grass)	5%	5%	5%	5%	2%	2%	1%	1%	2%	2%
MP 8	Canopy	*Angophora costata* (Smooth-barked Apple), *Eucalyptus eugenioides* (Thin-leaved Stringybark) and *Corymbia gummifera* (Red Bloodwood)	30%	30%	30%	30%	30%	30%	30%	30%	35%	35%
	Midstorey	*Allocasuarina littoralis* (Black She-oak), *Leptospermum polygalifolium* (Tantoon) and *Acacia longifolia* (Sydney Golden Wattle)	50%	50%	50%	50%	30%	40%	40%	40%	40%	43%
	Shrub	*Pultenaea paleacea* (Chaffy Bush-pea), *Pultenaea euchila* (Orange Pultenaea), *Phyllanthus hirtellus* (Thyme Spurge), *Hibbertia riparia* (Erect Guinea-flower) and *Hibbertia aspera* (Rough Guinea Flower)	20%	20%	20%	20%	15%	15%	15%	10%	10%	8%
	Ground (grass)	*Entolasia stricta* (Wiry Panic) and *Themeda triandra* (Kangaroo Grass)	50%	50%	50%	50%	40%	40%	15%	20%	25%	25%
	Ground (other)	*Lomandra longifolia* (Spiny-headed Mat-rush), *Ptilothrix deusta*, *Patersonia sericea* (Silky Purple-flag) and *Lomandra obliqua*	50%	50%	50%	50%	50%	40%	50%	55%	50%	55%
	Exotic	Nil	-	-	-	-	-	-	-	-	-	-

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)									
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
MP 9	Canopy	*Angophora costata* (Smooth-barked Apple), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus microcorys* (Tallowwood) and *E. eugenioides* (Thin-leaved Stringybark)	40%	40%	40%	40%	40%	40%	35%	40%	40%	40%
	Midstorey	*Allocasuarina* littoralis (Black She-oak), *Dodonaea triquetra* (Large-leaf Hop-bush) and *Persoonia linearis* (Narrow-leaved Geebung).	50%	50%	50%	50%	50%	40%	40%	40%	40%	40%
	Shrub	*Leptospermum polygalifolium* (Tantoon), *Pultenaea euchila* (Orange Pultenaea), *Logania albiflora* and *Polyscias sambucifolia* (Elderberry Panax)	10%	10%	10%	10%	7%	7%	10%	20%	15%	15%
	Ground (grass)	*Imperata cylindrica* (Blady Grass), *Rytidosperma pallidum* (Red-anther Wallaby Grass), *Entolasia stricta* (Wiry Panic) and *Themeda triandra* (Kangaroo Grass)	30%	30%	40%	40%	40%	30%	30%	30%	30%	35%
	Ground (other)	*Lomandra longifolia* (Spiny-headed Mat-rush), *Pteridium esculentum* (Common Bracken) and *Ptilothrix deusta*	60%	60%	60%	50%	40%	40%	40%	40%	35%	40%
	Exotic	Nil	-	-	-	-	-	-	-	-	-	-
MP 10	Canopy	*Eucalyptus piperita* (Sydney Peppermint), *Angophora costata* (Smooth-barked Apple), *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus microcorys* (Tallowwood)	40%	40%	40%	35%	35%	40%	40%	40%	35%	40%
	Midstorey	*Allocasuarina littoralis* (Black She-oak), *Persoonia* linearis (Narrow-leaved Geebung) and *A. torulosa* (Forest Oak)	10%	10%	10%	10%	10%	10%	15%	15%	15%	15%
	Shrub	*Pultenaea euchila* (Orange Pultenaea), *Leptospermum polygalifolium* (Tantoon), *Pultenaea paleacea* (Chaffy Bush-pea) *Polyscias sambucifolia* (Elderberry Panax) and *Acacia ulicifolia* (Prickly Moses)	5%	5%	5%	5%	5%	3%	5%	3%	5%	5%
	Ground (grass)	*Entolasia stricta* (Wiry Panic), *Themeda triandra* (Kangaroo Grass) and *Imperata cylindrica* (Blady Grass)	40%	40%	40%	40%	30%	40%	30%	40%	40%	40%
	Ground (other)	*Gahnia radula*, *Doryanthes excelsa* (Gymea Lily), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Ptilothrix deusta*	60%	60%	60%	60%	50%	40%	50%	50%	50%	50%
	Exotic	Nil	-	-	-	-	-	-	-	-	-	-

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)									
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
MP 11	Canopy	*Angophora costata* (Smooth-barked Apple), *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus capitellata* (Brown Stringybark)	35%	35%	35%	35%	35%	35%	35%	40%	45%	45%
	Midstorey	*Allocasuarina littoralis* (Black She-oak), *Glochidion ferdinandi var. ferdinandi* (Cheese Tree), *Leptospermum polygalifolium* (Tantoon) and *Banksia spinulosa* (Hairpin Banksia)	40%	40%	40%	40%	40%	40%	45%	45%	45%	45%
	Shrub	*Pultenaea euchila* (Orange Pultenaea) and *Boronia pinnata*	5%	5%	5%	5%	5%	5%	5%	5%	3%	3%
	Ground (grass)	*Entolasia stricta* (Wiry Panic), *Imperata cylindrica* (Blady Grass) and *Themeda triandra* (Kangaroo Grass)	35%	35%	40%	40%	30%	25%	25%	30%	30%	35%
	Ground (other)	*Xanthorrhoea latifolia*, *Pteridium esculentum* (Common Bracken) and *Ptilothrix deusta*, *Doryanthes excelsa* (Gymea Lily)	60%	60%	60%	60%	50%	40%	40%	25%	30%	30%
	Exotic	Nil	-	-	-	-	-	-	-	-	-	-
MP 12	Canopy	*Eucalyptus pilularis* (Blackbutt), *Angophora costata* (Smooth-barked Apple), *E. globoidea* (White Stringybark), *Corymbia gummifera* (Red Bloodwood), *E. microcorys* (Tallowwood) and *E. piperita* (Sydney Peppermint)	40%	40%	40%	40%	40%	35%	30%	30%	35%	35%
	Midstorey	*Leptospermum polygalifolium* (Tantoon), *Allocasuarina littoralis* (Black She-oak), *Glochidion ferdinandi var. ferdinandi* (Cheese Tree) and *Exocarpos cupressiformis* (Cherry Ballart)	30%	30%	30%	30%	30%	15%	15%	15%	20%	20%
	Shrub	*Pultenaea euchila* (Orange Pultenaea), *Boronia pinnata* and *Banksia spinulosa* (Hairpin Banksia)	10%	10%	10%	5%	10%	5%	5%	10%	10%	10%
	Ground (grass)	*Themeda triandra* (Kangaroo Grass), *Entolasia stricta* (Wiry Panic), and *Austrostipa sp.*	40%	40%	40%	30%	30%	20%	20%	20%	20%	20%
	Ground (other)	*Xanthorrhoea latifolia* and *Ptilothrix deusta*	40%	40%	40%	30%	30%	10%	15%	15%	15%	10%
	Exotic	*Senecio madagascariensis* (Fireweed)	-	-	-	-	-	-	0.5%	50%	-	-
MP 13	Canopy	*Eucalyptus sparsifolia* (Narrow-leaved Stringybark), *Corymbia maculata* (Spotted Gum), *E. paniculata* (Grey Ironbark) and *E. microcorys* (Tallowwood)	40%	40%	40%	40%	50%	25%	25%	40%	40%	40%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)									
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Midstorey	*Allocasuarina torulosa* (Forest Oak), *Syncarpia glomulifera* (Turpentine) and *Callistemon salignus* (Willow Bottlebrush)	40%	40%	40%	40%	40%	10%	10%	10%	10%	20%
	Shrub	*Hibbertia aspera* (Rough Guinea Flower), *Pultenaea euchila* (Orange Pultenaea), *Breynia oblongifolia* (Coffee Bush) and *Leptospermum polygalifolium* (Tantoon)	5%	5%	5%	5%	5%	2%	3%	3%	2%	2%
	Ground (grass)	*Imperata cylindrica* (Blady Grass), *Poa labillardierei* (Tussock), *Themeda triandra* (Kangaroo Grass) and *Oplismenus imbecillis* (Creeping Beard Grass).	60%	60%	60%	70%	70%	60%	60%	70%	70%	70%
	Ground (other)	*Lomandra longifolia* (Spiny-headed Mat-rush), *Doryanthes excelsa* (Gymea Lily), *Lepidosperma laterale*, *Patersonia sericea* and *Lomandra multiflora* (Many-flowered Mat-rush)	30%	30%	40%	40%	40%	30%	30%	40%	45%	40%
	Exotic	Nil	-	-	-	-	-	-	-	-	-	-
MP 14	Canopy	*Angophora costata* (Smooth-barked Apple), *Eucalyptus eugenioides* (Thin-leaved Stringybark), *E. microcorys* (Tallowwood), and *E. paniculata* subsp. *paniculata* (Grey Ironbark)	35%	40%	40%	40%	40%	40%	40%	40%	40%	40%
	Midstorey	*Allocasuarina torulosa* (Forest Oak), *Callistemon salignus* (Willow Bottlebrush) and *Glochidion ferdinandi* (Cheese Tree)	25%	25%	25%	25%	25%	25%	25%	25%	20%	25%
	Shrub	*Leucopogon juniperinus* (Prickly Beard-heath), *Pultenaea villosa* (Hairy Bush-pea), *Leptospermum polygalifolium* (Tantoon) and *Hibbertia aspera* (Rough Guinea Flower)	10%	15%	15%	15%	15%	15%	15%	15%	15%	15%
	Ground (grass)	*Themeda triandra* (Kangaroo Grass), *Poa labillardierei* (Tussock) and *Entolasia stricta* (Wiry Panic)	80%	80%	80%	80%	80%	80%	75%	75%	75%	75%
	Ground (other)	*Lomandra longifolia* (Spiny-headed Mat-rush), *Doryanthes excelsa* (Gymea Lily) and *Brunoniella pumilio* (Dwarf Blue Trumpet)	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
	Exotic	*Setaria sphacelata* (South African Pigeon Grass)	5%	5%	5%	5%	2%	2%	1%	1%	2%	2%
MP 15	Canopy	*Eucalyptus pilularis* (Blackbutt), *Angophora costata* (Smooth-barked Apple), *Corymbia gummifera* (Red Bloodwood) and *E. microcorys* (Tallowwood)	45%	45%	45%	45%	45%	45%	40%	40%	45%	50%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)									
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Midstorey	*Allocasuarina torulosa* (Forest She-oak) and *Acacia irrorata* (Green Wattle)	20%	20%	15%	15%	15%	15%	10%	10%	10%	10%
	Shrub	*Hibbertia vestita* (Hairy Guinea Flower), *Breynia oblongifolia* (Coffee Bush) and *Phyllanthus gunnii* (Scrubby Spurge)	10%	10%	10%	10%	10%	10%	15%	15%	10%	10%
	Ground (grass)	*Themeda triandra* (Kangaroo Grass), *Entolasia stricta* (Wiry Panic) and *Imperata cylindrica* (Blady Grass)	30%	30%	30%	30%	25%	25%	25%	25%	25%	30%
	Ground (other)	*Doryanthes excelsa* (Gymea Lily), *Lomandra longifolia* (Spiny-headed Mat-rush), *Pteridium esculentum* (Common Bracken), *Lepidosperma laterale* and *Xanthorrhoea macronema*	60%	60%	60%	60%	50%	50%	55%	55%	55%	60%
	Exotic	*Lantana camara* (Lantana)	5%	5%	1%	1%	1%	1%	1%	1%	1%	1%
MP 16	Canopy	*Eucalyptus pilularis* (Blackbutt), *E. propinqua* (Small-fruited Grey Gum), *E. microcorys* (Tallowwood) and *Angophora costata* (Smooth-barked Apple)	50%	50%	50%	50%	50%	50%	50%	50%	50%	45%
	Midstorey	*Allocasuarina torulosa* (Forest Oak), *Syncarpia glomulifera* (Turpentine) and *Glochidion ferdinandi var. ferdinandi* (Cheese Tree)	30%	30%	30%	30%	30%	30%	35%	30%	25%	30%
	Shrub	*Leucopogon juniperinus* (Prickly Beard-heath) and *Acacia floribunda* (White Sally Wattle)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
	Ground (grass)	*Poa labillardierei* (Tussock), *Imperata cylindrica* (Blady Grass), and *Oplismenus imbecillis* (Creeping Beard Grass)	50%	50%	40%	40%	30%	25%	25%	25%	25%	30%
	Ground (other)	*Carex appressa* (Tall Sedge), *Doodia aspera* (Prickly Rasp Fern), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Calochlaena dubia* (Rainbow Fern)	30%	30%	40%	40%	30%	20%	35%	25%	30%	30%
	Exotic	*Lantana camara* (Lantana)	30%	30%	30%	40%	30%	30%	30%	30%	30%	25%
MP 17	Canopy	*Eucalyptus pilularis* (Blackbutt), *E. microcorys* (Tallowwood), *Syncarpia glomulifera* (Turpentine), *E. acmenoides* (White Mahogany) and *E. propinqua* (Small-fruited Grey Gum)	40%	40%	40%	40%	40%	45%	45%	45%	45%	40%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)									
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Midstorey	*Backhousia myrtifolia* (Grey Myrtle), *Lophostemon confertus* (Brush Box), *Livistona australis* (Cabbage Palm), *Acmena smithii* (Lilly Pilly) and *Allocasuarina torulosa* (Forest Oak)	50%	50%	50%	50%	50%	50%	55%	55%	40%	45%
	Shrub	*Wilkiea huegeliana* (Veiny Wilkiea), *Acacia maidenii* (Maiden's Wattle), *Eupomatia laurina* (Bolwarra) and *Pittosporum multiflorum* (Orange Thorn)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	Ground (grass)	*Poa labillardierei* (Tussock), *Themeda triandra* (Kangaroo Grass) *Entolasia marginata* (Bordered Panic) and *Oplismenus imbecillis* (Creeping Beard Grass).	40%	40%	40%	40%	40%	25%	20%	20%	20%	15%
	Ground (other)	*Doodia aspera* (Prickly Rasp Fern), *Lomandra longifolia* (Spiny-headed Mat-rush), *Gymnostachys anceps* (Settlers' Twine) and *Calochlaena dubia* (Rainbow Fern)	50%	50%	50%	50%	50%	65%	65%	60%	60%	55%
	Exotic	*Lantana camara* (Lantana)	10%	15%	15%	15%	15%	15%	15%	5%	5%	10%
MP 18	Canopy	*Eucalyptus saligna* (Sydney Blue Gum), *E. microcorys* (Tallowwood), *Syncarpia glomulifera* (Turpentine), and *E. acmenoides* (White Mahogany)	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
	Midstorey	*Lophostemon confertus* (Brush Box), *Backhousia myrtifolia* (Grey Myrtle), *Cryptocarya glaucescens* (Jackwood), *Allocasuarina torulosa* (Forest Oak) and *Acacia irrorata* (Green Wattle)	25%	25%	25%	25%	25%	25%	25%	30%	30%	30%
	Shrub	*Acacia maidenii* (Maiden's Wattle) and *Denhamia silvestris* (Narrow-leaved Orangebark), *Persoonia linearis* (Narrow-leaved Geebung)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	Ground (grass)	*Poa labillardierei* (Tussock), *Imperata cylindrica* (Blady Grass), and *Oplismenus imbecillis* (Creeping Beard Grass)	50%	50%	50%	50%	40%	15%	20%	20%	20%	20%
	Ground (other)	*Doodia aspera* (Prickly Rasp Fern), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Gymnostachys anceps* (Settlers' Twine)	50%	50%	50%	50%	40%	30%	35%	50%	50%	50%
	Exotic	*Lantana camara* (Lantana)	10%	15%	15%	15%	15%	15%	15%	10%	15%	15%

