

Karuah Pit Consolidation Project: Karuah East Quarry (MP09_0175 MOD 11)

Noise Impact Assessment

Prepared for Karuah East Quarry Pty Ltd

March 2026

Karuah Pit Consolidation Project: Karuah East Quarry

(MP09_0175 MOD 11)

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Karuah East Quarry Pty Ltd

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Approved by



Robert Kirwan

Senior Associate Acoustics Consultant – Team Leader Acoustics

6 March 2026

Level 3 175 Scott Street

Newcastle NSW 2300

ABN: 28 141 736 558

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ABN: 28 141 736 558

Executive summary

Karuah East Quarry Pty Limited (KEQPL) propose to modify the Karuah East Quarry (KEQ) Project Approval (MP09_0175) concurrently with the Karuah Hard Rock Quarry (KHRQ) Development Consent (DA265-10-2004) to form the Karuah Pit Consolidation Project. The project is primarily aimed at extracting previously sterilised resource within the remnant dividing highwall between the two extraction areas of the KEQ as well as within other cleared areas in the KEQ.

A Section 4.55(2) modification (MOD 11) to the KEQ will be lodged concurrently with a reciprocal Section 4.55(2) modification (MOD 2) to the separate KHRQ Development Consent (DA 265-10-2004) to facilitate the project. EMM Consulting has been commissioned to prepare a Noise Impact Assessment (NIA) to support each Modification Application. This NIA has been prepared specifically to support the KEQ MOD 11 application.

The KEQ is currently approved to extract, process and transport up to 1.5 million tonnes of quarry products annually. These rates are not affected by the proposal and are not proposed to change.

The proposed modification to KEQ (MOD11) consists of the following key components:

- Concurrently modify both the KEQ and KHRQ consents to extract the known resource contained within already disturbed areas of Lot 12 DP1024564, Lot 13 DP1024564 and Lot 11 DP1024564 including the dividing highwall, within the currently approved excavation depths of RL45 at KEQ and RL65 at KHRQ. Extraction within the consolidated extraction areas will occur in three (3) stages as follows:
 - Stage 1 – Remove the top of the highwall (RL135m) to the KEQ pit level (currently at RL105/90).
 - Stage 2 - Extract the KEQ pit (currently at RL105/90) to (RL75/60) to match the KHRQ pit (RL65m).
 - Stage 3 - Extract final benches at KEQ to RL45m.
- Minor extension and overlap of extraction boundary of both KEQ and KHRQ extraction areas to holistically encompass the highwall structure, inclusive of appropriate safety offsets.
- Material sourced from the overlapping area of the combined extraction area (CEA) will be transported by internal haul road to either the KEQ or KHRQ for processing, stockpiling, sale and transport to market within currently approved throughput rates.
- Extension of the KEQ extraction area to the east (within already disturbed areas of the KEQ within Lot 13 DP 1024564).
- Minor extension of the KEQ disturbance area at the north-eastern boundary. This includes an area of approximately 4,690 m² that is highly degraded and comprised entirely of exotic and disturbed vegetation that has been historically cleared and managed to support a now redundant powerline corridor (infrastructure has been previously removed). With the inclusion of this area, the total site disturbance area of KEQ will increase nominally from 40.18 Ha to approximately 40.65 Ha.
- Formalise a total life of quarry extraction of 28.33 Mt (a nominal reduction from the 29 million tonnes anticipated in the original KEQ Project Approval documentation).
- Continued environmental management including update of relevant Management Plans

- Changes to approved blasting activities (cumulative reduction across both quarry sites from 3 to 2 and extending blasting hours to 9 am to 5 pm weekdays at both sites).
- Revised final landform resulting in a 'free draining' landscape resulting in reduced geotechnical risk over the long term and with greater consistency with the existing surrounding environment.

Operational noise from the KEQ has been assessed in accordance with the methodology outlined in the NPfI for existing sites. Noise goals (PNTLs) were established based on the results of ambient noise monitoring. Operational noise levels from approved operations were calculated and compared to the results of operator-attended noise monitoring to demonstrate the suitability of the noise model. Calculated noise levels correlated well with measured noise levels at the nearest noise assessment locations.

During Stage 1, quarry noise emissions are predicted to be below (i.e. comply with) the relevant existing morning shoulder, daytime and evening noise limits as per Schedule 3, Condition 3 of Project Approval MP09_0175 at most assessment locations, with the exception being a negligible 1 dB exceedance at Location H during the day and evening periods.

During Stages 2 & 3, quarry noise emissions are predicted to be below (i.e. comply with) the relevant existing morning shoulder, daytime and evening noise limits as per Schedule 3, Condition 3 of Project Approval MP09_0175 at all assessment locations.

During all stages, 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 an exceedance at location H during the day and evening periods during all three stages. Proposed morning shoulder operations are predicted to meet the relevant PNTL at this location.

An extensive investigation has previously been undertaken to identify and implement, where relevant, all feasible and reasonable noise mitigation measures. Measures that have been implemented include, but are not limited to, enclosures of the jaw crusher, cone crushers and generators as well as a review of the operating sound power level of mobile equipment (formalised by approved MOD 8 to MP09_0175).

As provided in Section 2.4, the dwelling at location H was approved and built after the KEQ commenced operations. The approval for this dwelling, issued by Mid Coast Council (DA 69/2018/A), also included the establishment and operation of a truck depot. The approval includes a condition of consent for acoustic treatment of the building to limit the noise impacts from the existing quarry.

Furthermore, as part of the MOD 9 approval (issued 2 December 2021), Schedule 4, Condition 5 4 was added to the Project Approval to establish provisions for additional receptor mitigation at location H upon request (consistent with the *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Development* (VLAMP) (2018)). Proposed MOD 11 does not seek to amend this condition and at the time of writing this NIA (February 2026), KEQPL are currently finalising an agreement with the landowner of location H for the provision of air conditioning in accordance with the VLAMP (2018).

Given the negligible (1 dB) and temporary nature of the predicted exceedance combined with the significant noise mitigation measures previously implemented (refer Section 6), the acoustic treatment applied to the dwelling under DA 69/2018/A (specifically noting that it was established after the quarry) and the provision of air conditioning through the applicable voluntary at-receptor mitigation under the VLAMP (refer Section 5.4), it is anticipated that any potential impact on location H will be negligible. On this basis, no further consideration of any additional mitigation measures is warranted.

Where noise emissions from an existing site are predicted to exceed NPfI PNTLs, the relevant regulatory authorities and proponent will determine achievable noise limits through negotiation and discussion with relevant stakeholders as required, in accordance with Section 6.1.1 of the NPfI. A replacement operational noise condition has been proposed in Section 7.9.

Cumulative noise impacts from KEQ and KHRQ have been assessed against the recommended amenity noise levels as outlined in the NPfI for each relevant receptor. During all stages, quarry noise emissions are predicted to be below (i.e. comply with) the relevant recommended amenity noise level during all periods of operations at all assessment locations.

Following the acquisition of Lot 11, KEQPL (and affiliated companies) are now the proponent for the proposed KSQ on the southern portion of the land. In terms of cumulative noise considerations, if progressed, KSQ will not commence until the cessation of KHRQ operations. The applicant is reviewing the business case for the integration of KSQ with the existing KEQ and KHRQ assets, and any future modification to KSQ will be supported by an updated noise and vibration impact assessment reflecting the revised Karuah Pit Consolidation and KSQ projects.

Vibration from operational activity (excluding blasting) is not anticipated to change as a result of the proposed modification compared to that currently approved. It is noted that KEQPL has engaged a blasting consultant to undertake a separate assessment of the impacts associated with blasting activities. Accordingly, a detailed assessment of blasting-related noise and vibration impacts have not been considered or assessed within the scope of this report.

Road traffic noise generated by quarry-related traffic is predicted to achieve relevant road traffic noise goals.

Upon determination of MOD 11, as necessary, the KEQ Noise Management Plan (NMP) will be updated to include the proposed changes associated with MOD 11 and an application will be made to vary the site's Environment Protection Licence (EPL), EPL 20611.

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1 Introduction

1.1 Overview

Karuah East Quarry Pty Limited (the Applicant, KEQPL) proposes to modify the State Significant Development approval for the Karuah East Quarry (Project Approval MP09_0175) under the provisions of S4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Section 4.55(2) application will be known as MOD 11, Karuah Pit Consolidation Project.

The Applicant has recently acquired Lot 11 DP 1024564 (Lot 11), enabling KEQPL (and affiliated companies) to control all landholdings within the Karuah Quarry Complex, which currently consists of two operational quarries, including the Karuah East Quarry (KEQ, the Quarry) and the Karuah Hard Rock Quarry (KHRQ). Following the acquisition of Lot 11, KEQPL (and affiliated companies) are also now the proponent for the separately proposed Karuah South Quarry (KSQ) located on the southern portion of the acquired land parcel.

This acquisition of Lot 11 now allows the Applicant to readily extract previously sterilised resource from the remnant dividing highwall between the KEQ and KHRQ extraction pits forming a Consolidated Extraction Area (CEA).

The purpose of the modification is to primarily enable the extraction of the previously sterilised andesite resource from the remnant dividing highwall as well as within other cleared areas from the KEQ site in a coordinated approach with the adjoining KHRQ.

MOD 11 will be lodged concurrently with a reciprocal Section 4.55(2) modification to the separate KHRQ Development Consent (DA 265-10-2004) to facilitate the Karuah Pit Consolidation project.

1.2 Assessment requirements

This Noise Impact Assessment (NIA) has been prepared specifically to accompany the KEQ MOD 11 application and assesses the noise impacts of the proposed modification on existing sensitive receptors in the surrounding area.

This NIA has been prepared with reference to the following guidelines and policies:

- NSW Environment Protection Authority (EPA) 2017, Noise Policy for Industry (NPfI)
- NSW Department of Environment, Climate Change and Water (DECCW) 2011, Road Noise Policy (RNP)
- NSW Government 2018, Voluntary Land Acquisition and Mitigation Policy (VLAMP).

Numerous technical terms have been utilised throughout this report for the discussion of noise. These are explained in the Glossary.

This report has also been prepared in accordance with the Environmental Assessment Requirements issued by the NSW Department of Planning, Housing and Infrastructure (NSW Planning) issued on 1 October 2025, that requires the Modification Application to consider noise impact.

2 Project and site description

2.1 Project background

Project Approval MP09_0175 was granted for the Karuah East Quarry (KEQ) on 17 June 2014 under the provisions of Section 75J of the EP&A Act 1979. Key features of the Project Approval (as amended) include:

- quarrying operation is permitted on the site until 31 December 2034.
- establishment and use of quarry plant and associated infrastructure
- the extraction (excluding overburden), processing and transport of quarry products is limited to 1.5 million tonnes in any calendar year
- roadworks to secure access to the site include upgrade and extension of Blue Rock Close, realignment of the Andersite Road and Blue Rock Close intersection and adjust road markings at The Branch Lane and Andersite Road intersection
- a total permitted disturbance area of 40.18 ha
- establishment of a land based biodiversity offset area on Part Lot 13 DP 1024564, Lot 14 DP 1024564, Lot 5 DP 838128 and Part Lot 201 DP1042537 (location to be determined)
- conditions apply to manage/mitigate potential impacts associated with a range of environmental conditions including noise, blasting, air quality, soil and water, transport, biodiversity, heritage, emergency and hazards management and waste.

Access to and from the KEQ is via Blue Rock Close and Andersite Road, which directly connect to The Branch Lane interchange with the Pacific Highway.

The current approved development layout as per MP09_0175 is shown in Figure 2.1.

Modification (MOD 1) to the Project Approval 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 and operational safety in proximity of the crushing plant and processing area.

Modification (MOD 2) to the Project Approval was approved on 19 December 2018 under the provisions of Section 75W of the EP&A Act. MOD 2 approved a 1.133 ha increase to the site disturbance area to allow for improved environmental management (particularly surface water management) and improved operational safety (for quarry vehicles), in particular separation of light and heavy vehicle movements along the internal north south haulage road.

Modifications 3 – 7 were withdrawn.

On 25 January 2019 the KEQ project was transitioned to a State Significant Development (SSD) under the provisions of Schedule 2 Clause 6(1) of the Environmental Planning and Assessment (Savings, Transitional and other Provisions) Regulation 2017.

Modification (MOD 8) to the Project Approval was approved on 22 December 2020 under the provisions of s4.55(1A) of the EP&A Act. MOD 8 approved revised operational acoustic criteria in line with the NSW Noise Policy for Industry (EPA 2017). MOD 8 also formalised a number of industry best practice acoustic mitigation measures that have been installed at the quarry.

Modification (MOD 9) to the Project Approval was approved on 2 December 2021 under the provisions of s4.55(1A) of the Environmental Planning and Assessment Act 1979. MOD 9 extended the approved operating hours of the KEQ as follows:

- 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
 - 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.

Modification (MOD 10) to the Project Approval was approved on 18 May 2023 under the provisions of s4.55(2) of the EP&A Act. MOD 10 is the latest amendment to MP09-0175 and provides approval to increase the disturbance area of the KEQ by 7.17 Ha (bringing the total approved disturbance area of the KEQ to 40.18 Ha). The purpose of MOD 10 is to increase the site disturbance area to establish additional stockpiling areas, facilitate improved stormwater management, construct a new administrative building and expand the vehicle manoeuvring and parking at the site.