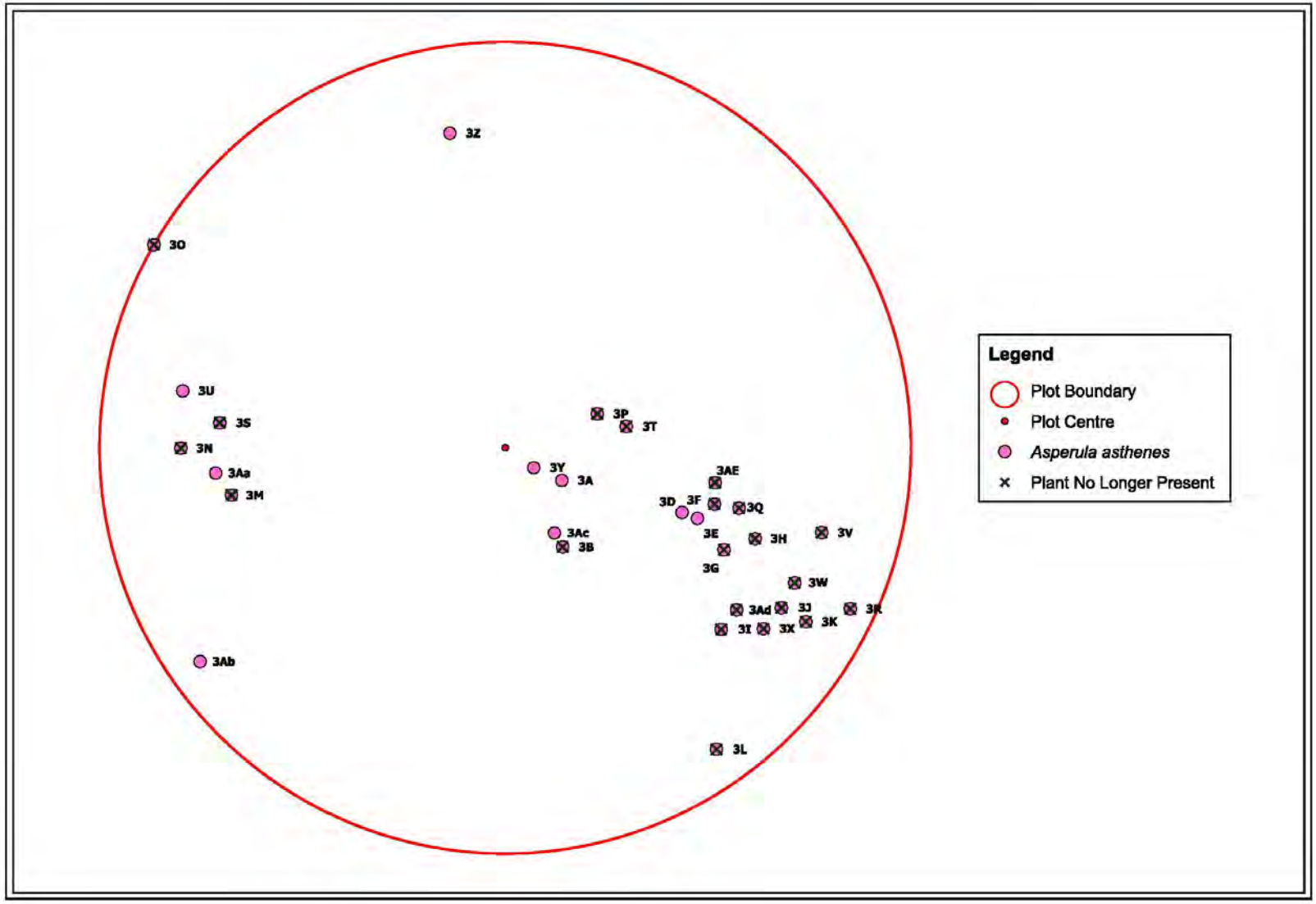
APPENDIX C. THREATENED FLORA MONITORING RESULTS

Biodiversity Offset Area Monitoring Sites

Monitoring Point 3: Asperula asthenes monitoring results

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
3A	160	140	30 x 25	70 x 40	10 x 5	30 x 10	-	-	-	-	60x40	30x30		
3B	280	150	20 x 25	-	5 x 5	-	-	-	60 x 60	70x70	50x40	-		
3C	160	120	40 x 30	40 x 30	170 x 90	200 x 50	110 x 110	110x110	130 x 100	-	-	-		
3D	460	110	50 x 20	30 x 20	-	-	-	-	10 x 20	-	-	20x10		
3E	500	110	55 x 30	30 x 30	45 x 40	5 x 5	-	-	10 x 10	40x40	40x5	30x5		
3F	530	105	50 x 10	30 x 30	60 x 20	60 x 20	80 x 60	100x60	100 x 60	100x60	-	-		
3G	590	115	25 x 35	25 x 40	170 x 80	-	10 x 5	10x5	20 x 20	20x20	5x5	-		
3H	650	110	20 x 20	40 x 20	-	100 x 100	60 x 40	20x40	60 x 40	-	-	-		
3I	690	130	40 x 25	30 x 20	-	-	-	-	-	-	-	-		
3J	780	120	35 x 20	20 x 20	-	80 x 50	-	-	-	-	-	-		
3K	850	120	30 x 30	30 x 30	60 x 15	-	10 x 5	-	30 x 10	-	-	-		
3L	900	145	35 x 45	20 x 10	-	-	-	10x10	-	-	-	-		
3M	680	260	40 x 35	40 x 35	25 x 30	40 x 20	60 x 40	40x2	20 x 5	-	-	-		
3N	790	270	30 x 25	30 x 20	-	-	120 x 50	20x6	10 x 10	10x10	-	-		
3O	990	300	55 x 25	-	-	20 x 5	-	50x30	-	-	-	-		
3P	240	90	40 x 20	40 x 15	40 x 15	40 x 20	150 x 90	-	-	-	-	-		
3Q	590	105	-	40 x 10	-	-	-	50x30	40 x 10	-	-	-		
3R	930	115	-	30 x 30	-	-	-	-	-	-	-	-		

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
3S	700	275	-	20 x 30	5 x 5	-	-	-	20 x 20	30x40	-	-		
3T	300	80	-	-	5 x 25	-	-	-	-	-	-	-		
3U	800	280	-	-	30 x 20	50 x 20	30 x 30	30x30	50 x 20	100x30	40x60	20x15		
3V	800	105	-	-	-	5 x 5	-	-	-	-	-	-		
3W	780	115	-	-	-	80 x 50	80 x 30	40x30	10 x 40	10x10	2x2	-		
3X	770	125	-	-	-	5 x 5	-	-	-	-	-	-		
3Y	85	125	-	-	-	-	40 x 60	30x10	-	100x70	20x20	20x15		
3Z	780	280	-	-	-	-	-	20x20	-	-	-	50x20	3FL	
3AA	710	265	-	-	-	-	-	10x10	30 x 30	25x10	55x30	45x30		
3AB	910	235	-	-	-	-	-	30x30	60 x 30	100x80	80x40	40x10	1FL	
3AC	290	160	-	-	-	-	-	-	30 x 30	30x30	35x30	30X30		
3AD	910	235	-	-	-	-	-	-	40 x 40	40x40	-	-		
3AE	520	100	-	-	-	-	-	-	-	5x5	25x20	-		