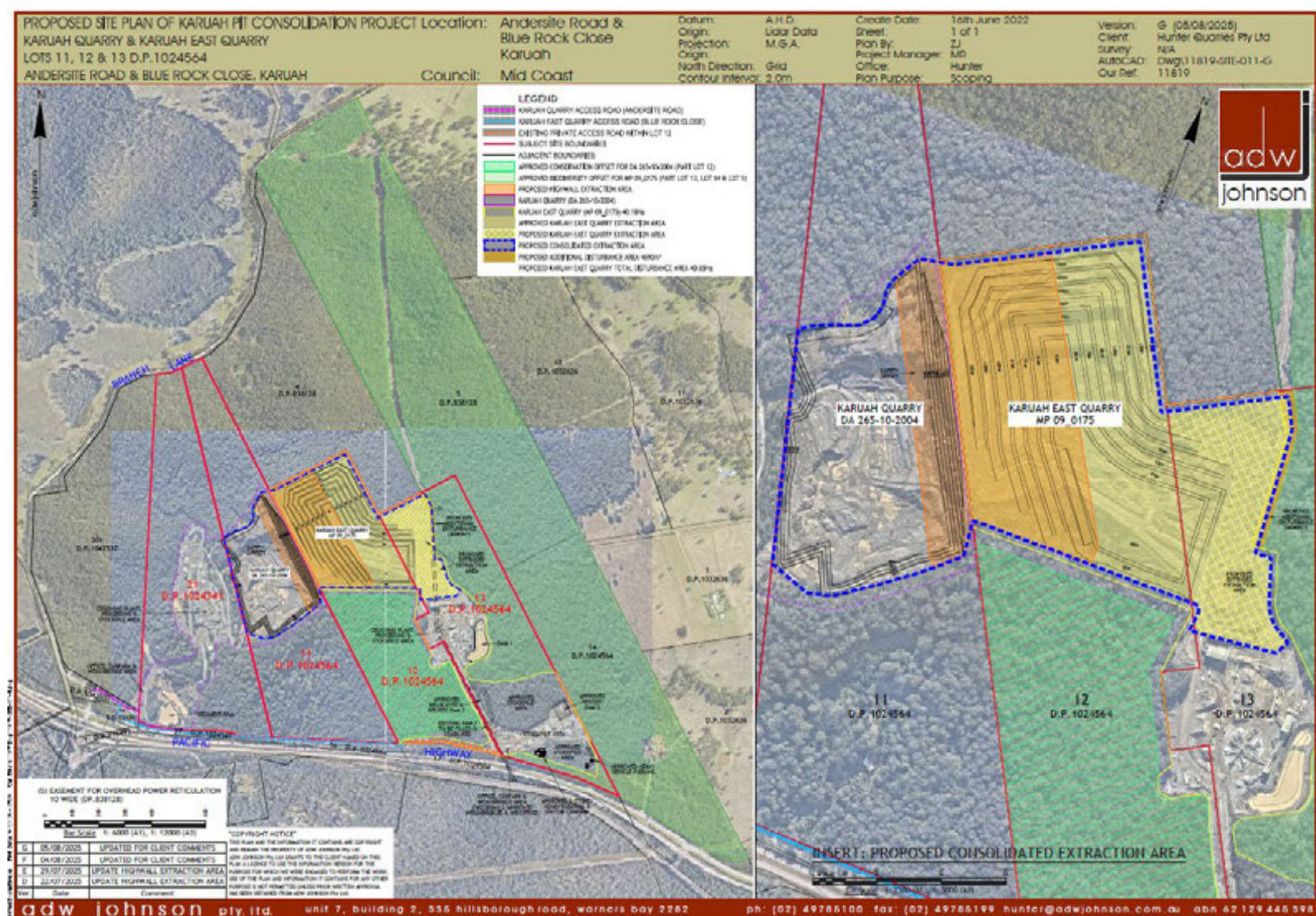


Figure 2.1 Approved development layout (MP 09_0175)

2.2 Proposed modification

2.2.1 Extraction within disturbed areas of Lots 11, 12 and 13 DP 1024564

The proposal seeks to concurrently modify the KEQ Project Approval and KHRQ Development Consent to extract the known resource contained within already disturbed areas of Lot 11, Lot 12 and Lot 13, including the dividing highwall, within currently approved extraction depths of RL45 at KEQ and RL65 at KHRQ.

Volume estimates identify that there is approximately 28.47 Mt of in-situ material remaining within disturbed areas of Lot 11, 12 and 13 DP 1024564, inclusive of currently approved resource and stockpiled overburden, as measured from LiDAR contours captured in September 2024.

MP09_0175 (as amended) does not contain a specific condition that provides a total extraction limit for the life of the KEQ, it does however refer to the Environmental Assessment (EA) for the KEQ (ADW Johnson, 31 January 2013), which detailed that the estimated total resource to be extracted by the KEQ was 29 Mt. MOD 11 will seek to nominally reduce this final extraction limit to 28.33 Mt.

It is important to note that all specialist assessments that informed the EA were prepared on the basis of a total extraction of 29 Mt. Accordingly, KEQPL are confident that any potential impacts of the proposed development will be within acceptable limits and can be readily managed.

The proposed modification does not seek to change to the maximum approved extraction, processing and transport rates of 1.5 million tonnes per annum.

2.2.2 Extraction Sequence

The following coordinated extraction sequence between the KEQ and the KHRQ will be generally undertaken to complete the pit consolidation project (inclusive of high wall removal):

- Stage 1 – Remove the top of the highwall (RL135m) to the KEQ pit level (currently at RL105/90). This will allow a single extraction level to be established on Lot 12. This approach is needed to safely remove peak of the dividing highwall and make the extraction area level with the current KEQ extraction area.
- Stage 2 - Extract the KEQ pit (currently at RL105/90) to (RL75/60) to match the KHRQ pit (RL65m) and KEQ boot bin level. This will form a single extraction level area across the entire CEA.
- Stage 3 - Extract final benches at KEQ (Lots 12 and 13) from RL65m to RL45m. The KHRQ pit floor will remain at RL65m.

2.2.3 Minor extension to quarry disturbance area

As design refinement of the extraction area has progressed as part of the pit consolidation project, opportunity for a minor adjustment to the north-eastern boundary of the approved KEQ disturbance area has been identified. This area is approximately 4,690 m² and is highly degraded and comprised entirely of exotic and disturbed vegetation. It has been historically cleared and managed to support a now redundant powerline corridor (infrastructure has been previously removed).

This area is proposed to form a minor extension of the approved disturbance area and is incorporated into the consolidated extraction area. Plans of the proposed additional disturbance area are provided in Figure 2.2.

2.2.4 Minor extension and overlap of extraction boundary

In order to practically extract the remnant rock-mass consisting of the dividing highwall structure between the KEQ and KHRQ pits, an extension of both approved extraction footprints is necessary to holistically encompass the highwall structure, inclusive of appropriate safety offsets.

Accordingly, it is proposed to extend the KEQ extraction footprint to the west into Lot 11 to contain the highwall structure; and similarly, via a concurrent modification to DA 265-10-2004, the KHRQ extraction footprint will be extended to the east into Lot 12, as illustrated by Figure 2.2 below. Note, no changes to the approved disturbance boundaries are sought to facilitate this outcome.

Material sourced from this overlapping area of the CEA will be transported by internal haul road to either the KEQ or KHRQ for processing, stockpiling, sale and transport to market within the currently approved extraction and throughput rates of:

- 1.5 million tonnes per annum at the KEQ site
- 500,000 tonnes per annum at the KHRQ site.

In addition, it is proposed to extend the extraction to the east within already cleared areas of the KEQ.

Cumulatively, no more than 2 million tonnes of extraction per annum will occur from both the KEQ and KHRQ extraction areas combined, which is unchanged from what the existing approvals cumulatively allow (i.e. no intensification is required).

It is proposed that the KEQPL will develop and implement a Consolidated Extraction Area Management Plan (or similar) that details the administrative arrangements required to achieve compliance with the overlapping extraction areas and relevant consent conditions.

2.2.5 Other modifications proposed

To facilitate the Karuah Pit Consolidation Project, other modifications to the KEQ Project Approval are necessary, including:

- Changes to approved blasting activity as follows:
 - Change in blasting frequency to limit the number of blasts to a maximum of two (2) blasts per week in total between KEQ and KHRQ.

This will result in a cumulative reduction of blasting activities between KEQ (2 blasts per week currently approved) and KHRQ (one blast per week currently approved) from a total of three (3) blasts per week to two (2) blasts per week.
 - Approved blasting hours are proposed to be extended by 1 hour to occur between the hours of 9:00 am and 5:00 pm (Monday to Friday) to provide improved flexibility during blasting of the dividing highwall and align with proposed arrangements at KHRQ.
- Revised final landform resulting in a free-draining landscape of the current extraction area, resulting in reduced geotechnical risks over the long-term and a landform with greater consistency with the existing surrounding environment.

2.3 Proposed justification

The Karuah Pit Consolidation Project is strongly justified. The following is noted:

- There is a proven, high quality andesite resource in the disturbed areas of the site, including the remnant highwall.
- The site consists of two well established quarry operations, both operated by the Applicant (and affiliated companies) and infrastructure is readily available to extract and process the resource.
- The proposal will ensure continued and uninterrupted employment for existing KEQPL and HQPL staff.
- Additional resource can be extracted and processed without the need for any additional land disturbance (i.e. no vegetation removal) and the approved disturbance footprint of the quarry will remain largely unchanged (except for a nominal 4,690 m² increase into previously cleared land).
- The proposal will involve removing the remnant dividing highwall between KEQ & KHRQ, resulting in a substantial visual amenity improvement, particularly when viewed from the Pacific Highway, Halloran Road, Taren Road and Mill Hill Close.
- Extraction of the remnant dividing highwall will result in significantly improved safety outcomes during operations of the KEQ & KHRQ.
- Extraction of the remnant dividing highwall will result in improved long-term landform and land use outcomes associated with rehabilitation and closure of both the KHRQ and KEQ sites.
- The proposal will result in improved long-term landform drainage (a free-draining landscape will be established) and reduced geotechnical risk with a long-term landscape that will achieve greater consistency with the surrounding landscape.

- Key environmental considerations in the area are well understood and can be readily managed. KEQPL is affiliated with HQPL, who operate the established KHRQ on Lot 12 and Lot 13. Noting the adjoining operations, HQPL and KEQPL can extract and process the resource within the CEA in an efficient manner whilst ensuring that coordinated operational and environmental management (as needed) can readily occur.
- The remnant dividing highwall between the KEQ & the KHRQ was recognised at the time of the assessment of the KEQ application (it was a logical consideration that the KHRQ be extended to the east into Lot 12 and Lot 13).
- As was demonstrated in detail during the assessment process for the KEQ, the Applicant was unable to come to terms with the Lot 11 landowner at that time to extend the Lot 11 quarry pit into Lot 12 and Lot 13 (which now contains the KEQ pit). Now that the Applicant owns Lot 11, the highwall resource is no longer sterilised and this important project can progress.
- The proposal does not seek to intensify quarry operations in terms of annual extraction limits, processing throughput, hours of operation or traffic generation.
- There is a proven market demand for the andesite resource available at the KHRQ site. The Applicant has well established markets in the Greater Newcastle, the Hunter Valley and Mid-North Coast regions. The product that will be extracted from the site will contribute to servicing these markets.
- Since the time of approval of the KEQ, the customer and project base of the quarry has evolved, with the quarry now servicing a number of large public infrastructure projects. The evolving client base includes a range of government agencies/organisations including Transport for NSW, a number of local Councils, the Port of Newcastle, Ausgrid, Newcastle Airport and Tier 1 infrastructure providers. The product that will be extracted from the Karuah Pit Consolidation Project will contribute to servicing these important customers that deliver key infrastructure projects.
- In addition to the above, HQPL supply material to State Significant Infrastructure (SSI) projects including the Singleton Bypass, the Newcastle Inner City Bypass (SSI-6888), Pacific Highway widening at Hexham Straight, and the M1 Pacific Motorway Extension to Raymond Terrace (SSI- 7319), which are critical to deliver improved connectivity of the Mid-North Coast (including the MidCoast LGA) to Sydney, Newcastle and the Hunter Valley.
- The CEA is well separated from any sensitive receptors or significant areas of urban development.
- The KEQ has direct access available to the Pacific Highway interchange (via The Branch Lane interchange to Andersite Road and Blue Rock Close). The haulage route to the Pacific Highway does not require heavy vehicles to pass any sensitive receptors (e.g. a property with a rural dwelling).
- The receiving environment is very well understood by KEQPL. Environmental safeguards currently in place can be readily adjusted to accommodate the pit consolidation project (including the establishment of any cooperative protocols (as necessary) with the adjoining KHRQ operation).

2.4 Site description and assessment locations

KEQ is located on the northern side of the Pacific Highway approximately 5 km north-west of the township of Karuah, NSW.

The nearest noise sensitive receptors (herein referred to as assessment locations) are shown in Figure 2.3 and described in Table 2.1. These are generally consistent with MP09_0175, previous noise impact assessments and the current compliance noise monitoring requirements.

It is of note that the noise monitoring location identifiers in Table 2.1 for the adjacent KHRQ have been updated to align with the contemporary identifiers used for the KEQ. This is an administrative change only, with no alteration to the physical receptor locations or assessment positions adopted in previous assessments. The revised identifiers will ensure clearer and more consistent referencing of receptors across both sites (and the proposed Karuah South Quarry) for the proponent, nearby residents, and regulatory authorities.

Table 2.1 Noise assessment locations

ID	Description	Address	Property details
A	Private residence	74 Mill Hill Close, Karuah	Lot 100 DP 1028885
B	Private residence	64 Mill Hill Close, Karuah	Lot 3 DP 785172
C	Private residence	54 Mill Hill Close, Karuah	Lot 1 DP 785172
D	Private residence	827 Tarean Road, Karuah	Lot 250 DP 1092111
E	Private residence	789 Tarean Road, Karuah	Lot 22 DP 1024341
F	Private residence	1714 The Branch Lane, Karuah	Lot 50 DP 1036893
G	Private residence	2 Halloran Road, North Arm Cove	Lot 1 DP 1032636
H	Private residence	21 Halloran Road, North Arm Cove	Lot 10 DP 1032636
I	Private residence	51 Halloran Road, North Arm Cove	Lot 11 DP 1032636
J	Private residence	129 Halloran Road, North Arm Cove	Lot 13 DP 1032636
K	Private residence	83 Halloran Road, North Arm Cove	Lot 12 DP 1032636

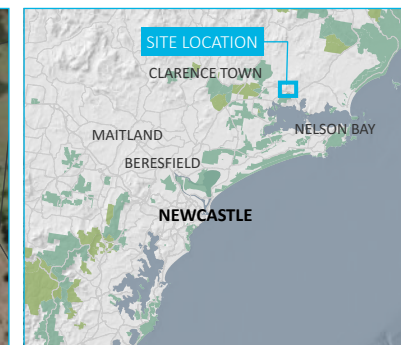
The dwelling at location H was approved and built after Karuah East Quarry commenced operations. The approval for this dwelling, issued by Mid Coast Council (DA 69/2018/A), included the establishment and operation of a truck depot. It also included a condition of consent for acoustic treatment of the building to limit the noise impacts from the existing quarry according to the requirements of AS/NZS 2107(5). In its assessment of the application for the dwelling, Council considered the operation of the quarry and included Condition 11 of consent DA 69/2018 which states:

Prior to the issue of a construction certificate, plans and specifications detailing the measures to reduce noise impacts on the building occupants from the quarry must be submitted to and approved by the certifying authority. The buildings must be acoustically designed and constructed to meet the requirements of Australian Standard AS/NZS 2107: Acoustics - Recommended design sound levels and reverberation times for building interiors. Evidence from an appropriately qualified person that their design will achieve the requirements of the Australian standard must be submitted with the plans and specifications.

Information regarding this design was previously requested from MidCoast Council, however Council would not release the documentation due to copyright and privacy restrictions.

In accordance with Condition 5 of Schedule 4 of MP09_0175 (which was established as part of the MOD 9 approval), location H is subject to additional mitigation upon request. KEQPL, if requested by the owner of the dwelling at location H is required to consider reasonable and feasible receptor mitigation measures consistent with the Voluntary Land Acquisition and Mitigation Policy (NSW Government 2018). The measures must be reasonable and feasible, proportionate to the level of impact and directed towards reducing the noise impacts of the development. The MOD 11 application does not seek to amend this condition. At the time of writing (February 2025), KEQPL are currently finalising agreement with the landholder of location H for the provision of air conditioning in accordance with the VLAMP (2018).

\\lemm.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Acoustics\NOI001_NoiseMonitoringAssessmentLocations_20251127_01\NOI001_NoiseMonitoringAssessmentLocations_20251127_02.aprx 3/5/2026



KEY

- KEQ approved disturbance boundary
- Proposed KEQ Mod 11 additional disturbance area
- Noise assessment location
- Noise monitoring location
- Existing environment
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Cadastral boundary
- NPWS reserve

INSET KEY

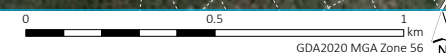
- Major road
- NPWS reserve
- State forest

Noise monitoring and assessment locations

Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure 2.3



Source: EMM (2026); ABS (2021); DCSST (2024); ESRI (2026); GA (2009)



2.5 Other quarrying operations

KHRQ is an existing quarrying operation located adjacent to and west of the KEQ and operated by Hunter Quarries. It is located on Lot 21 DP 1024 341 and Lot 11 DP 1024564. Hours of operation of KHRQ are from 7:00 am to 6:00 pm Monday to Friday and 7:00 am to 1:00 pm Saturdays. The annual production limit for KHRQ is 500,000 tonnes. It should be noted that the concurrent Modification Application to the KHRQ seeks to extend its hours of operation to align with the hours of operation of the KEQ site.

The proposed Karuah South Quarry (KSQ) (State Significant Development (SSD) SSD-8795) application at Lot 11 DP 1024564 is located to the west of KEQ and the south of the KHRQ extraction area. The proposal seeks to extract the remaining resource south (of KHRQ) and west (of KEQ) of the existing quarry's limit of extraction. The quarry is proposed to be a conventional drill and blast operation with rock collected and processed onsite. Processed product is proposed to be stockpiled onsite with a loader used to load trucks for transport off-site when required. The proposed hours of operation are 5:00 am to 6:00 pm Monday to Friday and 5:00 am to 1:00 pm Saturday with only product loading and transport activity to occur between 5:00 am and 7:00 am. The proposed annual production limit is 600,000 tonnes.

As a result of the recent acquisition of Lot 11, HQPL are now the proponent for the proposed KSQ. If this application is progressed, operations will not commence until the time that the KHRQ operations have ceased.

3 Existing KEQ noise

3.1 Existing noise criteria

Operational noise criteria for current approved operations are provided in Schedule 3, Condition 3 of Project Approval MP09_0175 and are reproduced in Table 3.1. Importantly, the derivation of these limits was based on the current NSW EPA policy (i.e. NPfl) and background noise monitoring undertaken in June 2021 (refer Section 4).

Table 3.1 Existing operational noise limits

Assessment Location	Morning Shoulder $L_{Aeq,15minute}$, dB	Morning Shoulder L_{Amax} , dB	Day $L_{Aeq,15minute}$, dB	Evening $L_{Aeq,15minute}$, dB
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

3.2 Existing quarry noise emissions

Quarterly noise monitoring is currently undertaken during the morning shoulder (5:00 am to 7:00 am), daytime (7:00 am to 6:00 pm) and evening periods (6:00 pm to 10:00 pm) at Receptors A, B, F, G & H in accordance with the approved KEQ Noise Management Plan (EMM, version 4C, June 2024).

Based on the results of quarterly noise compliance monitoring, noise from the Quarry is generally not audible at locations A, B or F over noise from road traffic on the Pacific Highway and noise emissions from the Quarry satisfy the relevant operational noise limits as provided in Project Approval MP09_0175. During routine noise compliance monitoring, quarry noise levels have been quantified to be up to $L_{Aeq,15minute}$ 43 dB at location G and $L_{Aeq,15minute}$ 44 dB (i.e. 42 dB + 2 dB adjustment for LFN) at location H during the day period, which are below the noise limits specified in Table 3.1.

Additional operator-attended noise monitoring was undertaken during logger deployment by EMM in June 2021. Quarry noise emissions were quantified under noise-enhancing weather conditions at locations G and H. Results of these surveys are provided in Section 4.

3.3 Complaint history

Quarrying activity commenced in 2017 and some community complaints were initially received. It was identified that improved, targeted acoustic mitigation measures were necessary and would be beneficial to all stakeholders. The original NIA report that accompanied the KEQ application (SLR 1212) was developed based on a concept layout and it was also assessed in accordance with the now superseded NSW Industrial Noise Policy (INP) (EPA 2000).

In 2019, in response to community feedback, the applicant commissioned the services of Thearle Acoustics to undertake an updated noise assessment (Thearle Acoustics 2019) in accordance with the NPfl (EPA 2017). This process identified appropriate operational noise targets and industry best practice noise mitigation measures. This was undertaken in consultation with NSW Planning, EPA and the Karuah East Quarry Community Consultative Committee (CCC). The outcomes of the assessment were formalised by the MOD 8 approval (approved 22 December 2020).

The noise mitigation measures (as outlined in Section 6.2 of this report) formalised by MOD 8 have been installed and EMM understands that community feedback, particularly through the KEQ CCC, has been positive.

4 Existing ambient noise environment

Unattended noise monitoring was undertaken by EMM at four locations surrounding the quarry to establish ambient and background noise levels. The monitored locations are shown in Figure 2.3. Noise loggers were in place from 15 to 30 June 2021 and were programmed to record statistical noise level indices continuously in 15-minute intervals. The calibration of each noise logger was checked prior to and following unattended noise monitoring and the equipment carried appropriate and current NATA calibration certificates. Weather data for the unattended noise monitoring period was obtained from the weather station located at the KHRQ. Wind speed and rainfall data were used to exclude noise data during periods of any rainfall and/or wind speeds exceeding 5 m/s (approximately 9 knots) in accordance with the methodology provided in the NPfI.

A summary of the background and ambient noise monitoring results is provided in Table 4.1 for the periods relevant to the current approved hours of operation. Detailed daily graphs of the data are provided in Appendix A.

Table 4.1 Summary of existing measured background and ambient noise levels (2021)

Monitoring location	Period ¹	RBL ² , dB	L _{Aeq,period} noise level ³ , dB
NM1 (H)	Morning shoulder	33	41
	Day	35	59
	Evening	40	47
NM2 (G)	Morning shoulder	37	50
	Day	41	58
	Evening	41	48
NM3 (A)	Morning shoulder	41	53
	Day	46	62
	Evening	46	53
NM4 (west of F)	Morning shoulder	45 ⁴	56 ⁴
	Day	54 ⁴	70 ⁴
	Evening	52 ⁴	60 ⁴

- Notes:
1. Morning shoulder 5:00 am to 7:00 am; Day: 7:00 am to 6:00 pm Monday to Saturday; 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm; Night: 10:00 pm to 7:00 am.
 2. The RBL is an NPfI term and is used to represent the background noise level.
 3. The energy averaged noise level over the measurement period and representative of general ambient noise.
 4. Insufficient data was obtained from this logger due to adverse weather and power failure of the noise logger. Data presented here is based on 3-4 days of valid data per period.

Operator-attended noise monitoring was also completed by EMM at the unattended noise logger locations during the 2021 monitoring program. A summary of the attended noise monitoring results is provided in Table 4.2. These surveys were undertaken using a Brüel & Kjær 2250 Type 1 sound analyser (S/N 3029363).

Table 4.2 Summary of attended noise monitoring results

Monitoring location	Date Start time	Weather	Total measured noise levels, dB				Site contribution L _{Aeq} , dB	Comments
			L _{A90}	L _{Aeq}	L _{A10}	L _{Amax}		
NM1 (H - Eastern side of dwelling)	15/6/21 12:36	1–1.5 m/s WSW	42	45	46	61	42	Processing plant and feed from jaw predominant, trucks on Highway, dogs at residence, occasional loading of truck from Quarry, local traffic; resident returning home.
NM1 (H - Western side of dwelling)	15/6/21 12:53	1–1.5 m/s WSW	41	46	47	66	44	Processing plant, feed from jaw, reversing alarms audible, haul trucks. Distant Highway traffic audible, dogs barking and bird call, aeroplane audible.
NM2 (G)	15/6/21 13:44	1.5–2.5 m/s WSW	43	50	54	64	39	Dogs barking constantly and predominant, Highway traffic, processing plant and trucks from Quarry, birdcall, aeroplane.
NM3 (A)	15/6/21 11:26	1–1.5 m/s SW	46	49	50	65	IA	Traffic on Pac Hwy constant, local pump consistently on/off, quarry not audible, resident activity.
NM4 (West of F)	15/6/21 14:36	1–2 m/s SW	55	60	62	80	IA	Highway traffic dominant, dog barking, truck on Branch Lane, Quarry not audible.

Notes: 1. Weather data was obtained from the on-site weather station. Weather conditions recorded during the operator-attended surveys at residences G and H were noise-enhancing
IA = Inaudible

Based on observations during logger deployment and the results of operator-attended noise monitoring, Highway traffic and dogs barking dominate the ambient acoustic environment at location G with the KEQ also audible. Highway traffic, particularly heavy vehicles, is audible at residence H and when the KEQ is not operational would dominate the ambient acoustic environment. The daytime background noise levels at both locations are likely to have been influenced by noise from the KEQ; however, it is noted that the KEQ was not operational during the evening or morning shoulder period and would not have contributed to background noise levels during these periods. Results of the unattended noise monitoring program (as provided in Appendix A) indicate that the lowest daytime ABLs were recorded on days when the KEQ was operational and overall RBLs for daytime were equal to or less than the evening period at both locations.

5 Assessment methodology

5.1 Applying the NPfI to existing sites

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

Section 6.1 of the NPfI states that:

The project noise trigger levels should not be applied as mandatory noise limits. The project noise trigger level is the level used to assess noise impact and drive the process of assessing all feasible and reasonable control measures.