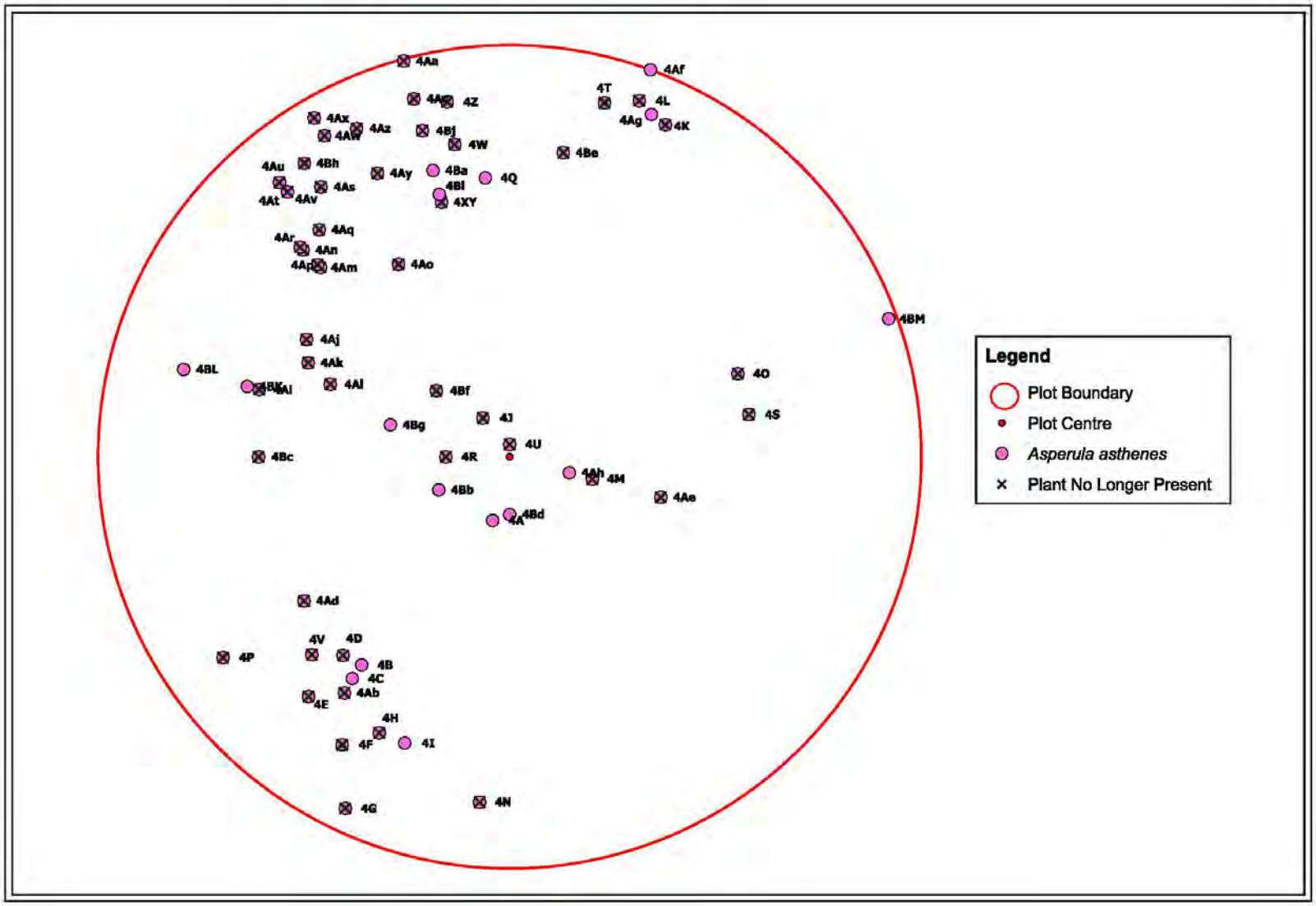
Monitoring Point 3 Asperula asthenes monitoring results 2024

Monitoring Point 4: Asperula asthenes monitoring results

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits
4A	160	195	30 x 20	30 x 20	5 x 5	-	-	-	30 x 20	25x 5	20x10	33X10		
4B	620	215	55 x 20	45 x 25	-	20 x 10	-	-	30 x 30	30 x 20	-	44X15		
4C	660	215	30 x 15	30 x 30	-	5 x 5	-	10x5	100 x 30	100 x 40	40x40	20X20		
4D	630	220	20 x 20	20 x 20	-	20 x 10	45 x 45	45x45	-	-	-	-		
4E	760	220	65 x 20	40 x 20	10 x 5	-	10 x 5	10x5	-	-	-	-		
4F	810	210	70 x 45	70 x 40	10 x 5	-	-	-	-	-	-	-		
4G	940	205	40 x 15	50 x 10	30 x 10	5 x 10	70 x 50	40x40	20 x 20	15 x 15	-	-		
4H	740	205	50 x 30	50 x 30	20 x 10	40 x 30	50 x 40	50x40	10 x 10	-	-	-		
4I	740	200	80 x 15	60 x 40	-	5 x 10	-	-	-	-	-	45X20		
4J	110	325	80 x 30	60 x 30	70 x 10	10 x 70	100 x 80	40x20	-	-	-	-		
4K	890	25	30 x 30	40 x 30	60 x 60	-	-	-	-	-	-	-		
4L	920	20	55 x 35	50 x 25	50 x 30	5 x 3	-	-	-	-	-	-		
4M	210	105	115 x 30	90 x 40	90 x 10	-	-	-	10 x 10	-	-	-		
4N	840	185	110 x 30	100 x 40	50 x 10	40 x 30	40 x 25	15x10	5 x 5	20 x 30	-	-		
4O	590	70	40 x 25	50 x 50	80 x 5	-	-	.-	-	-	-	-		
4P	850	235	-	20 x 20	40 x 2	-	-	-	-	-	-	-		
4Q	680	355	-	20 x 30	180 x 80	60 x 20	50 x 20	5x5	-	-	40x10	20X10		
4R	155	270	-	-	20 x 5	50 x 10	100 x 40	20x10	-	-	-	-		
4S	590	80	-	-	10 x 15	-	-	-	-	-	-	-		
4T	890	15	-	-	10 x 5	-	10 x 5	10x5	20 x 5	-	-	-		
4U	30	0	-	-	20 x 10	-	-		-	-	-	-		
4V	680	225	-	-	80 x 50	-	-		10 x 10	-	-	-		

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits
4W	770	350	-	-	-	20 x 5	50 x 40	20x5	30 x 50	-	-	-		
4X	640	345	-	-	-	50 x 20	80 x 60	15x5	30 x 15	-	-	-		
4Y	600	345	-	-	-	50 x 20	-	30x15	-	-	-	-		
4Z	875	350	-	-	-	30 x 5	70 x 30	30x10	-	-	-	-		
4Aa	995	345	-	-	-	10 x 10	80 x 50	10x10	30 x 10	-	-	-		
4Ab	700	215	-	-	-	10 x 5	-	-	-	-	-	-		
4Ac	900	345	-	-	-	-	10 x 5	10x5	20 x 20	-	-	-		
4Ad	610	235	-	-	-	-	35 x 20	-	-	-	-	-		
4Ae	380	105	-	-	-	-	10 x 5	-	-	-	-	-		
4Af	1000	20	-	-	-	-	55 x 30	5x10	50 x 60	120 x 70	50x40	20X20		
4AG	900	22.5	-	-	-	-	-	20x5	-	50 x 40	45x30	30X15		
4AH	150	105	-	-	-	-	-	20x20	20 x 20	50 x 40	75x30	20X30		
4AI	470	292	-	-	-	-	-	55x30	-	-	-	-		
4AJ	570	300	-	-	-	-	-	20x20	5 x 5	5 x 5	-	-		
4AK	540	295	-	-	-	-	-	45x45	-	-	-	-		
4AL	630	285	-	-	-	-	-	50x30	-	-	-	-		
4AM	650	315	-	-	-	-	-	45x15	-	-	-	-		
4AN	710	315	-	-	-	-	-	210x15	-	-	-	-		
4AO	540	330	-	-	-	-	-	5x5	-	-	-	-		
4AP	660	315	-	-	-	-	-	30x30	-	-	-	-		
4AQ	720	320	-	-	-	-	-	10x5	-	-	-	-		
4AR	720	315	-	-	-	-	-	15x10	-	-	-	-		
4AS	800	325	-	-	-	-	-	5X10	-	-	-	-		