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

The process for applying the NPfI to existing sites is outlined in Section 6.1.1 of the NPfI and is summarised as follows as applicable to the modification application:

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

5.2 Operational noise limits – NPfI

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

The reaction to noise is highly subjective. Hence, it is not possible to adopt noise levels that will guarantee that no one will experience an impact. Adherence with the PNTLs should not be interpreted to mean that industrial noise will be inaudible, or that all members of the community will find the noise acceptable. The PNTLs for industry provide a benchmark for assessing a proposed or existing industrial development.

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

5.2.1 Assessing intrusiveness

The intrusive noise trigger levels require that $L_{Aeq,15minute}$ noise levels from the site during the relevant operational periods (i.e. morning shoulder, day and evening) do not exceed the rating background level (RBL) by more than 5 dB. The NPfI recommends that the intrusive noise trigger level for evening be set at no greater than the intrusive noise level for daytime and that the intrusive noise level for the morning-shoulder should be no greater than the intrusive noise level for day or evening. Intrusive noise trigger levels are applicable at residential assessment locations only.

The results of long-term, unattended ambient noise surveys undertaken by EMM in June 2021 (summarised in Section 4) have been used to determine relevant project intrusive noise levels at neighbouring noise sensitive receptors.

The RBLs utilised for determination of the project intrusiveness levels for locations A, B, C, D, E, and F are based on the results from NM3 (residence A) since the minimum number days of valid data was not obtained at NM4. This is considered a conservative approach to intrusive noise criteria at location F given that it is far more exposed to road traffic noise than residence A. The results from NM1 (residence H) have been adopted for the purpose of establishing intrusive noise criteria at residents H and I due to their similar location and distance to the Pacific Highway. The results from NM2 (residence G) have been adopted for the purpose of establishing intrusive noise criteria at location G. Minimum RBLs as per the NPfI have been adopted for location J given the relatively remote and rural setting.

It is important to note that the RBLs measured during the evening period at location H are higher than those measured during the day period and are similar to those measured at location G during the evening. This is due to variation of traffic on the Highway and the relative increase in heavy vehicle traffic during the evening period. The NPfI states the following in this regard:

In determining project noise trigger levels from RBLs, the community's expectations also need to be considered. The community generally expects greater control of noise during the more sensitive evening and night-time periods than during the less sensitive daytime period. Therefore, in determining project noise trigger levels for a particular development, it is generally recommended that the project intrusiveness noise level for evening be set at no greater than the project intrusiveness noise level for daytime. The project intrusiveness noise level for night-time should be no greater than the project intrusiveness noise level for day or evening. Alternative approaches to these recommendations may be adopted if appropriately justified.

The adopted evening RBL at location H is the measured RBL since the data clearly shows increasing noise levels during the evening period (in particular data from 23 to 25 June 2021). This deviation from the methodology of the NPfI was fully justified in the MOD 9 NIA (EMM 2021) and summarised in Section 5.2.3 below.

The project intrusive noise levels are presented in Table 5.1.

Table 5.1 **Intrusive noise levels**

Assessment locations	Adopted RBL, dB			Project intrusive noise level, $L_{Aeq,15minute}$ dB		
	Morning Shoulder ¹	Day ¹	Evening ¹	Morning Shoulder ¹	Day ¹	Evening ¹
A	41	46	46	46	51	51
B	41	46	46	46	51	51
C	41	46	46	46	51	51
D	41	46	46	46	51	51
E	41	46	46	46	51	51
F	41	46	46	46	51	51
G	37	41	41	42	46	46
H	33	35	40	38	40	45
I	33	35	40	38	40	45
J	30	35	30	35	40	35
K	33	35	40	38	40	45

Notes: 1. Morning shoulder: 5:00 am to 7:00 am Monday to Saturday; 5:00 am to 8:00 am Sundays and public holidays; Day: 7:00 am to 6:00 pm Monday to Saturday; 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm.

5.2.2 Assessing amenity

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

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

Residences have been categorised in the NPfI rural or suburban amenity categories consistent with the methodology used in previous NIAs for the site. Assessment locations south of the Pacific Highway have been classified as suburban and those north of the Highway have been classified as rural.

It is commonly acknowledged and accepted amongst regulators and industry that average noise levels are typically 3 dB higher over a 15-minute worst case assessment period when compared to an entire day (11 hour), evening (4 hour) and night (9 hour) assessment period. This is outlined in the NPfI and has been used in this assessment to standardise the time periods for the intrusive and amenity noise levels.

An extract from the NPfI that relates to the amenity noise levels relevant to the project is given in Table 5.2. There is no specific guidance in the NPfI regarding amenity noise levels for the morning shoulder period. For this assessment and to provide a conservative approach the night-time project amenity noise level has been adopted for the morning shoulder period.

Table 5.2 **Amenity noise levels - Recommended L_{Aeq} noise levels from industrial noise sources**

Type of receptor	Noise amenity area	Time of day ¹	Recommended $L_{Aeq,period}$ noise level, dB	Project Amenity $L_{Aeq,period}$ noise Level, dB	Project Amenity noise Level, $L_{Aeq,15minute}$ dB
Residence	Rural	Morning shoulder	40	35	38
		Day	50	45	48
		Evening	45	40	43
		Night	40	35	N/A
	Suburban	Morning shoulder	40	35	38
		Day	55	50	53
		Evening	45	40	43
		Night	40	35	N/A

Notes: 1. Morning shoulder: 5:00 am to 7:00 am Monday to Saturday; 5:00 am to 8:00 am Sundays and public holidays; Day: 7:00 am to 6:00 pm Monday to Saturday; 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm.

5.2.3 Project noise trigger levels

Project noise trigger levels (PNTLs) are the lower (i.e. more stringent) of either the project intrusiveness or amenity levels. These are provided in Table 5.3.

Table 5.3 **Project noise trigger levels**

Assessment location	Intrusive noise level, $L_{Aeq,15minute}$, dB			Amenity noise level, $L_{Aeq,15minute}$, dB			PNTL, $L_{Aeq,15minute}$, dB		
	Morning Shoulder ¹	Day ¹	Evening ¹	Morning Shoulder ¹	Day ¹	Evening ¹	Morning Shoulder ¹	Day ¹	Evening ¹
A	46	51	51	38	53	43	38	51	43
B	46	51	51	38	53	43	38	51	43
C	46	51	51	38	53	43	38	51	43
D	46	51	51	38	53	43	38	51	43
E	46	51	51	38	53	43	38	51	43
F	46	51	51	38	48	43	38	48	43
G	42	46	46	38	48	43	38	46	43
H	38	40	45	38	48	43	38	40	43
I	38	40	45	38	48	43	38	40	43
J	35	40	35	38	48	43	35	40	35
K	38	40	45	38	48	43	38	40	43

Notes: 1. Morning shoulder: 5:00 am to 7:00 am Monday to Saturday; 5:00 am to 8:00 am Sundays and public holidays; Day: 7:00 am to 6:00 pm Monday to Saturday; 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm.

During the assessment process of MOD 9 (approved 2 December 2021), the EPA requested further information regarding why the evening PNTLs were higher than the day PNTLs for residences H and I. This was justified to the satisfaction of the NSW EPA by the following points:

- Changes in diurnal patterns are most likely due to weather effects and variances in traffic flow on the Pacific Highway.
- There is a direct correlation between the ambient background noise levels measured at locations G and H. This indicated that the primary influence on ambient and background levels is part of the broader environment and not something that is localised to a particular residence.
- Of ten long-term unattended noise monitoring periods undertaken at location G since February 2019 only one of those monitoring periods recorded an evening RBL less than the daytime (and even on this one occasion the day RBL (41 dB) only exceeded the evening RBL (40 dB) by 1 dB). On all other occasions the measured evening RBL was equal to or greater than the daytime RBL (ranging from equal to up to 6 dB higher). This clearly demonstrates that this is a long-term feature of the locality.

5.2.4 Maximum noise level event assessment

The quarry operations incorporate part of the night-time period (5:00 am to 7:00 am Monday to Friday and 6:00 am to 7:00 am Saturday). These night-time activities are limited to product loading and dispatch activity, which involves operation of the sales front end loader and road trucks to dispatch materials from site via the weighbridge. These activities will be affected by this modification and, therefore, an assessment of maximum noise level events is required.

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

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

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

Based on the guidance provided in the NPfI, Table 5.4 provides the sleep disturbance screening levels for the residential assessment locations.

Table 5.4 Maximum noise level event screening criteria

Assessment location	Adopted RBL, dB	Sleep disturbance screening levels, dB	
		$L_{Aeq,15minute}$	L_{Amax}
A	41	46	56
B	41	46	56
C	41	46	56
D	41	46	56
E	41	46	56
F	41	46	56
G	37	42	52

Assessment location	Adopted RBL, dB	Sleep disturbance screening levels, dB	
		L _{Aeq,15minute}	L _{Amax}
H	33	40	52
I	33	40	52
J	30	40	52
K	33	40	52

5.3 Low frequency noise

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

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels predicted or recorded should be compared to the values in Table C2 of the NPfl (EPA 2017), which has been reproduced in Table 5.5 below.

Table 5.5 One-third octave low-frequency noise thresholds

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

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

- where any of the one-third octave noise levels in Table 5.5 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period, or
- where any of the one-third octave noise levels in Table 5.5 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2 dB positive adjustment applies for the daytime period.

Low frequency noise from the proposed operations is discussed in Section 7.5 of this report.

5.3.1 Tonality and intermittent noise

As defined in the NPfl:

Tonal noise contains a prominent frequency and is characterised by a definite pitch.

While:

Intermittent noise is noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB(A); for example, equipment cycling on and off. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.

Tonal and intermittent noise from the proposed operations is discussed in Section 7.5 of this report.

5.4 Voluntary Land Acquisition and Mitigation Policy

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

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

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

But not:

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

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

Of most interest is the last point above relating to the relative noise impact of the proposed operation compared to the existing/approved development. The change in noise impacts is predicted to be negligible during operational hours for proposed MOD 11 as identified in Section 7.

The characterisation of the noise impacts (as outlined in the VLAMP and NPfI) are generally based on human perception to changes in noise levels as explained in the glossary of the acoustic terms in this report. For example, a change in noise level of 1–2 dB is typically indiscernible to the human ear. The characterisation of a residual noise impact of 0–2 dB above the PNTL is therefore considered negligible.

This characterisation of residual noise impacts is outlined further in Table 5.6.

Table 5.6 VLAMP characterisation of noise impacts and potential treatments

If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Characterisation of impacts	Potential treatment
All time periods 0-2 dB	Not applicable	Impacts are considered to be negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls.
All time periods 3-5 dB	< recommended amenity noise level > recommended amenity noise level but the increase in total cumulative industrial noise level resulting from development is <1 dB	Impacts are considered to be marginal	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.

If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Characterisation of impacts	Potential treatment
All time periods 3-5 dB	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is >1 dB	Impacts are considered to be moderate	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening > 5 dB	< recommended amenity noise level	Impacts are considered to be moderate	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening > 5 dB	> recommended amenity noise level	Impacts are considered to be significant	Provide mitigation as for moderate impacts and refer voluntary land acquisition provisions
Night > 5 dB	Not applicable	Impacts are considered to be significant	Provide mitigation as for moderate impacts and refer voluntary land acquisition provisions

Source: VLAMP (NSW Government 2018)

It is noted that as part of the MOD 9 approval (issued 2 December 2021), Schedule 4, Condition 5 was added to MP09_0175 to establish provisions for additional receptor mitigation upon request. If requested by the owner of the dwelling at location H, KEQPL is required to consider reasonable and feasible receptor mitigation measures consistent with the VLAMP. In the event that additional noise mitigation is required, additional noise mitigation measures consistent with the measures outlined in the VLAMP will be implemented. The measures must be reasonable and feasible, proportionate to the level of impact and directed towards reducing the noise impacts of the development. The MOD 11 application does not seek to amend this condition.

At the time of writing this NIA (February 2026), KEQPL are currently finalising an agreement with the landholder of location H for the provision of air conditioning in accordance with the VLAMP (2018).

5.5 Road traffic noise

The principal guidance to assess the impact of noise from project-related road traffic on public roads is the NSW Department of Environment, Climate Change and Water (DECCW) Road Noise Policy (RNP) (2011).

The road traffic noise assessment criteria for residential assessment locations, reproduced from Table 3 of the RNP for road categories relevant to the Project are provided in Table 5.7.

Table 5.7 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria, dB	
		Day (7:00 am to 10:00 pm)	Night (10:00 pm to 7:00 am)
Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	60 $L_{Aeq,15hour}$	55 $L_{Aeq,9hour}$

Source: RNP (DECCW 2011).

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB.

5.6 Operational and construction vibration

Vibration from operational activity (excluding blasting) is not anticipated to change as a result of the proposed modification when compared to that currently approved. The main potential sources of vibration from the site are movement of the dozer in the pit and/or front-end loaders in the stockpile areas. Given the separation distance of at least 600 m between the working areas and the nearest private residences, vibration levels from mobile plant are expected to be below that which could cause disturbance to residents.

It is noted that KEQPL has engaged a blasting consultant to undertake a separate assessment of impacts associated with blasting activities. Accordingly, a detailed assessment of blasting-related noise and vibration impacts have not been considered or assessed within the scope of this report.

6 Noise mitigation and management

6.1 Overview

Prior to the MOD8 approval (issued on 22 December 2020), an investigation was undertaken to identify and implement, where relevant, all feasible and reasonable noise mitigation measures. Extensive consideration of all feasible and reasonable mitigation measures was completed. The mitigation measures implemented have been shown, through measurement and feedback from the KEQ Community Consultative Committee (which includes members from neighbouring residences), to be effective in reducing off-site operational noise emission. Approval of MOD 9 (on 2 December 2021) resulted in additional commitments being established to mitigate and manage potential noise impacts from the site.

The following sections describe the measures that were deemed feasible and reasonable and installed at the site as well as those that were considered and discounted, including justification as to why they have not been implemented at the site.

6.2 Mitigation measures implemented

6.2.1 Noise mitigation measures

The following noise mitigation measures have been implemented at the Quarry in line with the Project Approval (established as part of the MOD8 and MOD9 approvals):

- Enclosure of the Jaw Crusher with 100 mm thick concrete panels on the North, East and South sides. Roofing materials to have an acoustic rating of STC28.
- Enclosure of the Cone Crushers on the Northern and eastern elevations with materials having an acoustic rating of STC28. Southern and western elevations and roof to be enclosed with Colorbond.
- Purchase and use of generator sets which are acoustically treated including complete enclosure of the engine and generator, acoustically treated exhaust systems and cooling systems.
- Noise compliance monitoring will be undertaken in accordance with conditions of consent and Noise Management Plan by a suitably qualified acoustic expert. The monitoring will consider the performance of the quarry in relation to the development specific noise (as established in the EMM Revised Noise Impact Assessment August 2021) and vibration and blast criteria established in the SLR Noise and Blasting Impact Assessment (dated 2 November 2012).
- The Applicant will manage blasts at the KHRQ and KEQ in a coordinated fashion (i.e. not firing at the same time).
- The Applicant will implement a blasting program where nearby receptors are notified in advance of a blast.
- The following control measures for vibration will be undertaken:
 - reducing the maximum instantaneous charge (MIC) by using delays, reduced hole diameter and/or deck loading
 - changing the burden and spacing by altering the drill pattern and/or delay layout or altering the hole inclination
 - use the minimum practicable sub drilling which gives satisfactory toe conditions

- investigate alternative rock breaking techniques.
- The following control measures for air blasting will be undertaken:
 - reducing the maximum instantaneous charge (MIC) by using delays, reduced hole diameter and/or deck loading
 - ensure stemming depth and type is adequate
 - eliminate exposed detonating cord and secondary blasting
 - restrict blasting events to favourable weather conditions
 - orient quarry faces away from potentially sensitive receptors
 - use a hole spacing and burden which will ensure that the explosive force is just sufficient to break the ore to the required size
 - the Applicant will take particular care where the face is already broken and consider deck loading where appropriate to avoid broken ground or cavities in the face.
- Splitting or hammering of Class 1 (700–1,200 mm) and Class 2 (400–700 mm) rock will not be undertaken after 6:00 pm.
- The Applicant will implement training to ensure staff are aware of the sensitivity of noise emissions.
- Product will be loaded into trucks from as low a height as possible.
- Loading of Class 1 (700–1,200 mm) and Class 2 (400–700 mm) rock for dispatch during the following hours will be undertaken via excavator ‘grabs’ using the hydraulic excavator rock grab attachment rather than a bucket attachment:
 - 5:00 am to 7:00 am, Monday to Friday
 - 6:00 pm to 9:00 pm, Monday to Friday
 - 9:00 pm to 10:00 pm, Monday to Friday on up to 50 calendar days per year
 - 6:00 am to 7:00 am, Saturdays.

6.2.2 Other mitigation measures implemented

The following additional mitigation measures have also been undertaken/implemented:

- A review of mobile plant (loaders, excavators and trucks) used on the site was undertaken. The review included testing the acoustic performance of a sample of the machines to enable comparison to other similar machines available on the market. The KEQ loaders and excavators were found to be examples of the best available noise levels for the class of machine.

- Haul trucks were found to perform below the best available in the market however, with engines already enclosed, it was determined that further engineered noise attenuation would not be effective. Hence, investigations were completed with the aim of minimising off-site noise emissions from haul trucks through site design. The following measures have been implemented and have been found to improve off-site noise emissions from haul trucks:
 - Inclusion of the dump hopper into the jaw crusher building has resulted in reduction of the intermittent and audible noise generated by engines at high idle as the material slides against the steel body of the truck as it is being unloaded.
 - Incorporation of windrows along the internal quarry haul roads. The barrier has the demonstrated effect of reducing noise from gearboxes or transmissions.
 - Training of operators to use higher gears and lower engine acceleration where practical. Investigations identified that this measure resulted in reductions of up to 1-3 dB.
- Other site design considerations implemented include:
 - Installation of the generators on the western side of the fuel tanks (which are adjacent to the cone crusher enclosure). This has increased acoustical shielding of these sources to the residences east of the site.
 - Openings for the crusher buildings (including the jaw crusher and cone crushers) are located on the western side of the buildings.
 - Arrangements for stockpiles encourage loading from the western side of the stockpile.
 - Road access away from the quarry pit and plant is downhill. Speed limits have been implemented (30 km/h) to reduce the impact of exhaust noise generated by trucks leaving the site when under load.
 - Long term review of the quarry pit design to provide natural barriers to receptors to the east of the quarry earlier in the Quarry life.

6.3 Other mitigation measures considered but not Implemented

The following provides a summary of the mitigation measures that were considered and determined not to be feasible or reasonable. These measures have not been implemented at the Quarry.

- Installation of a 4 m high barrier around stockpile areas was previously modelled. It was identified that the barrier would have negligible benefit for receptors east of the quarry.
- Separate operation of the primary (jaw crusher) and secondary (cone crushers) crushing plants so that these plants do not run simultaneously. This measure would provide some acoustic benefit by limiting the number of pieces of equipment operating at any one time on the site. However, this would substantially restrict the overall quantity of material able to be produced (to a level below the approved extraction rate). This was not considered a sustainable (or reasonable) noise mitigation measure.

- Investigations were completed in relation to acoustic treatment of radiator inlets and outlets of the mobile equipment. The investigations confirmed that attenuation of these areas was impractical due to the additional restriction being placed on the cooling fans requiring higher fan speeds and as a result producing greater noise levels requiring attenuation. The overall effect resulted in no further noise reduction of the machine.
- Alternative exhaust systems for mobile equipment were investigated however was not possible due to insufficient space on the machine. Further, noise emissions would likely increase as a result of having to remove the secondary muffler system and exhausting nearer to ground level.

7 Operational noise assessment

7.1 Overview

This section presents the methods and base parameters used to model noise emissions from the KEQ, including the effects of noise-enhancing meteorological conditions.

Noise modelling was based on three-dimensional digitised ground contours of the surrounding land and surface infrastructure. The operational noise model represents a snapshot of typical operations, with equipment placed at various locations and heights, representing realistic scenarios.

Noise predictions were carried out using DMGR's iNoise software incorporating the ISO 9613 'Acoustics – Attenuation of sound during propagation outdoors' algorithm. iNoise calculates total noise levels at assessment locations from concurrent operation of multiple noise sources. The model considers factors such as the lateral and vertical location of plant, source-to-receptor distances, ground effects, atmospheric absorption, topography of the surface facilities area and surrounds and applicable meteorological conditions.

7.2 Extraction staging

In order to accurately model the noise emissions over the project lifecycle, three distinct critical stages representing the progressive extraction sequence have been developed relevant to noise emissions:

- Stage 1: Extract the current top benches of the remnant highwall from RL135 down to RL90 (currently lowest KEQ bench at the time of writing (February 2026)), forming a single extraction level/area on Lot 12. The noise modelling for this stage assumes extraction equipment operating at RL135 in a worst-case location.
- Stage 2: Extract Lot 12 from RL90 (currently lowest KEQ bench at the time of writing (February 2026), down to RL65 to in line with KHRQ pit floor and KEQ boot-bin levels, forming a single extraction level/area over the entire Consolidated Extraction Area. The noise modelling for this stage assumes extraction equipment operating at RL90 in a worst-case location.
- Stage 3: Extract Lots 12 & 13 (KEQ) from RL65 down to RL45. The KHRQ pit floor is to remain at RL65. The noise modelling for this stage assumes extraction equipment operating at RL65 in a worst-case location.

7.3 Meteorology

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

A simple yet conservative approach has been selected for the consideration of potentially noise-enhancing weather conditions with reference to Fact Sheet D of the NPfI. Noise emissions from the quarry have been predicted for noise-enhancing conditions.

7.4 Plant and equipment

The operational noise model considered a representative snapshot of surface operations with equipment placed at locations representing a realistic operational scenario. Adopted locations of plant and equipment are shown in Appendix B.

Equipment sound power levels have been based on measurements undertaken at the site as provided by Thearle Acoustics and confirmed by EMM via on and off-site noise measurements undertaken in June 2021. A summary of the acoustically significant fixed and mobile equipment items considered in the noise model is provided Table 7.1. The sound power levels provided here are representative of activities undertaken at the Quarry.

Table 7.1 Acoustically significant plant and equipment for noise modelling

Item	Sound power level per item (dBA)	Quantity operating		
		Morning shoulder	Day	Evening
Jaw crusher	114	Nil	1	1
Primary screen	108	Nil	1	1
Secondary screens (2, 3 and 4)	103	Nil	3	3
Cone crushers	103	Nil	2	2
Vertical shaft impactor (Barmac)	106	Nil	1	1
Drill rig	114	Nil	1	Nil
Excavator	102	Nil	2	2
Diesel generator set	98	Nil	3	3
Front end loader (operations)	104	Nil	2	2
Front end loader (sales)	104	1	1	1
Haul trucks ¹	107	Nil	4	4
Road truck	103	11	11	11

Notes: 1. It is assumed that two haul trucks continuously operate between the pit and the jaw crusher, and two haul trucks continuously operate between the processing area and the sales stockpiles.

7.5 Noise model validation and modifying factors

As outlined in Sections 3.2 and 4, Quarry noise levels at the nearest residences are summarised as follows:

- Location G: noise from the Quarry is often audible alongside Highway traffic and has been measured as high as $L_{Aeq,15minute}$ 43 dB during the day period under noise-enhancing weather conditions.
- Location H: noise from the Quarry is often audible alongside Highway traffic and has been measured as high as $L_{Aeq,15minute}$ 44 dB during the day period under noise-enhancing weather conditions.

Existing Quarry noise at locations G and H are predicted to be $L_{Aeq,15minute}$ 39 dB and $L_{Aeq,15minute}$ 44 dB, respectively. Hence, there is a relatively good correlation between predicted levels and the noise emission from the Quarry measured during noise enhancing weather conditions. The operational noise model is therefore considered appropriate for the purpose of determining noise impacts from the Quarry.

Annoying noise characteristics, as defined in the NSW Noise Policy for Industry (NPfI), have been considered in this assessment to determine whether any modifying factor corrections are warranted.

Site operations are not considered to exhibit tonal or intermittent characteristics, consistent with the intent of the NPfI. Review of historical compliance noise monitoring data confirms that no tonal or intermittent modifying factors have previously applied. Accordingly, no further assessment of these characteristics has been undertaken.

As there are no additional plant or equipment proposed, it is reasonable to conclude that such characteristics will remain absent under ongoing operations.

With respect to low-frequency noise, a screening review of predicted single-octave band centre frequencies was undertaken for the nearest receptors. This review indicated that, during evening operations, low-frequency noise levels at Location H may marginally exceed the NPfI LFN threshold levels in the 80-160 Hz frequency range. Further, Historical noise monitoring data indicates that low-frequency modifying factor corrections may apply during evening operations at Location H. On this basis, this modifying factor has been applied to predicted operational noise levels during the evening period only as the processing plant is not proposed for operation during the morning shoulder. In accordance with the NPfI methodology, a modifying factor does not apply during the day period given the exceedance of the threshold levels is less than 5 dB.

Given that the dominant low-frequency noise sources remain unchanged, and historical noise monitoring indicates that low-frequency modifying factor corrections have not typically been applicable, no low-frequency modifying factor adjustments have been applied at any other assessment location.

7.6 Operational noise assessment

Operational noise emissions for each proposed period of operation are summarised in Table 7.2. Indicative noise contours for morning shoulder, daytime and evening operations are provided in Appendix C.