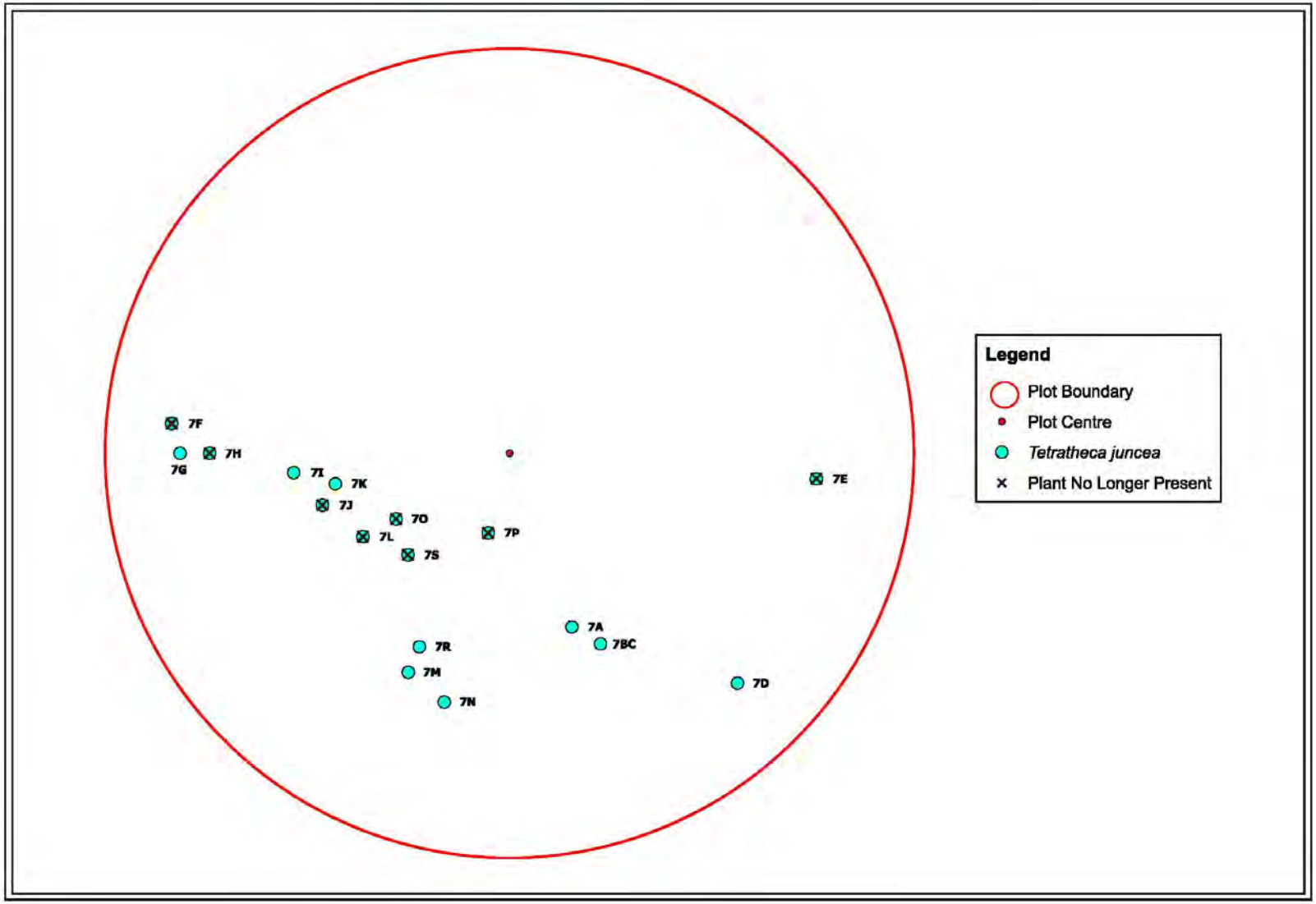
ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits
4AT	840	320	-	-	-	-	-	50X30	10 x 20	-	-	-		
4AU	870	320	-	-	-	-	-	30X45	10 x 10	-	-	-		
4AV	840	320	-	-	-	-	-	60X60	40 x 40	-	10x5	-		
4AW	900	330	-	-	-	-	-	5X5	5 x 5	-	-	-		
4AX	950	330	-	-	-	-	-	30X10	-	-	-	-		
4AY	760	335	-	-	-	-	-	40X30	40 x 40	-	-	-		
4AZ	880	335	-	-	-	-	-	40x20	20 x20	-	-	-		
4BA	720	345	-	-	-	-	-	10X10	-	-	5x5	5X5		
4BB	190	245	-	-	-	-	-	10X10	40 x 15	40 x 15	20x10	40X10	2FL	
4BC	610	270	-	-	-	-	-	50X10	-	-	-	-		
4BD	140	180	-	-	-	-	-	-	10 x 10	10 x 10	26x15	20X15	1FL	
4BE	750	10	-	-	-	-	-	-	10 x 30	40 x 10	-	-		
4BF	240	312	-	-	-	-	-	-	20 x 20	-	-	-		
4BG	285	295	-	-	-	-	-	-	10 x 5	10 x 10	28x15	20X10		
4BH	300	285	-	-	-	-	-	-	5 x 5	5 x 5	5x5	-		
4BI	790	325	-	-	-	-	-	-	20 x 10	30 x 30	70x60	30X30		
4BJ	870	325	-	-	-	-	-	-	10 x 15	-	-	-		
4BK	660	345	-	-	-	-	-	-	10 x 20	-	60x50	60X40		
4BL	820	345	-	-	-	-	-		10 x 10	-	20x10	20X10		
4BM	980	20	-	-	-	-	-	-	-	-	50x40	60X40		



Monitoring Point 4 ***Asperula asthenes monitoring results 2024***

Monitoring Point 7 - Tetratheca juncea monitoring results

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present		Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits	
7A	480	160	70x40	60x40	60x50	10x60	70x40	20x30	25 x 30	80x40	80x50	91x100	38		
7B	470	155	5x 5	10x5	-	10x10	30x20	30x20	-	-	30x20	39x5	4		
7C	500	155	35x15	40x15	70x30	60x30	50x20	70x40	55 x 40	100x55	75x30	43x42	12		
7D	800	135	50x20	60x40	90x50	70x40	10x10	10x10	45 x 30	50x30	60x40	24x16	15		Very dusty but not yellowing
7E	730	95	60x50	90x40	100x70	100x50	110x80	30x60	30 x 60	45x10	-	-			
7F	800	275	60x10	70x20	20x5	-	40x30	40x20	20 x 20	-	-	-			
7G	780	270	40x40	40x40	60x20	-	130x80	100x65	60 x 15	105x30	65x30	95x40	7	2	
7H	710	270	50x10	50x10	90x20	100x50	70x80	50x20	60 x 5	-	-	-			
7I	510	265	30x10	30x10	20x5	-	20x5	20x5	20 x 25	40x10	35x10	40x5			
7J	460	255	40x20	40x30	90x30	100x50	90x60	80x60	70 x 40	55x20	40x5	-			
7K	420	260	70x45	80x40	70x70	100x80	120x85	120x60	60 x 40	90x90	105x80	80x105	41	2	
7L	400	240	45x10	50x10	55x10	20x10	25x10	25x10	-	-	-	-			
7M	570	205	110x70	110x70	110x80	60x20	80x130	30x10	15 x 5	40x15	30x20	15x5			New shoots, though many old dried ones
7N	610	195	45x35	45x35	35x50	80x30	40x25	20x10	25 x 20	40x10	15x10	30x5	2		many new shoots
7O	310	240	-	20x20	20x15	-	-	-	-	-	-	-			
7P	700	195	-	-	-	-	80x60	60x20	50 x 5	-	-	-			
7R	505	205	-	-	-	-	30x40	30x40	35 x 20	45x10	45x5	35x5	1		
7S	340	225	-	-	-	-	-	-	5 x 5	20x5	20x5	-			

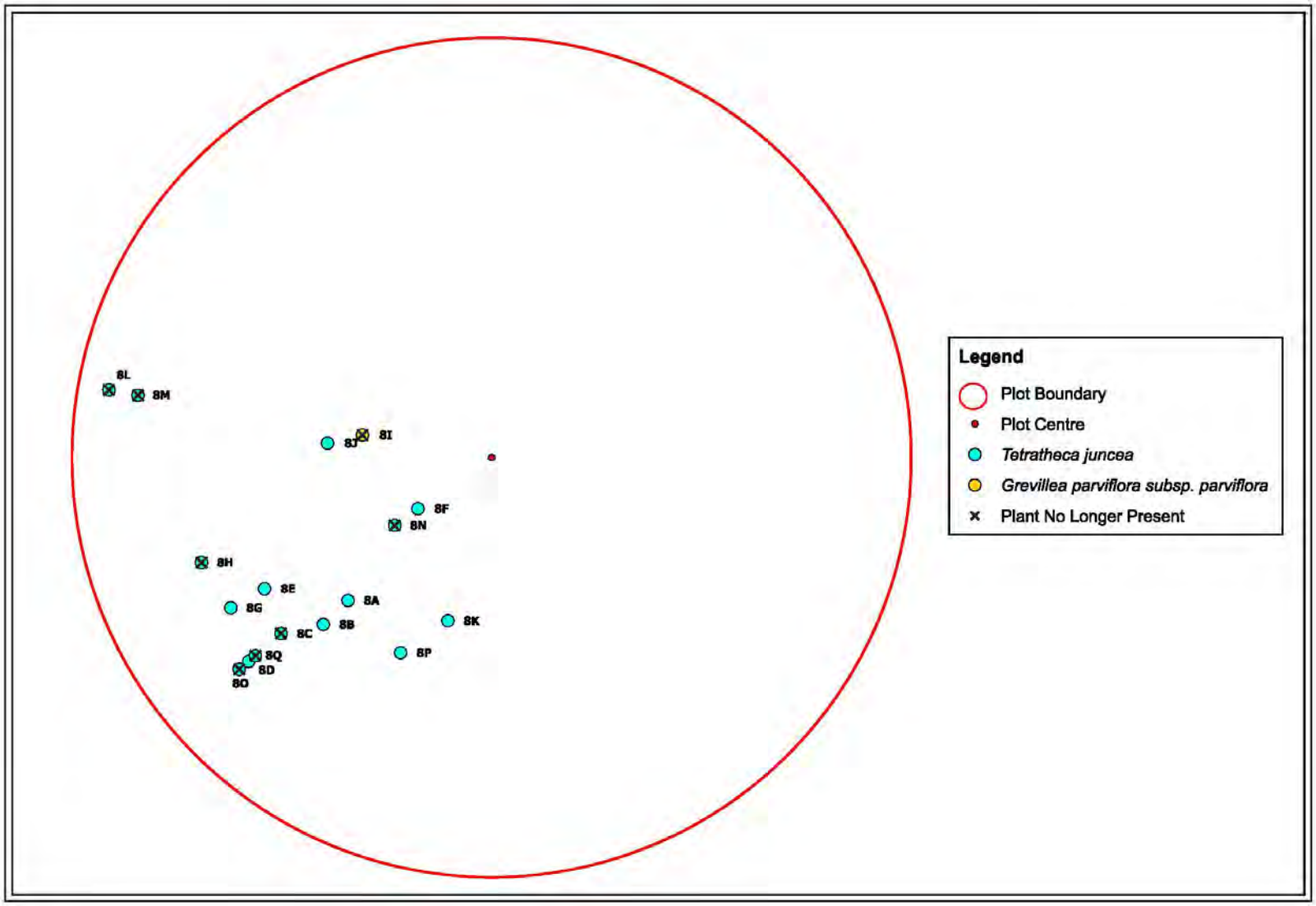


Monitoring Point 7 - Tetratheca juncea monitoring results 2024

Monitoring Point 8 – Tetratheca juncea and Grevillea parviflora monitoring results

ID	Species	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present		Comments
				2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits	
8A	*Tetratheca juncea*	210	235	110x70	110x80	130x80	80x110	110x50	60x30	30 x 30	90x50	70x40	100x80	38	16	healthy
8B	*Tetratheca juncea*	480	225	40x 30	60x 30	90x 20	80x 20	50x 50	60x60	-	80x10	55x40	30x5	2	0	
8C	*Tetratheca juncea*	560	225	120x110	120x100	-	-	-	-	-	-	-	-			
8D	*Tetratheca juncea*	650	230	110x110	110x110	120x60	45x 10	30x5	60x60	45 x 30	60x45	90x40	110x80	20	2	
8E	*Tetratheca juncea*	750	230	65x30	65x30	40x80	60x30	50x 20	40x20	25 x 5	60x40	70x55	80x40	2	0	
8F	*Tetratheca juncea*	620	240	80x30	90x30	120x50	120x40	60x 30	20x10	30 x 10	65x55	65x70	110x60	12	0	8F and 8G starting to form one clump
8G	*Tetratheca juncea*	710	240	100x50	100x50	80x50	100x50	-	-	5 x 5	-	85x70	110x70	45		
8H	*Tetratheca juncea*	730	250	60x50	60x50	100x40	-	90x 30	90x30	-	-	-	-			
8I	*Grevillea parviflora subsp. parviflora*	310	280	30	30	30	70	60	60x70	-	-	-	-			
8J	*Tetratheca juncea*	390	275	50x 10	50x 10	65x 10	60x 20	60x20	30x20	25 x 15	30x10	45x5	45x5	1	0	yellowing
8K	*Tetratheca juncea*	400	195	60x20	60x20	90x90	170x50	130x60	130x100	75 x 40	105x120	120x80	100x10	6	0	new shoots
8L	*Tetratheca juncea*	920	280	-	-	70x 70	70x 80	100x90	100x30	40 x 5	-	-	-			
8M	*Tetratheca juncea*	850	280	-	-	-	40x20	-	20x10	20 x 5	-	-	-			
8N	*Tetratheca juncea*	280	235	-	-	-	-	50x 20	20x10	20 x 5	40x5	-	-			
8O	*Tetratheca juncea*	780	230	-	-	-	-	-	50x40	25 x 15	-	-	-			