Table 7.2 Operational noise predictions

Location	Period	Predicted noise level MOD 11 operations L _{Aeq,15minute} dB			PNTL L _{Aeq,15minute} dB	Existing noise limit L _{Aeq,15minute} dB
		Stage 1	Stage 2	Stage 3		
A	Morning shoulder	<30	<30	<30	38	35
	Day	39	39	39	51	42
	Evening	39	39	39	43	40
B	Morning shoulder	<30	<30	<30	38	35
	Day	<35	<35	<35	51	40
	Evening	34	33	33	43	40
C	Morning shoulder	<30	<30	<30	38	35
	Day	<35	<35	<35	51	40
	Evening	<30	<30	<30	43	35
D	Morning shoulder	<30	<30	<30	38	35
	Day	<35	<35	<35	51	40
	Evening	31	32	32	43	35
E	Morning shoulder	<30	<30	<30	38	35
	Day	<35	<35	<35	51	40
	Evening	31	31	31	43	35

Location	Period	Predicted noise level MOD 11 operations L _{Aeq,15minute} dB			PNTL L _{Aeq,15minute} dB	Existing noise limit L _{Aeq,15minute} dB
		Stage 1	Stage 2	Stage 3		
F	Morning shoulder	<30	<30	<30	38	35
	Day	<35	<35	<35	48	40
	Evening	<30	<30	<30	43	35
G	Morning shoulder	<30	<30	<30	38	35
	Day	39	39	39	46	43
	Evening	39	39	39	43	39
H	Morning shoulder	<30	<30	<30	38	35
	Day	45	44	44	40	44
	Evening	47 ¹	46 ¹	46 ¹	43	46
I	Morning shoulder	<30	<30	<30	38	35
	Day	37	37	37	40	40
	Evening	37	37	37	40	37
J	Morning shoulder	<30	<30	<30	35	35
	Day	<35	<35	<35	40	40
	Evening	<30	<30	<30	35	35
K	Morning shoulder	<30	<30	<30	38	35
	Day	<35	<35	<35	40	40
	Evening	34	34	34	40	35

Notes: 1. This predicted noise level includes a positive 2 dB modification factor to account for the low frequency noise from the processing plant.

During Stage 1, quarry noise emissions are predicted to be below (i.e. comply with) the relevant existing morning shoulder, daytime and evening noise limits as per Schedule 3, Condition 3 of Project Approval MP09_0175 at most assessment locations. The exception is a negligible 1 dB exceedance of the existing daytime (L_{Aeq,15minute} 44 dB) and evening (L_{Aeq,15minute} 46 dB) noise limits at Location H.

During Stages 2 & 3, quarry noise emissions are predicted to be below (i.e. comply with) the relevant existing morning shoulder, daytime and evening noise limits as per Schedule 3, Condition 3 of Project Approval MP09_0175 at all assessment locations.

During all stages, 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 an exceedance at location H during the day and evening periods during all three stages. Proposed morning shoulder operations are predicted to meet the relevant PNTL at this location.

As provided in Section 6, an extensive investigation has previously been undertaken to identify and implement, where relevant, all feasible and reasonable noise mitigation measures. Measures that have been implemented include, but are not limited to, enclosures of the jaw crusher, cone crushers and generators as well as a review of the operating sound power level of mobile equipment.

As provided in Section 2.4, the dwelling at location H was approved and built after the KEQ commenced operations. The approval for this dwelling, issued by MidCoast Council (DA 69/2018/A), also included the establishment and operation of a truck depot. The approval includes a condition of consent for acoustic treatment of the building to limit the noise impacts from the established quarry.

Furthermore, as part of the MOD 9 approval (issued 2 December 2021), Condition 5 of Schedule 4 was added to Project Approval MP09_0175 to establish provisions for additional receptor mitigation at location H upon request (consistent with the VLAMP). MOD 11 does not seek to amend this condition and at the time of writing (February 2026), KEQPL are currently finalising agreement with the landholder of location H for the provision of air conditioning in accordance with the VLAMP (2018).

Given the negligible (1 dB) and temporary nature of the predicted exceedance, the significant noise mitigation measures previously implemented (refer Section 6), the acoustic treatment applied to the dwelling (specifically noting that it was established after the quarry) and provision of air conditioning through the applicable voluntary at-receptor mitigation under the VLAMP (refer Section 5.4), it is anticipated that any potential impact on location H will be minimal. On this basis, no further consideration of additional mitigation measures is warranted. A revised noise condition is proposed in Section 7.9.

Where noise emissions from an existing site are predicted to exceed NPfI PNTLs, the relevant regulatory authorities and proponent will determine achievable noise limits through negotiation and discussion with relevant stakeholders as required, in accordance with Section 6.1.1 of the NPfI.

7.7 Sleep disturbance (maximum noise level assessment)

Consideration has been given to likely maximum noise level events at the nearest residential assessment locations during the morning shoulder period to determine the potential for sleep disturbance.

Typical maximum noise events are likely to include reversing alarms and impacts associated with loading and/or unloading material. A typical conservative sound power level of L_{Amax} 125 dB has been used to predict potential sleep disturbance impacts at residential assessment locations. Predicted $L_{Aeq,15minute}$ noise levels for the night period were taken from Table 7.2 and compared against the relevant sleep disturbance trigger levels.

Noise modelling results for the assessment of sleep disturbance are shown in Table 7.3 for noise-enhancing meteorological conditions.

Table 7.3 Predicted maximum noise event levels – noise enhancing meteorological conditions

Assessment location	Predicted noise level, dB		Maximum noise screening criteria, dB	
	$L_{Aeq,15minute}$	L_{Amax}	$L_{Aeq,15minute}$	L_{Amax}
A	<30	46	46	56
B	<30	38	46	56
C	<30	31	46	56
D	<30	37	46	56
E	<30	36	46	56
F	<30	27	46	56
G	<30	50	42	52
H	<30	52	40	52
I	<30	48	40	52

Assessment location	Predicted noise level, dB		Maximum noise screening criteria, dB	
	L _{Aeq,15minute}	L _{Amax}	L _{Aeq,15minute}	L _{Amax}
J	<30	35	40	52
K	<30	45	40	52

Results of noise modelling demonstrate that maximum noise level events are predicted to satisfy the relevant maximum noise level event screening criteria at all assessment locations under noise-enhancing meteorological conditions. Hence, it is unlikely that the project will cause sleep disturbance at any residential receptors.

7.8 Cumulative noise

Potential cumulative noise impacts from existing and future developments are addressed under the procedures of the NSW Noise Policy for Industry (NPfI), which ensures that project noise trigger levels are set to maintain acceptable cumulative noise amenity levels. Cumulative operational noise is generally assessed against the recommended amenity noise levels in Table 2.2 of the NPfI. However, if a standalone project complies with the more stringent project amenity noise levels (i.e. the recommended amenity levels minus 5 dB), cumulative impacts are not expected, as this allowance accounts for industrial noise contributions from multiple sites or projects. Future developments would also be required to apply the same NPfI framework, thereby maintaining consistency in the cumulative noise management approach.

Notwithstanding the above, cumulative noise levels have been compared to the recommended amenity noise levels as outlined in the NPfI for each relevant receptor. Cumulative noise contours for both KEQ and KHRQ operations have been provided in Appendix D.

During all stages, quarry noise emissions are predicted to be below (i.e. comply with) the relevant recommended amenity noise level during all periods of operations at all assessment locations.

Further, and following the acquisition of Lot 11, KEQPL (and affiliated companies) are also the proponent for the proposed Karuah South Quarry (KSQ) located on the southern portion of the acquired land parcel.

In relation to cumulative noise impacts from this proposal, it is of note that:

- If progressed, KSQ will not commence operations until the cessation of operations at KHRQ.
- The applicant is currently reviewing the business case for the KSQ project and the potential to integrate this within the existing KEQ and KHRQ quarry assets.
- Any future revision or amendment to the proposed KSQ project will be supported by an updated NIA that accounts for the revised Karuah Pit Consolidation and KSQ projects.

7.9 Proposed replacement noise condition

Given the outcomes of the above operational noise predictions, it is appropriate to update the operational noise criteria condition (Schedule 3, Condition 3 of Project Approval MP09_0175). Provide below is a recommended replacement condition:

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 the table below at any residence on privately-owned land.

Noise Assessment Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Morning Shoulder L _{Aeq,15minute}	Morning Shoulder L _{AMax}
A	42	40	35	52
B	40	40	35	52
G	43	39	35	52
H	45	47	35	52
I	40	37	35	52
All other residences	40	35	35	52

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

8 Road traffic noise assessment

Based on the annual production limit, which is not proposed to change as a result of the proposed modification, the following summarises the traffic generation of Karuah East Quarry:

- a total of 432 vehicle movements per day which equates to 216 despatched loads per day
- a maximum hourly traffic flow of 44 vehicle movements which equates to 22 despatched loads during that hour.

The project will not affect the number of vehicle movements or their arrival/departure patterns. Road traffic noise impacts are not predicted as a result of the project.

9 Noise monitoring

The Karuah East Quarry Project Noise Management Plan will be updated upon determination of the modification, to reflect the appropriate changes associated with the project. Quarterly daytime noise monitoring is currently undertaken at Receptors A, B, F, G & H in accordance with the approved Noise Management Plan (Version 4C, EMM 2024). If compliance is determined at locations A, B, F, G and H then compliance can be inferred at all other locations.

Upon approval of this modification, application will be made to vary EPL 20611 applicable to KEQ, as well as revision of the Noise Management Plan where required.

10 Conclusion

Karuah East Quarry Pty Limited (KEQPL) propose to modify the Karuah East Quarry (KEQ) Project Approval (MP09_0175) concurrently with the Karuah Hard Rock Quarry (KHRQ) Development Consent (DA265-10-2004) to form the Karuah Pit Consolidation Project. The project is primarily aimed at extracting previously sterilised resource within the remnant dividing highwall between the two extraction areas of the KEQ and KHRQ as well as within other cleared areas from the KEQ site.

A Section 4.55(2) modification (MOD 11) to the KEQ will be lodged concurrently with a reciprocal Section 4.55(2) modification (MOD 2) to the separate KHRQ Development Consent (DA 265-10-2004) to facilitate the project. EMM Consulting has been commissioned to prepare a Noise Impact Assessment to support each Modification Application. This NIA is prepared specifically for the KEQ MOD 11 application (and should be read in conjunction with the NIA prepared for the KHRQ MOD 2).

The KEQ is currently approved to extract, process and transport up to 1.5 million tonnes of quarry product annually. These rates are not affected by the proposal and are not proposed to change.

The proposed modification to KEQ (MOD11) consists of the following key components:

- Concurrently modify both the KEQ and KHRQ consents to extract the known resource contained within already disturbed areas of Lot 12 DP1024564, Lot 13 DP1024564 and Lot 11 DP1024564 including the dividing highwall, within the currently approved excavation depths of RL45 at KEQ and RL65 at KHRQ. Extraction within the consolidated extraction area will occur in three (3) stages.
- Minor extension and overlap of extraction boundary of both KEQ and KHRQ extraction areas to holistically encompass the highwall structure, inclusive of appropriate safety offsets.
- Extension of the KEQ extraction area to the east (within already disturbed areas of the KEQ within Lot 13 DP 1024564).
- Minor extension of the KEQ disturbance area at the north-eastern boundary. This includes an area of approximately 4,690 m² that is highly degraded and comprised entirely of exotic and disturbed vegetation that has been historically cleared and managed to support a now redundant powerline corridor (infrastructure has been previously removed). With the inclusion of this area, the total site disturbance area of KEQ will increase nominally from 40.18 Ha to approximately 40.65 Ha.
- Formalise a total life of quarry extraction of 28.32 Mt (a nominal reduction from the 29 million tonnes anticipated in the original KEQ Project Approval documentation).
- Continued environmental management including update of relevant Management Plans
- Changes to approved blasting activities (cumulative reduction across both quarry sites from 3 to 2 and extending blasting hours to 9 am to 5 pm weekdays at both sites).
- Revised final landform resulting in a 'free draining' landscape resulting in reduced geotechnical risk over the long term and with greater consistency with the existing surrounding environment.

Operational noise from the KEQ has been assessed in accordance with the methodology outlined in the NPfI for existing sites. Noise goals (PNTLs) were established based on the results of ambient noise monitoring. Operational noise levels from approved operations were calculated and compared to the results of operator-attended noise monitoring to demonstrate the suitability of the noise model. Calculated noise levels correlated well with measured noise levels at the nearest noise assessment locations.

During Stage 1, quarry noise emissions are predicted to be below (i.e. comply with) the relevant existing morning shoulder, daytime and evening noise limits as per Schedule 3, Condition 3 of Project Approval MP09_0175 at most assessment locations, with the exception being a negligible 1 dB exceedance at Location H during the day and evening periods.

During Stages 2 & 3, quarry noise emissions are predicted to be below (i.e. comply with) the relevant existing morning shoulder, daytime and evening noise limits as per Schedule 3, Condition 3 of Project Approval MP09_0175 at all assessment locations.

During all stages, 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 an exceedance at location H during the day and evening periods during all three stages. Proposed morning shoulder operations are predicted to meet the relevant PNTL at this location.

Given the negligible (1 dB) and temporary nature of the predicted exceedance combined with the significant noise mitigation measures previously implemented (refer Section 6), the acoustic treatment applied to the dwelling (specifically noting that it was established after the quarry) and the provision of air conditioning through the applicable voluntary at-receptor mitigation under the VLAMP (refer Section 5.4), it is anticipated that any potential impact on location H will be minimal. On this basis, no further consideration of additional mitigation measures is warranted.

Where noise emissions from an existing site are predicted to exceed NPfI PNTLs, the relevant regulatory authorities and proponent will determine achievable noise limits through negotiation and discussion with relevant stakeholders as required, in accordance with Section 6.1.1 of the NPfI. A replacement operational noise condition has been proposed in Section 7.9.

Cumulative noise impacts from KEQ and KHRQ have been assessed against the recommended amenity noise levels as outlined in the NPfI for each relevant receptor. During all stages, quarry noise emissions are predicted to be below (i.e. comply with) the relevant recommended amenity noise level during all periods of operations at all assessment locations.

Following the acquisition of Lot 11, KEQPL (and affiliated companies) are the proponent for the proposed KSQ on the southern portion of the land. In terms of cumulative noise considerations, if progressed, KSQ will not commence until operations at the KHRQ have ceased. The applicant is reviewing the business case for the integration of KSQ with the existing KEQ and KHRQ assets, and any future revision or amendment to KSQ will be supported by an updated noise and vibration impact assessment reflecting the revised Karuah Pit Consolidation and KSQ projects.

Vibration from operational activity (excluding blasting) is not anticipated to change as a result of the proposed modification compared to that currently approved. KEQPL has engaged a blasting consultant to undertake a separate assessment of the impacts associated with blasting activities. Accordingly, a detailed assessment of blasting-related noise and vibration impacts have not been considered or assessed within the scope of this report.

Road traffic noise generated by quarry-related traffic is predicted to achieve relevant road traffic noise goals.

Upon determination of MOD 11, as necessary, the KEQ NMP will be updated to include the proposed changes associated with MOD 11 and an application will be made to vary the site's Environment Protection Licence (EPL), EPL 20611.

References

EMM Consulting (EMM) 2021, Karuah East Quarry Modification 9 Response To Submissions: Revised Noise Impact Assessment

EMM Consulting (EMM) 2024, Karuah East Quarry Noise Management Plan

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

NSW Department of Planning, Housing & Infrastructure, Project Approval MP09-0175

NSW Environment Protection Authority (EPA) 2000, Industrial Noise Policy (INP)

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

NSW Government 2018, Voluntary Land Acquisition and Mitigation Policy (VLAMP)

SLR Consulting (SLR) 2012, Karuah East Quarry Project Noise & Blasting Impact Assessment

Thearle Acoustics 2019, Karuah East Quarry Noise Impact Assessment

Glossary

Technical terms typically utilised in a noise assessment report are explained in Table G.1.

Table G.1 **Glossary of acoustic terms and abbreviations**

Abbreviation or term	Description
ABL	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L_{A90} statistical noise levels.
Amenity noise criteria	The amenity noise criteria relate to the overall level of industrial noise. Where existing levels of industrial noise (excluding the subject development) approach the acceptable amenity noise criteria, then noise levels from new industries need to demonstrate that they will not be an additional contributor to existing industrial noise.
A-weighting	There are several different weightings utilised for describing noise, the most common being the 'A-weighting'. This attempts to closely approximate the frequency response of the human ear.
C-weighting	There are several different weightings utilised for describing noise, with the 'C-weighted' scale typically used to assess low frequency noise and is also utilised in the assessment of occupational noise.
Day period	Monday–Saturday: 7:00 am to 6:00 pm, on Sundays and public holidays: 8:00 am to 6:00 pm.
dB	Noise is measured in units called decibels (dB).
DPHI	Department of Planning, Housing and Infrastructure
EA	Environmental assessment
EMM	EMM Consulting Pty Limited
EP&A Act	<i>Environmental and Planning Assessment Act 1979</i> (NSW)
EPA	The NSW Environment Protection Authority (formerly the Department of Environment, Climate Change and Water).
Evening period	Monday–Saturday: 6:00 pm to 10:00 pm, on Sundays and public holidays
INP	Industrial Noise Policy
Intrusive noise criteria	The intrusive noise criteria refer to noise that intrudes above the background level by more than 5 dB. The intrusiveness criterion is described in detail in Section 5.2.1.
L_{A1}	The A-weighted noise level exceeded for 1% of the time.
L_{A10}	The A-weighted noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{A90}	The A-weighted noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{Aeq}	The A-weighted energy average noise level. This is the equivalent continuous sound pressure level over a given period. The $L_{Aeq,15\text{minute}}$ descriptor refers to an L_{Aeq} noise level measured over a 15-minute period.
Linear peak	The peak level of an event is normally measured using a microphone in the same manner as linear noise (i.e. unweighted), at frequencies both in and below the audible range.
L_{Amax}	The maximum A-weighted sound pressure level received during a measurement interval.
Night period	Monday–Saturday: 10:00 pm to 7:00 am, on Sundays and public holidays: 10:00 pm to 8:00 am.

Abbreviation or term	Description
NMP	Noise management plan
NPfi	Noise Policy for Industry
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
PNTL	Project noise trigger level
PSNL	The project-specific noise level (PSNL) is criteria for a particular industrial noise source or industry. The PSNL is the lower of either the intrusive noise criteria or amenity noise criteria.
RBL	The rating background level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the average background levels.
RNP	Road Noise Policy
SEARs	Secretary's environmental assessment requirements
Sound power level (L_W)	A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

It is useful to have an appreciation of decibels (dB), the unit of noise measurement. Table G.2 gives an indication as to what an average person perceives about changes in noise levels. Examples of common noise levels are provided in Figure G.1.

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

Change in sound level (dB)	Perceived change in noise
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