ID	Species	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present		Comments
				2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits	
8P	*Tetratheca juncea*	510	205	-	-	-	-	-	100x40	60 x 40	90x70	90x90	200x30	3		New shoots
8Q	*Tetratheca juncea*	730	230	-	-	-	-	-	-	5 x 10	-	-	-	-		



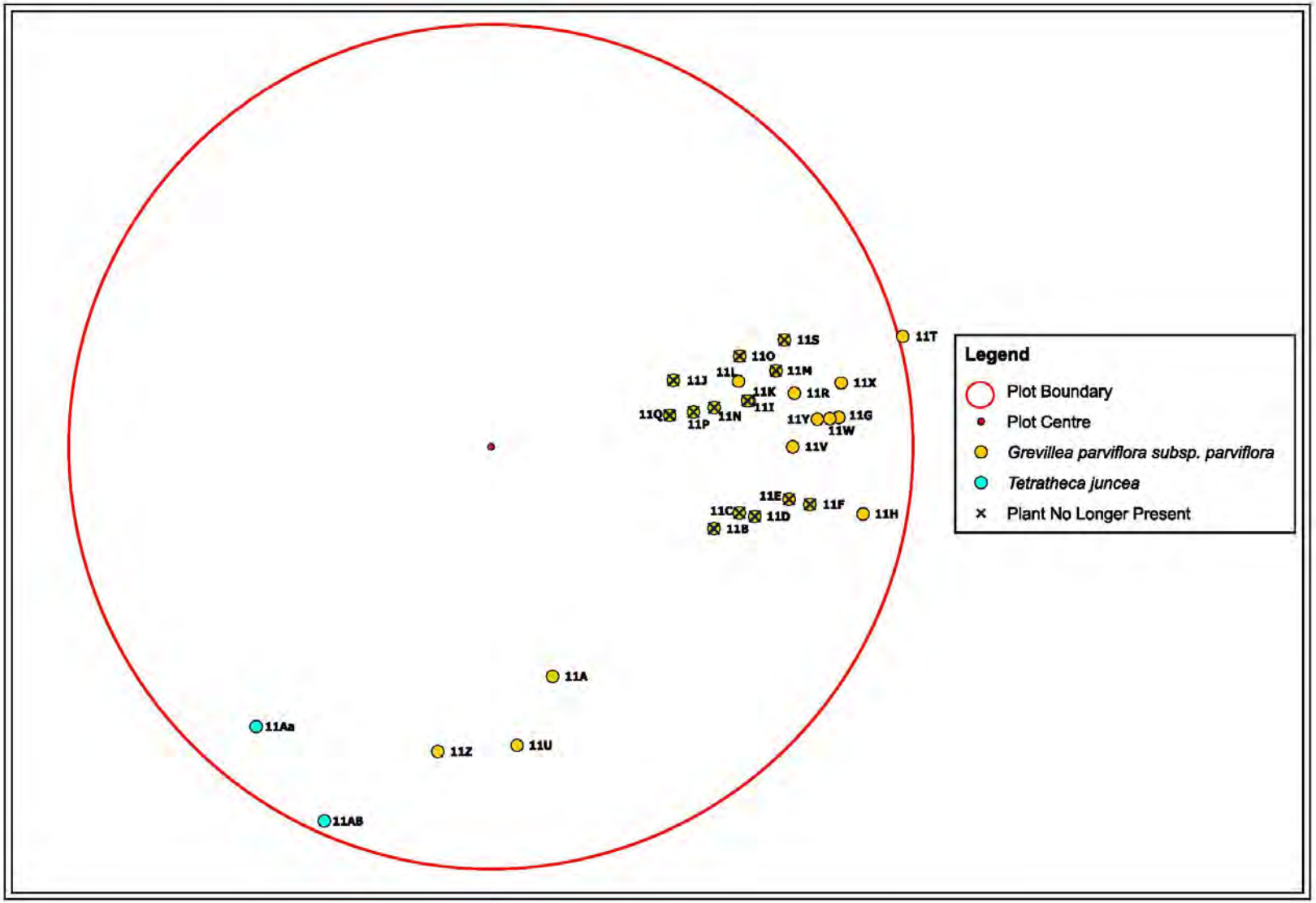
Monitoring Point 8 – *Tetratheca juncea* and *Grevillea parviflora* monitoring results 2024

Monitoring Point 11 - Grevillea parviflora monitoring results

ID	Species	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present		Comments
				2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits	
11A	*Grevillea parviflora subsp. parviflora*	560	165	90	90	50	45	60	60	-	-	76	71			stem dying back
11B	*Grevillea parviflora subsp. parviflora*	565	110	20	45	-	-	-	18	-	-	-	-			
11C	*Grevillea parviflora subsp. parviflora*	610	105	55	-	-	-	-	-	-	-	-	-			
11D	*Grevillea parviflora subsp. parviflora*	650	105	100	65	-	-	-	-	-	-	-	-			
11E	*Grevillea parviflora subsp. parviflora*	720	100	75	75	41	-	-	-	-	-	-	-			
11F	*Grevillea parviflora subsp. parviflora*	770	100	20	10	-	-	-	-	-	-	-	-			
11G	*Grevillea parviflora subsp. parviflora*	830	85	110	110	80	100	90	95	90	91	75	75			
11H	*Grevillea parviflora subsp. parviflora*	900	100	60	60	30	65	70	80	70	60	60	66	2		healthy
11I	*Grevillea parviflora subsp. parviflora*	620	80	50	50	60	60	55	55	-	-	-	-			
11J	*Grevillea parviflora subsp. parviflora*	460	70	45	35	40	-	-	-	-	-	-	-			
11K	*Grevillea parviflora subsp. parviflora*	620	80	40	40	40	40	-	-	-	-	-	-			
11L	*Grevillea parviflora subsp. parviflora*	610	75	45	55	55	65	65	70	70	62	67	65			
11M	*Grevillea parviflora subsp. parviflora*	700	75	65	70	65	75	80	-	-	-	-	-			

ID	Species	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present		Comments
				2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits	
11N	*Grevillea parviflora subsp. parviflora*	540	80	35	40	45	45	40	-	-	-	-	-			
11O	*Grevillea parviflora subsp. parviflora*	630	70	20	30	-	-	-	-	-	-	-	-			
11P	*Grevillea parviflora subsp. parviflora*	490	80	45	70	50	30	30	30	-	-	-	-			
11Q	*Grevillea parviflora subsp. parviflora*	430	80	-	20	60	-	-	-	-	-	-	-			
11R	*Grevillea parviflora subsp. parviflora*	730	80	-	-	-	65	65	40	30	62	78	76	2		stems dying
11S	*Grevillea parviflora subsp. parviflora*	740	70	-	-	-	-	20	20	-	-	-	-			
11T	*Grevillea parviflora subsp. parviflora*	1010	75	-	-	-	-	80	95	95	77	73	61			die back
11U	*Grevillea parviflora subsp. parviflora*	710	175	-	-	-	-	40	37	-	-	-	39			healthy
11V	*Grevillea parviflora subsp. parviflora*	715	90	-	-	-	-	-	55	60	80	-	85	5		
11W	*Grevillea parviflora subsp. parviflora*	800	85	-	-	-	-	-	65	60	62	65	70			healthy
11X	*Grevillea parviflora subsp. parviflora*	840	80	-	-	-	-	-	60	85	91	95	85	7		
11Y	*Grevillea parviflora subsp. parviflora*	770	85	-	-	-	-	-	25	55	-	41	44			okay
11Z	*Grevillea parviflora subsp. parviflora*	720	190	-	-	-	-	-	55	55	65	70	67	1		
11AA	*Tetratheca juncea*	865	220	-	-	-	-	-	75x50	80 x 50	110x80	90x90	90x110	162	56	

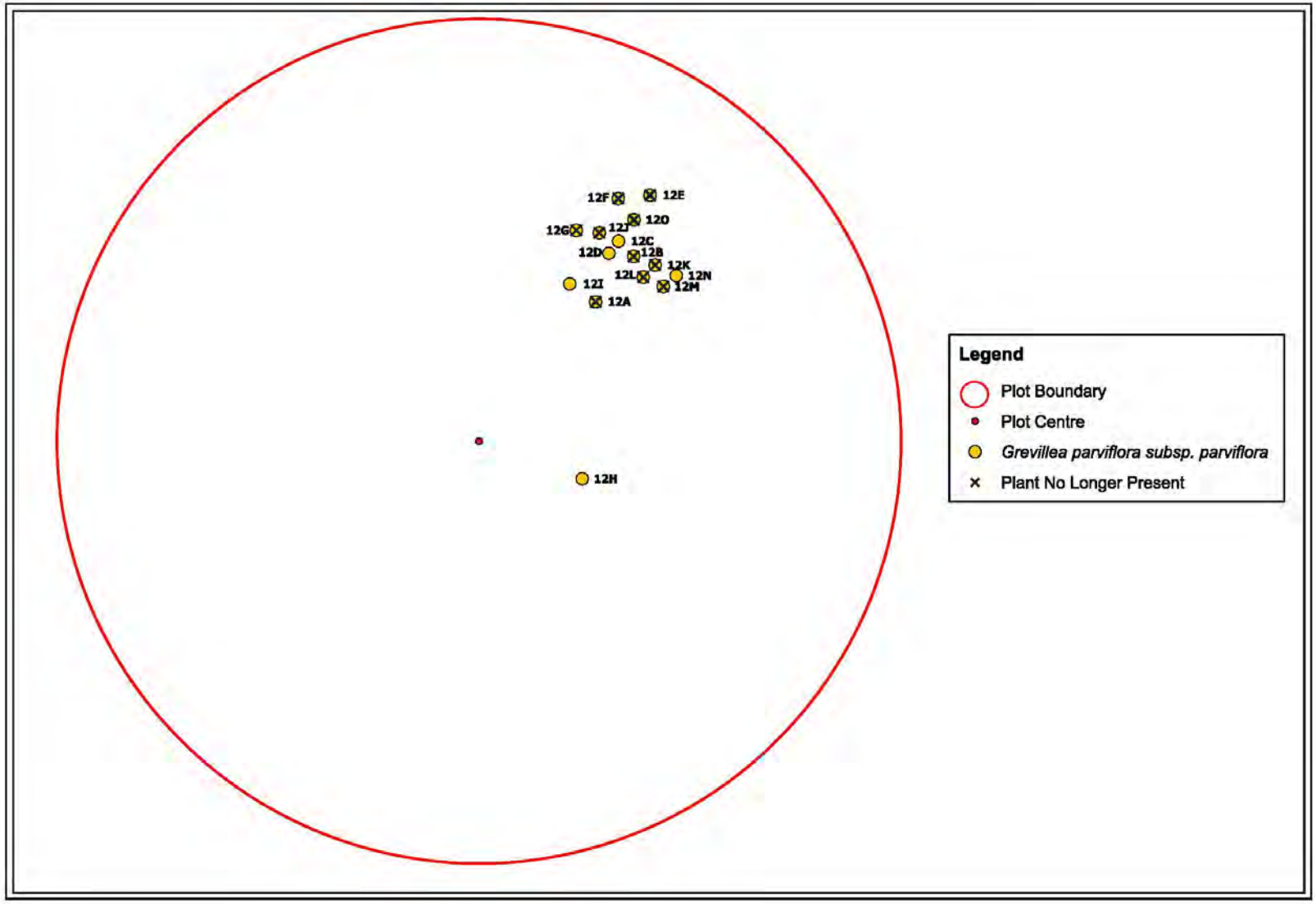
ID	Species	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present		Comments
				2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits	
11AB	*Tetratheca juncea*	970	246										60x70	55		First detected 24/09/24



Monitoring Point 11 - *Grevillea parviflora* and *Tetratheca juncea* monitoring results 2024

Monitoring Point 12 - Grevillea parviflora monitoring results

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
12A	430	40	80	80	80	50	-	-	-	-	-	-		
12B	570	40	80	90	60	25	50	55	75	93	100	-		
12C	580	35	65	70	-	50	45	55	50	50	60	65	6FL, NO FRUIT	
12D	540	35	20	25	40	30	-	70	100	113	115	120	10FL, 2FR	
12E	710	35	25	30	-	-	-	-	-	-	-	-		
12F	660	30	25	25	-	-	-	-	-	-	-	-		
12G	550	25	50	50	40	10	-	-	-	-	-	-		
12H	260	110	-	25	55	70	78	78	30	53	61	72		
12I	430	30	-	-	-	50	60	60	70	88	130	140	57FL, NO FRUIT	
12J	570	30	-	-	-	25	-	-	-	-	-	-		
12K	590	45	-	-	-	60	50	70	-	-	-	-		
12L	550	45	-	-	-	30	50	60	-	-	-	-		
12M	570	50	-	-	-	55	65	75	-	-	-	-		
12N	610	50	-	-	-	-	40	60	15	42	45	61	1FL	
12O	640	35	-	-	-	-	-	-	20	30	29	-		

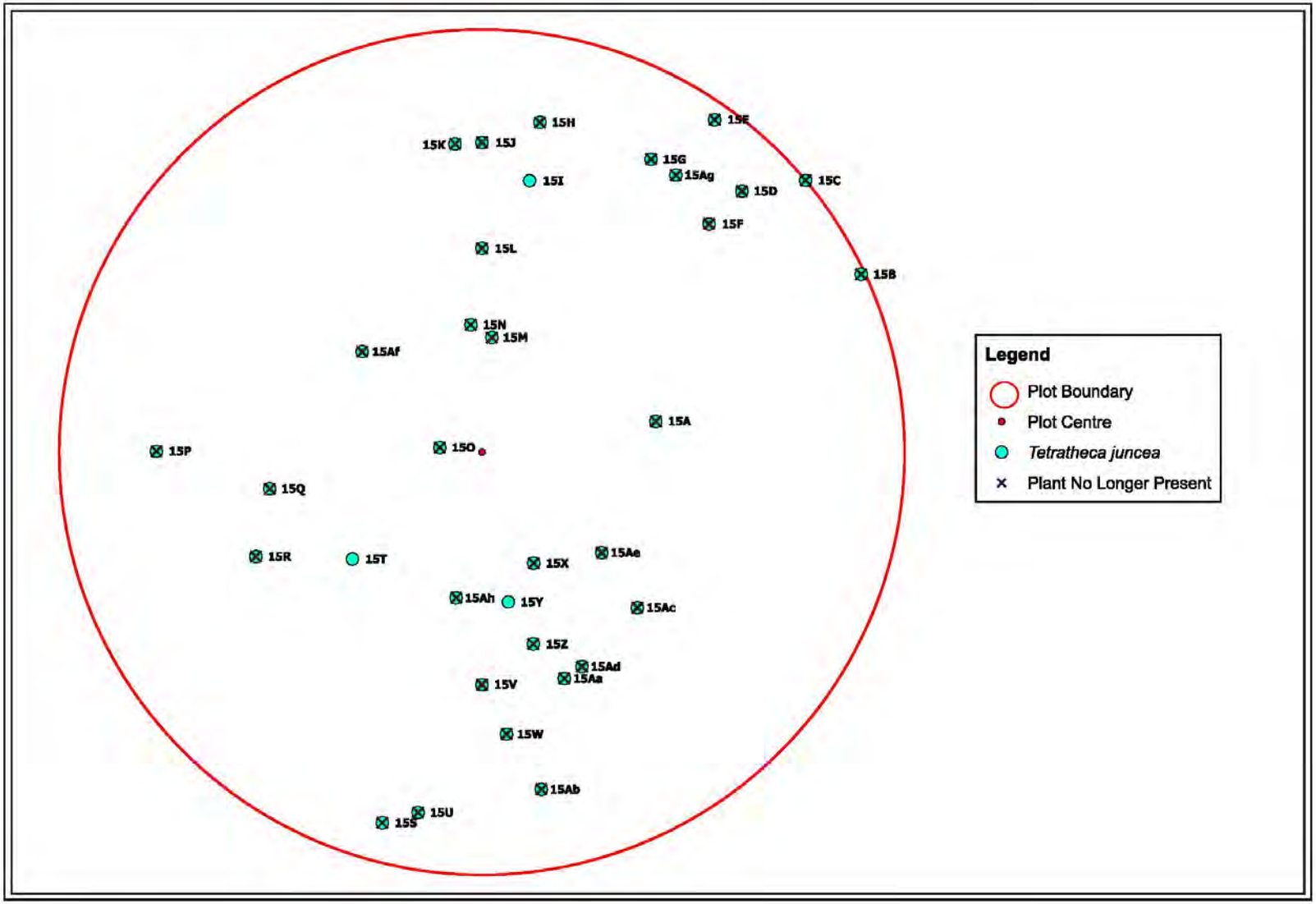


Monitoring Point 12 - *Grevillea parviflora* monitoring results 2024

Monitoring Point 15 - Tetratheca juncea monitoring results

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present		Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits	
15A	420	80	20 x 10	30 x 10	-	-	-	-	-	-	-	-			
15B	990	65	5 x 5	10 x 5	-	-	-	-	-	-	-	-			
15C	1000	50	50 x 50	60 x 40	100 x 30	-	-	-	50x30	-	-	-			
15D	870	45	40 x 40	40 x 40	65 x 20	-	-	-	-	-	-	-			
15E	960	40	75 x 20	80 x 20	90 x 20	-	40x20	40x30	30x30	-	-	-			
15F	780	45	30 x 15	40 x 15	40 x15	30x40	30x20	-	-	-	-	-			
15G	800	35	40 x 25	50 x 25	40 x 20	-	-	-	-	-	-	-			
15H	790	10	5 x 5	10 x 5	-	-	-	-	-	-	-	-			
15I	620	10	60 x 30	60 x 30	-	-	-	-	-	-	-	20X10	1FL		
15J	730	0	20 x 30	40 x 20	40 x 10	-	-	-	-	-	-	-			
15K	730	355	50 x 20	40 x 20	-	-	-	-	-	-	-	-			
15L	480	0	30 x 10	30 x 10	15 x 10	30x20	40x20	30x20	20x30	60x10		-			
15M	270	5	40 x 10	50 x 10	-	50x20	40x30	-	-	-	-	-			
15N	300	355	40 x 10	40 x 10	50 x 10	-	-	-	-	-	-	-			
15O	100	275	20 x 5	20 x 40	-	-	-	-	-	-	-	-			
15P	770	270	60 x 20	50 x 30	50 x 30	40x10	40x10	40x20	40x10	-	-	-			
15Q	510	260	60 x 50	70 x 50	90 x 50	90x30	50x40	80x50	40x30	-	50x10	-			
15R	590	245	70 x 50	70 x 50	80 x 15	-	10x10	-	-	-	-	-			
15S	910	195	20 x 10	20 x 10	-	-	-	-	-	-	-	-			
15T	400	230	30 x 10	30 x 10	-	-	-	-	-	30x10	40x40	30X30	4FL		
15U	870	190	10 x 10	30 x 10	30 x 5	70x20	100x30	90x70	60x60	65x75	90x80	70X30	10FL, 2FR		

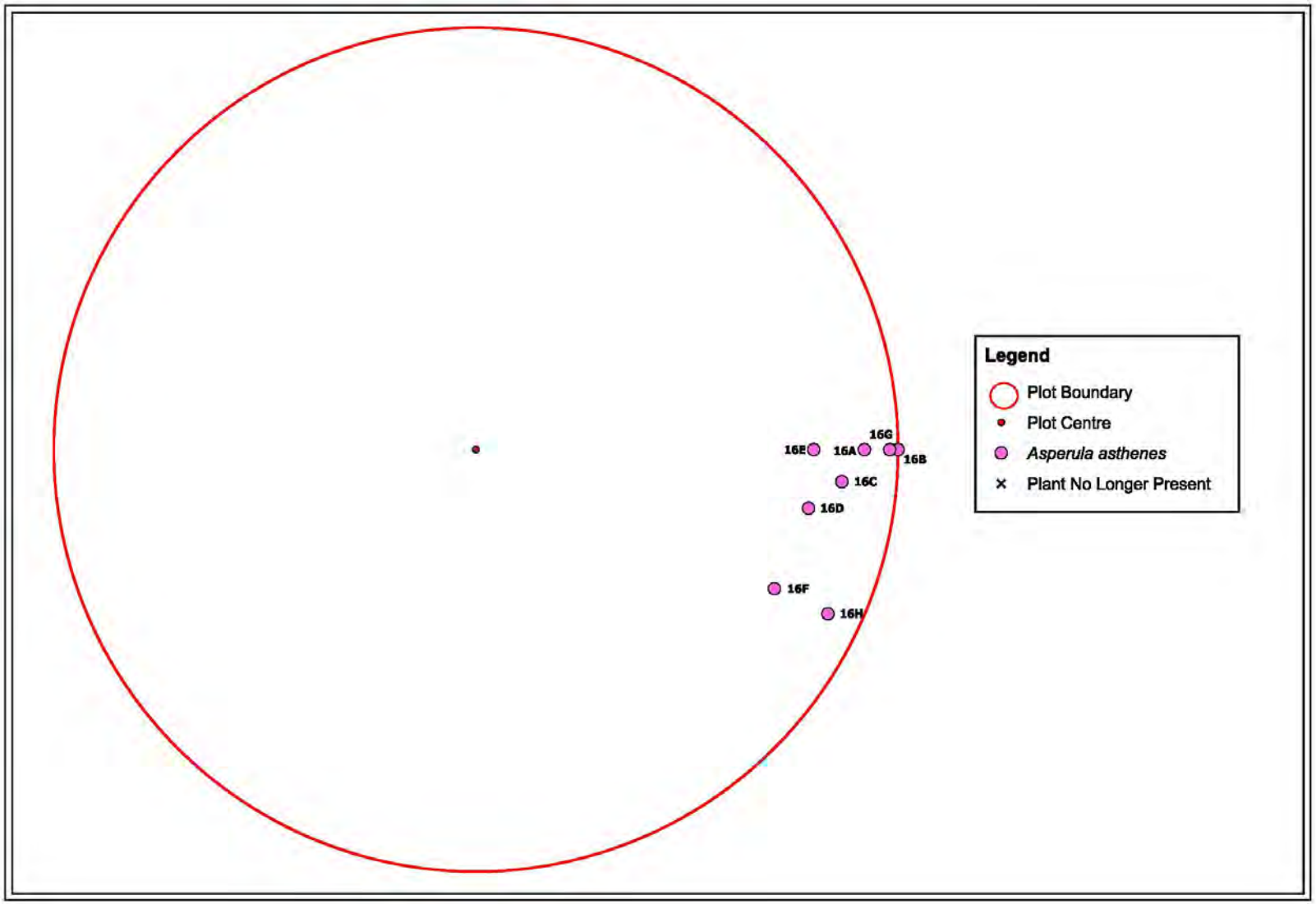
ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present		Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Flowers	Fruits	
15V	550	180	30 x 15	40 x 20	40 x 10	-	-	-	-	-	-	-			
15W	670	175	5 x 5	10 x 5	-	-	-	-	-	-	-	-			
15X	290	155	40 x 10	40 x 10	30 x 5	-	-	-	-	-	-	-			
15Y	360	170	5 x 5	30 x 5	-	20x5	-	-	15x5	20x10	55x30	40X30	5FL		
15Z	470	165	30 x 40	50 x 30	60 x 70	60x20	40x20	-	-	-	-	-			
15AA	570	170	25 x 20	50 x 20	20 x 50	80x20	40x40	-	-	-	-	-			
15AB	810	170	5 x 5	10 x 5	-	-	-	-	-	-	-	-			
15AC	520	135	40 x 10	50 x 15	15 x 50	40x30	60x10	50x30	30x20	50x30	-	-			
15AD	560	160	20 x 30	20 x 30	-	-	40x30	50x30	50x30	-	-	-			
15AE	370	130	-	20 x 10	-	-	-	-	-	-	-	-			
15AF	370	310	-	-	-	10x10	50x30	60x40	30x40	-	-	-			
15AG	800	35	-	-	-	-	-	20x20	2010	-	-	-			
15AH	350	190	-	-	-	-	-	-	50x40	75x80	45x40	-			
15AI	510	165	-	-	-	-	-	-	-	45x10	-	-			



Monitoring Point 15 - *Tetratheca juncea* monitoring results 2024

Monitoring Point 16 - Asperula asthenes monitoring results

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
16A	920	90	-	-	-	-	-	-	50 x 40	40x100	30x10	25X10	2/0	
16B	1000	90	-	-	-	-	-	-	60 x 50	60x50	15x10	15X10		
16C	870	95	-	-	-	-	-	-	30 x 60	40x50	10x5	10X10		
16D	920	100	-	-	-	-	-	-	40 x 40	30x30	30x5	10X15		
16E	800	90	-	-	-	-	-	-	20 x 30	50x30	30x20	25X10	2/0	
16F	780	115	-	-	-	-	-	-	60 x 50	70x60	30x5	20X10	1/0	
16G	980	90	-	-	-	-	-	-	-	-	-	30X10	6/0	First detected 25/09/2024
16H	920	115	-	-	-	-	-	-	-	-	-	10X10	5/0	First detected 25/09/2024

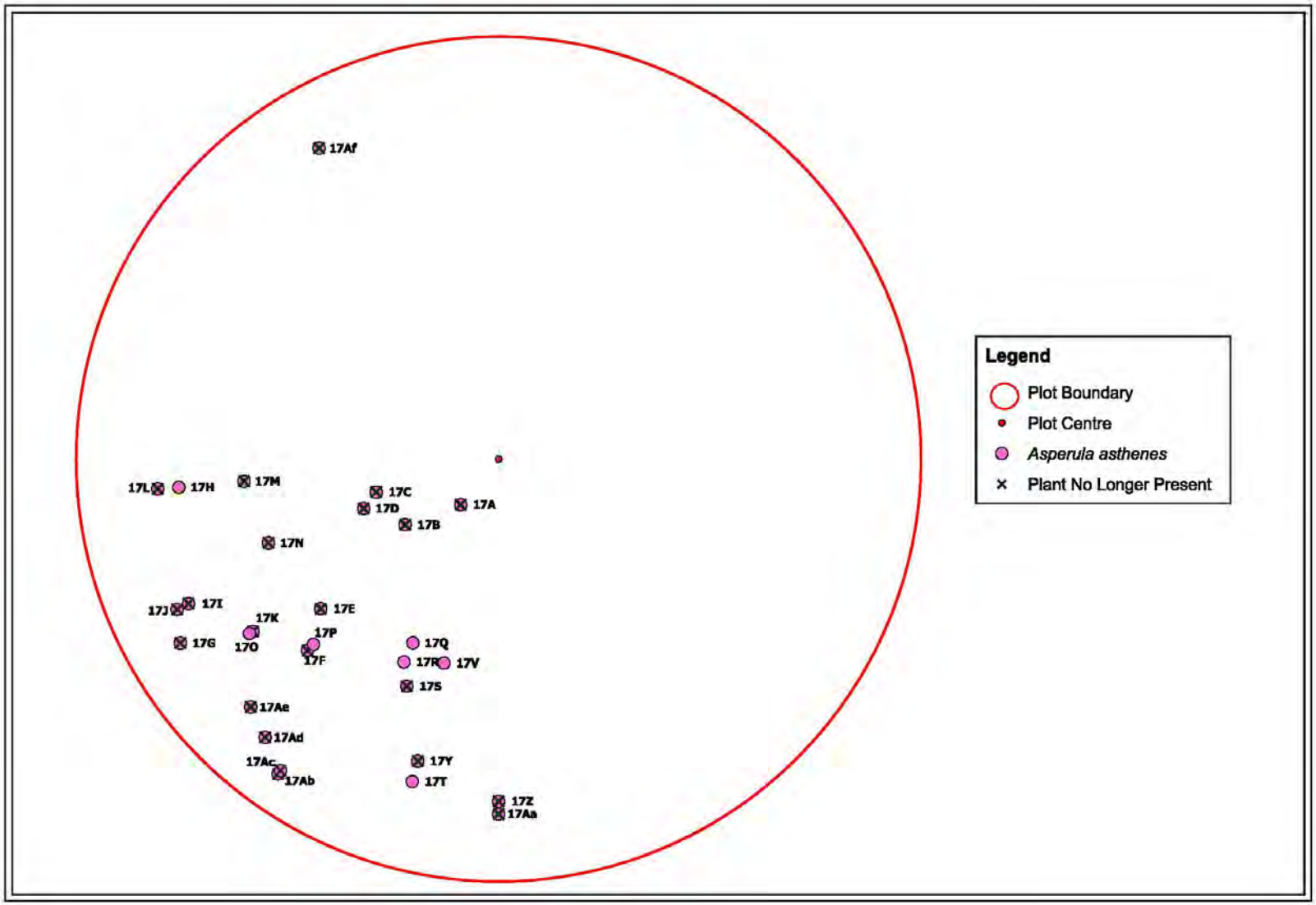


Monitoring Point 16 - *Asperula asthenes* monitoring results 2024

Monitoring Point 17 - Asperula asthenes monitoring results

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
17A	140	220	20 x 5	20 x 5	-	-	-	-	-	-	-	-		
17B	270	235	35 x 15	20 x 10	-	-	-	-	40 x 40	-	-	-		
17C	300	255	40 x 5	30 x 5	-	-	-	-	-	-	-	-		
17D	340	250	5 x 5	10 x 5	-	-	-	-	-	-	-	-		
17E	550	230	80 x 80	80 x 80	-	70x90	70x30	50x50	25 x 10	-	-	-		
17F	640	225	20 x 25	20 x 25	30 x 5	30x60	20x10	20x10	-	-	-	-		
17G	870	240	20 x 10	20 x 10	-	-	-	-	-	-	-	-		
17H	760	265	90 x 35	90 x 35	-	-	-	-	-	-	-	5X10		
17I	810	245	35 x 20	25 x 10	-	-	-	-	5 x 5	-	-	-		
17J	840	245	40 x 60	40 x 50	-	-	-	-	-	-	-	-		
17K	710	235	20 x 5	20 x 10	30 x 10	130x55	20x10	-	-	-	-	-		
17L	810	265	-	-	-	10x5	-	-	-	-	-	-		
17M	605	265	-	-	-	5x5	15x15	-	-	-	-	-		
17N	580	250	-	-	-	10x5	10x5	-	-	-	-	-		
17O	720	235	-	-	-	-	10x5	-	-	-	-	-		
17P	620	225	-	-	-	-	20x10	-	10 x 10	40x15	30x20	25X10	8FL	
17Q	480	205	-	-	-	-	-	35x10	15 x 10	20x20	60x40	65X40	17FL	
17R	530	205	-	-	-	-	-	30x20	-	-	40x30	60X40	5FL	
17S	580	220	-	-	-	-	-	30x10	-	-	-	-		
17T	490	195	-	-	-	-	-	40x30	30 x 20	30x20	40x20	30X10	1FL	
17V	500	195	-	-	-	-	-	5x5	-	-	-	5X10		

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
17W	760	215	-	-	-	-	-	5x10	-	-	-	-		
17X	740	210	-	-	-	-	-	20x20	-	-	-	-		
17Y	740	195	-	-	-	-	-	5x5	-	-	-	-		
17Z	810	180	-	-	-	-	-	10x10	50 x 40	-	-	-		
17AA	840	180	-	-	-	-	-	20x10	20 x 10	80x20	30x70	-		Washed away
17AB	910	215	-	-	-	-	-	10x5	40 x 30	40x30	15x20	-		Washed away
17AC	900	215	-	-	-	-	-	5x5	5 x 10	20x10	-	-		Washed away
17AD	860	220	-	-	-	-	-	10x5	-	-	-	-		
17AE	830	225	-	-	-	-	-	10x10	-	-	-	-		
17AF	850	330	-	-	-	-	-	10x5	-	-	-	-		

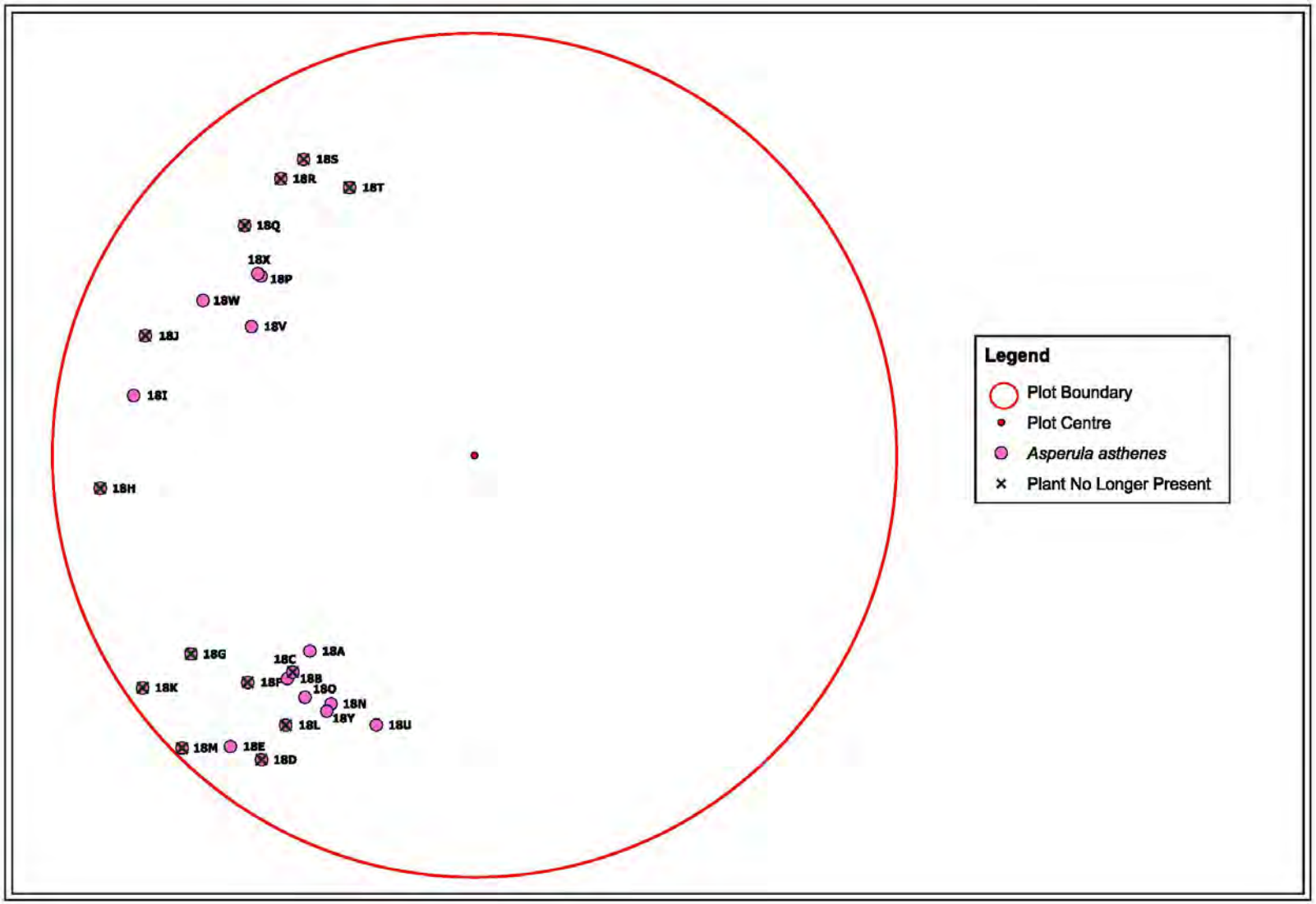


Monitoring Point 17 - *Asperula asthenes* monitoring results 2024

Monitoring point 18 - Asperula asthenes monitoring results

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
18A	610	220	40 x 30	40 x 30	-	-	-	-	30 x10	40x20	5x5	5x5		
18B	690	220	100 x 60	100 x 50	-	-	-	-	15 x 15	15x15	40x30	50x30		
18C	670	225	30 x 20	30 x 20	-	-	-	-	-	-	-	-		
18D	880	215	20 x 40	20 x 40	-	-	-	-	-	-	-	-		
18E	900	220	100 x 90	90 x 90	10 x 5	-	10 x 5	10 x5	5 x 10	20x20	5x3	15x5	2fl	
18F	760	225	70 x 80	70 x 90	-	-	-	-	-	-	-	-		
18G	820	235	70 x 30	70 x 40	10 x 5	-	-	-	-	-	-	-		
18H	890	265	5 x 10	20 x 10	-	-	-	-	-	-	-	-		
18I	820	280	30 x 40	30 x 30	-	-	-	-	-	45x20	70x40	40x30	3fl	
18J	830	290	55 x 30	50 x 30	5 x 5	-	5 x 5	1x1	-	-	-	-		
18K	960	235	50 x 10	40 x 15	-	-	-	5x5	-	-	-	-		
18L	780	215	10 x 10	20 x 20	-	-	-	-	-	-	-	-		
18M	980	225	30 x 10	20 x 10	-	-	-	-	-	-	-	-		
18N	680	210	-	-	40 x 10	60x10	75x50	70x70	60 x 50	40x40	40x40	30x30		
18O	700	215	-	-	-	70x16	30x20	30x30	25 x 40	40x20	50x30	30x10	2fl	
18P	660	310	-	-	-	10x26	45x15	10x10	10 x 10	50x10	15x5	20x5		
18Q	770	315	-	-	-	60x21	-	25x10	-	-	-	-		
18R	800	325	-	-	-	-	-	10x10	-	-	-	-		
18S	810	330	-	-	-	-	-	10x15	-	-	-	-		
18T	700	335	-	-	-	-	-	10x10	-	-	-	-		
18U	680	200	-	-	-	-	-	-	30 x 30	30x20	60x20	60x20		

ID	Distance	Bearing	Clump Size (cm)										Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
18V	610	300	-	-	-	-	-	-	10 x 10	60x20	40x10	25x10		
18W	740	300	-	-	-	-	-	-	10 x15	40x10	42x20	35x25x	7fl	
18X	670	310	-	-	-	-	-	-	-	-	20x5	20x5		
18Y	700	210	-	-	-	-	-	-	-	-	-	25x10	1	First detected 25/09/2024



Monitoring point 18 - *Asperula asthenes* monitoring results 2024

APPENDIX D. PHOTO MONITORING

Monitoring Point 1 (MP 1)

MP 1 2015

MP 1 2017

MP 1 2018

MP 1 2019

MP 1 2020

MP 1 2021

MP 1 2022

MP 1 2023

MP 1 2024

Monitoring Point 2 (MP 2)

MP 2 2015

MP 2 2017

MP 2 2018

MP 2 2019

MP 2 2020

MP 2 2021

MP 2 2022

MP 2 2023

MP 2 2024

Monitoring Point 3 (MP 3)

MP 3 2015

MP 3 2017

MP 3 2018

MP 3 2019

MP 3 2020

MP 3 2021

MP 3 2022

MP 3 2023

MP 3 2024

Monitoring Point 4 (MP 4)

MP 4 2015

MP 4 2017

MP 4 2018

MP 4 2019

MP 4 2020

MP 4 2021

MP 4 2022

MP 4 2023

MP 4 2024

Monitoring Point 5 (MP 5)

MP 5 2015

MP 5 2017

MP 5 2018

MP 5 2019

MP 5 2020

MP 5 2021

MP 5 2022

MP 5 2023

MP 5 2024

Monitoring Point 6 (MP 6)

MP 6 2015

MP 6 2017

MP 6 2018

MP 6 2019

MP 6 2020

MP 6 2021

MP 6 2022

MP 6 2023

MP 6 2024

Monitoring Point 7 (MP 7)

MP 7 2015

MP 7 2017

MP 7 2018

MP 7 2019

MP 7 2020

MP 7 2021

MP 7 2022

MP 7 2023

MP 7 2024

Monitoring Point 8 (MP 8)

MP 8 2015

MP 8 2017

MP 8 2018

MP 8 2019

MP 8 2020

MP 8 2021

MP 8 2022

MP 8 2023

MP 8 2024

Monitoring Point 9 (MP 9)

MP 9 2015

MP 9 2017

MP 9 2018

MP 9 2019

MP 9 2020

MP 9 2021

MP 9 2022

MP 9 2023

MP 9 2024

Monitoring Point 10 (MP 10)

MP 10 2015

MP 10 2017

MP 10 2018

MP 10 2019

MP 10 2020

MP 10 2021

MP 10 2022

MP 10 2023

MP 10 2024

Monitoring Point 11 (MP 11)

MP 11 2016

MP 11 2017

MP 11 2018

MP 11 2019

MP 11 2020

MP 11 2021

MP 11 2022

MP 11 2023

MP 11 2024

Monitoring Point 12 (MP 12)

MP 12 2015

MP 12 2017

MP 12 2018

MP 12 2019

MP 12 2021

MP 12 2022

MP 12 2023

MP 12 2024

Monitoring Point 13 (MP 13)

MP 13 2015

MP 13 2017

MP 13 2018

MP 13 2019

MP 13 2021

MP 13 2022

MP 13 2023

MP 13 2024

Monitoring Point 14 (MP 14)

MP 14 2015

MP 14 2017

MP 14 2018

MP 14 2019

MP 14 2021

MP 14 2022

MP 14 2023

MP 14 2024

Monitoring Point 15 (MP 15)

MP 15 2015

MP 15 2017

MP 15 2018

MP 15 2019

MP 15 2021

MP 15 2022

MP 15 2023

MP 15 2024

Monitoring Point 16 (MP 16)

MP 16 2015

MP 16 2017

MP 16 2018

MP 16 2019

MP 16 2021

MP 16 2022

MP 16 2023

MP 16 2024

Monitoring Point 17 (MP 17)

MP 17 2015

MP 17 2017

MP 17 2018

MP 17 2019

MP 17 2021

MP 17 2022

MP 17 2023

MP 17 2024

Monitoring Point 18 (MP 18)

MP 18 2015

MP 18 2016

MP 18 2017

MP 18 2019

MP 18 2021

MP 18 2022

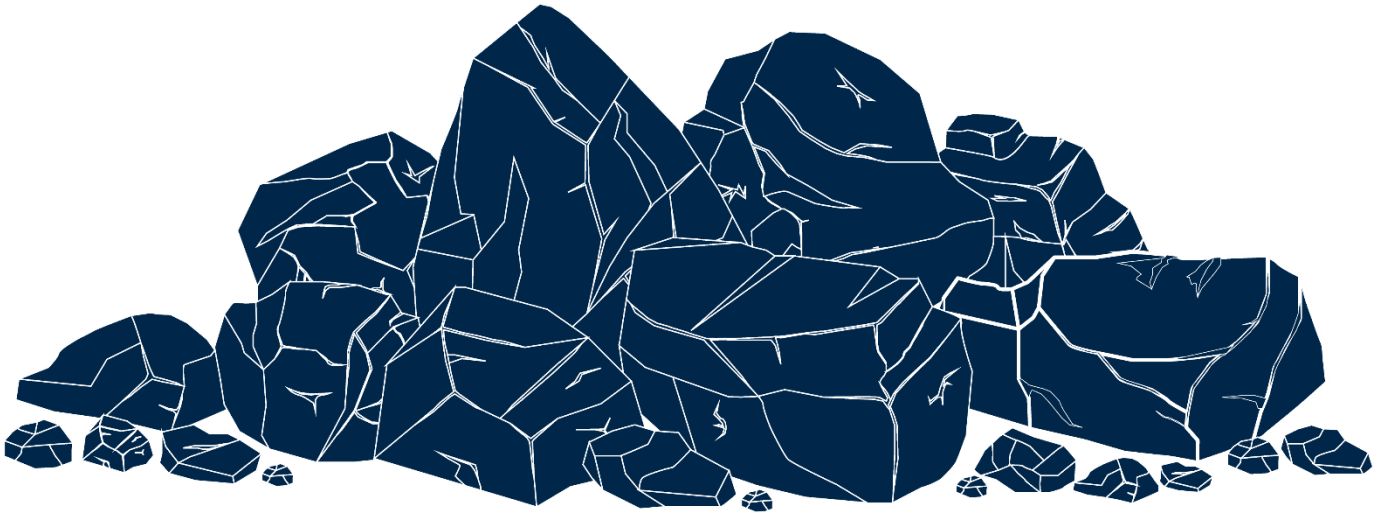
MP 18 2023

MP 18 2024

APPENDIX F. STAFF CONTRIBUTIONS

The following staff were involved in the project:

Name	Qualification	Title	Contribution
Rachel Neal	BBSc (Hons)	Ecologist	Field surveys – flora surveys, site inspection, monitoring, nest box monitoring Report writing
Kane Blundell	Grad Dip Spatial Sc	Ecologist	GIS Figures
Olivia Szekelyhidy	BSc. Zool	Ecologist	Field surveys, nest box monitoring
Stephanie Gilmour	BSc. Zool	Ecologist	Field surveys, nest box monitoring
Mark Dean	BEnvSc	Ecologist	Report review
Samara Schulz	BEnvSc & Mgt (Hons) Accredited BAM Assessor	Principal Botanist	Report review

APPENDIX G. LICENSING

Wedgetail employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL102506, Expiry: 31 May 2026) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.