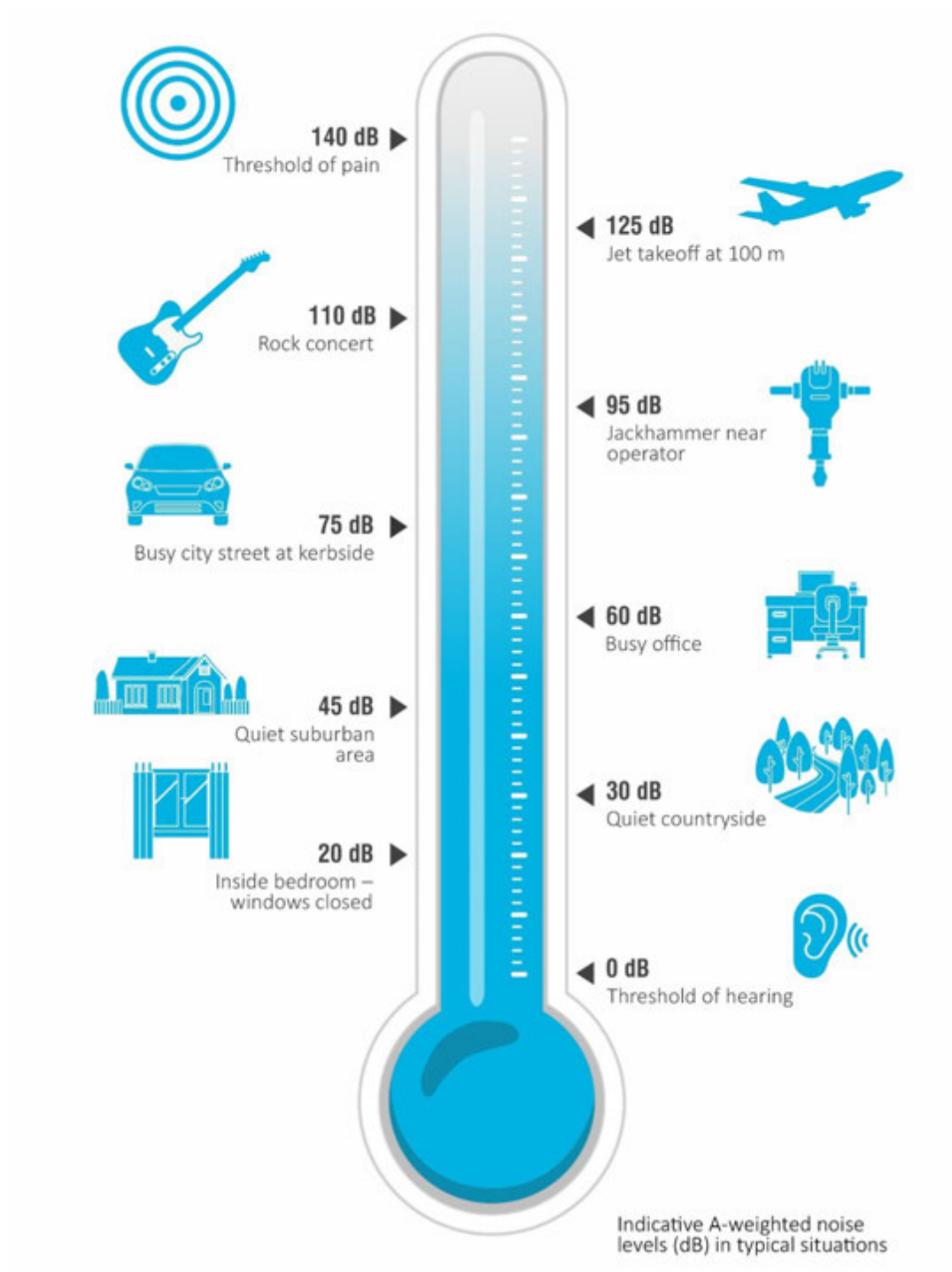


Figure G.1 Common noise levels

Appendix A

Existing ambient noise levels

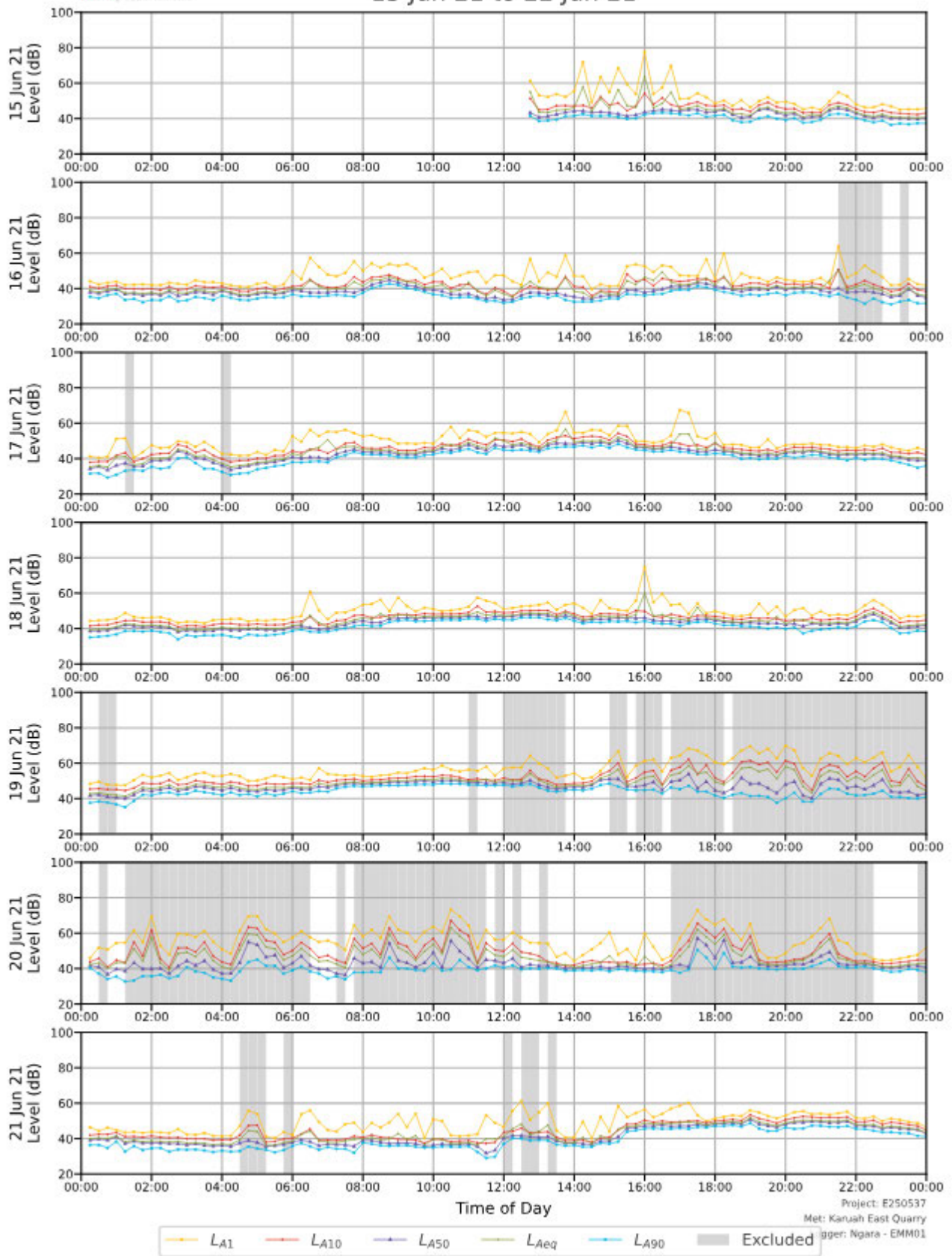
A.1 NM1 - Location H

Table A.1 Summary of daily noise logging results – NM1

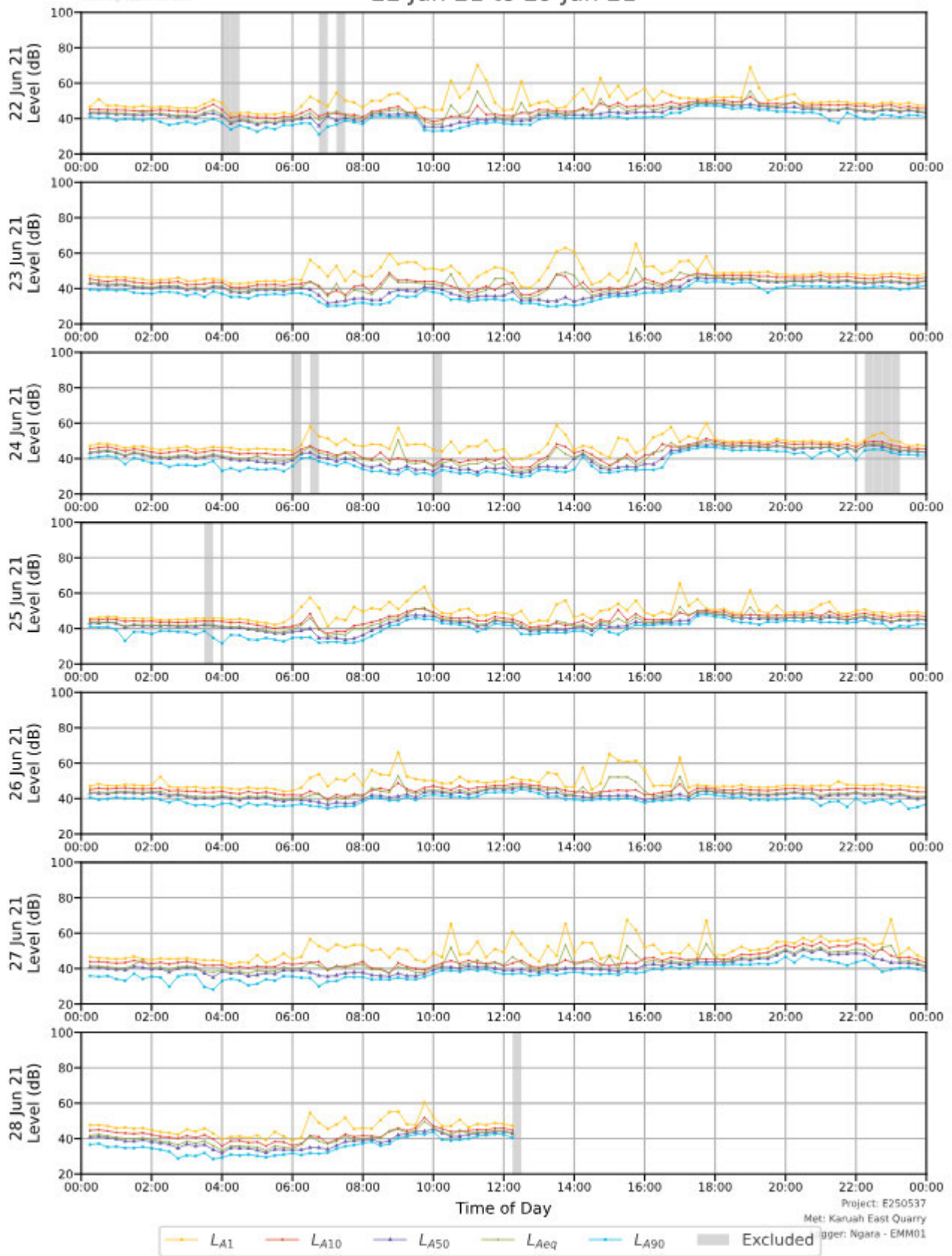
Date	RBL (Day)	RBL (Evening)	RBL (Night)	L _{Aeq,11hour} dB (Day)	L _{Aeq,4hour} dB (Evening)	L _{Aeq,9hour} dB (Night)
Tuesday, 15/06/21	39	38	33	70	44	39
Wednesday, 16/06/21	33	0	31	43	0	42
Thursday, 17/06/21	42	40	35	49	44	41
Friday, 18/06/21	42	39	37	49	44	46
Saturday, 19/06/21	0	0	0	0	0	0
Sunday, 20/06/21	0	0	0	0	0	0
Monday, 21/06/21	34	45	35	44	50	44
Tuesday, 22/06/21	35	40	35	46	48	42
Wednesday, 23/06/21	31	40	34	44	45	43
Thursday, 24/06/21	31	41	33	43	47	43
Friday, 25/06/21	36	43	36	46	47	43
Saturday, 26/06/21	38	37	30	46	43	41
Sunday, 27/06/21	34	42	30	46	49	43
Monday, 28/06/21	36	0	0	44	0	0
Overall	35	40	34	59	47	43

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

Unattended Logger Levels at NM1 - Location H 15 Jun 21 to 22 Jun 21



Unattended Logger Levels at NM1 - Location H 22 Jun 21 to 29 Jun 21



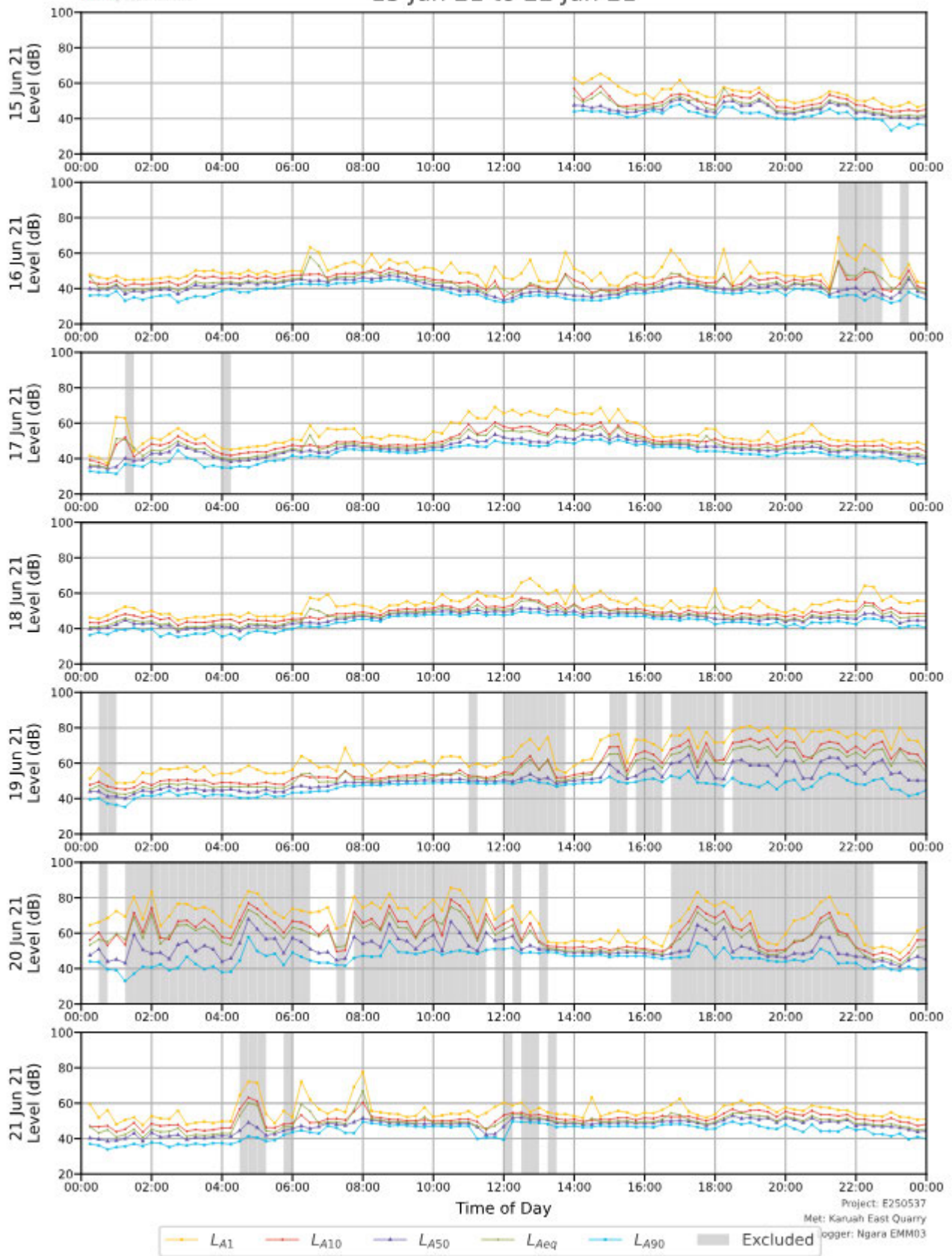
A.2 NM2 – Location G

Table A.2 Summary of daily noise logging results – NM2

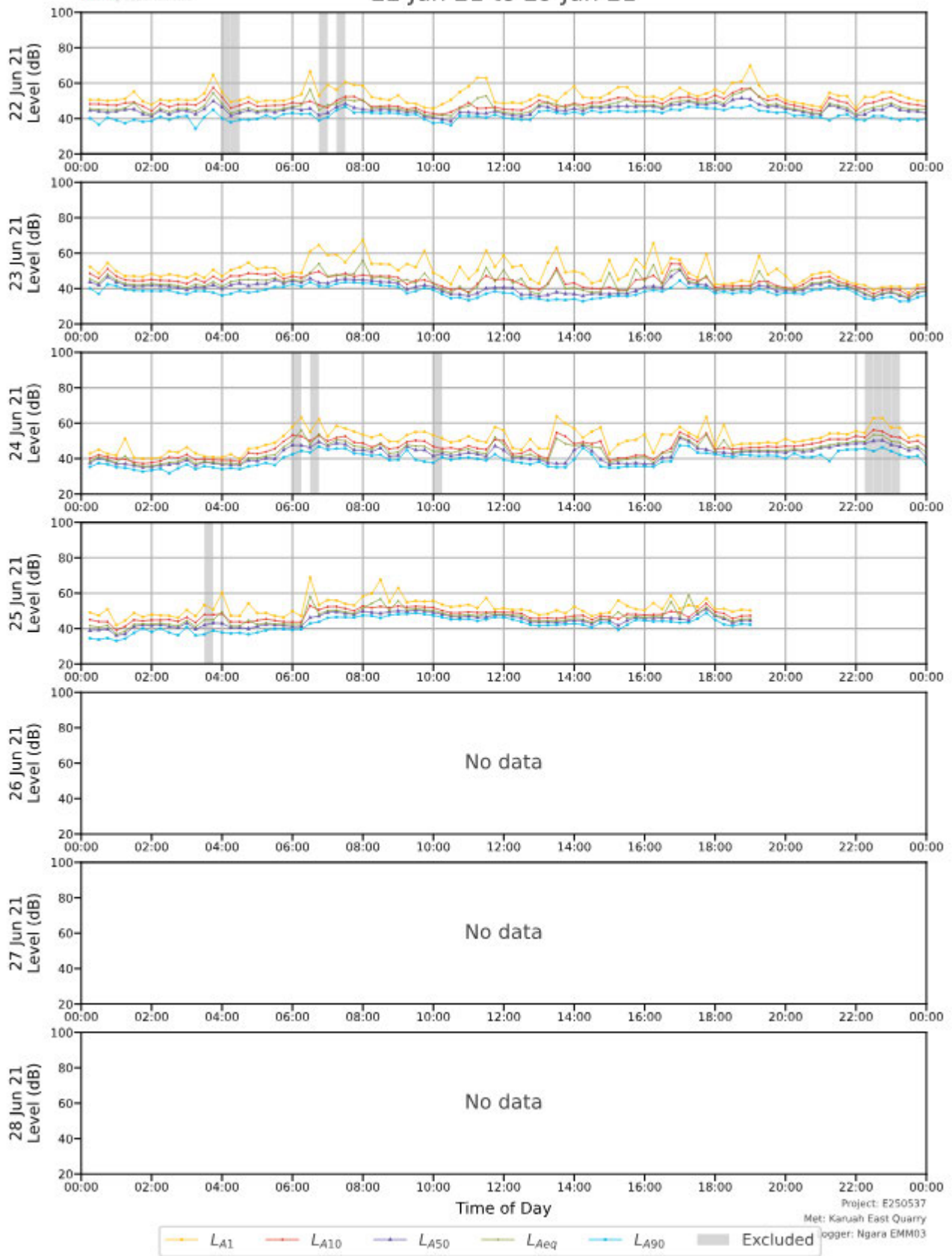
Date	RBL (Day)	RBL (Evening)	RBL (Night)	L _{Aeq,11hour} dB (Day)	L _{Aeq,4hour} dB (Evening)	L _{Aeq,9hour} dB (Night)
Tuesday, 15/06/21	41	40	34	67	50	46
Wednesday, 16/06/21	33	0	32	44	0	46
Thursday, 17/06/21	44	41	35	53	46	44
Friday, 18/06/21	45	42	40	51	47	48
Saturday, 19/06/21	0	0	0	0	0	0
Sunday, 20/06/21	0	0	0	0	0	0
Monday, 21/06/21	43	44	38	54	52	48
Tuesday, 22/06/21	39	40	37	48	50	46
Wednesday, 23/06/21	34	37	33	47	43	45
Thursday, 24/06/21	35	40	35	47	47	48
Friday, 25/06/21	42	42	0	50	45	0
Overall	41	41	35	58	48	47

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

Unattended Logger Levels at NM2 - Location G 15 Jun 21 to 22 Jun 21



Unattended Logger Levels at NM2 - Location G 22 Jun 21 to 29 Jun 21



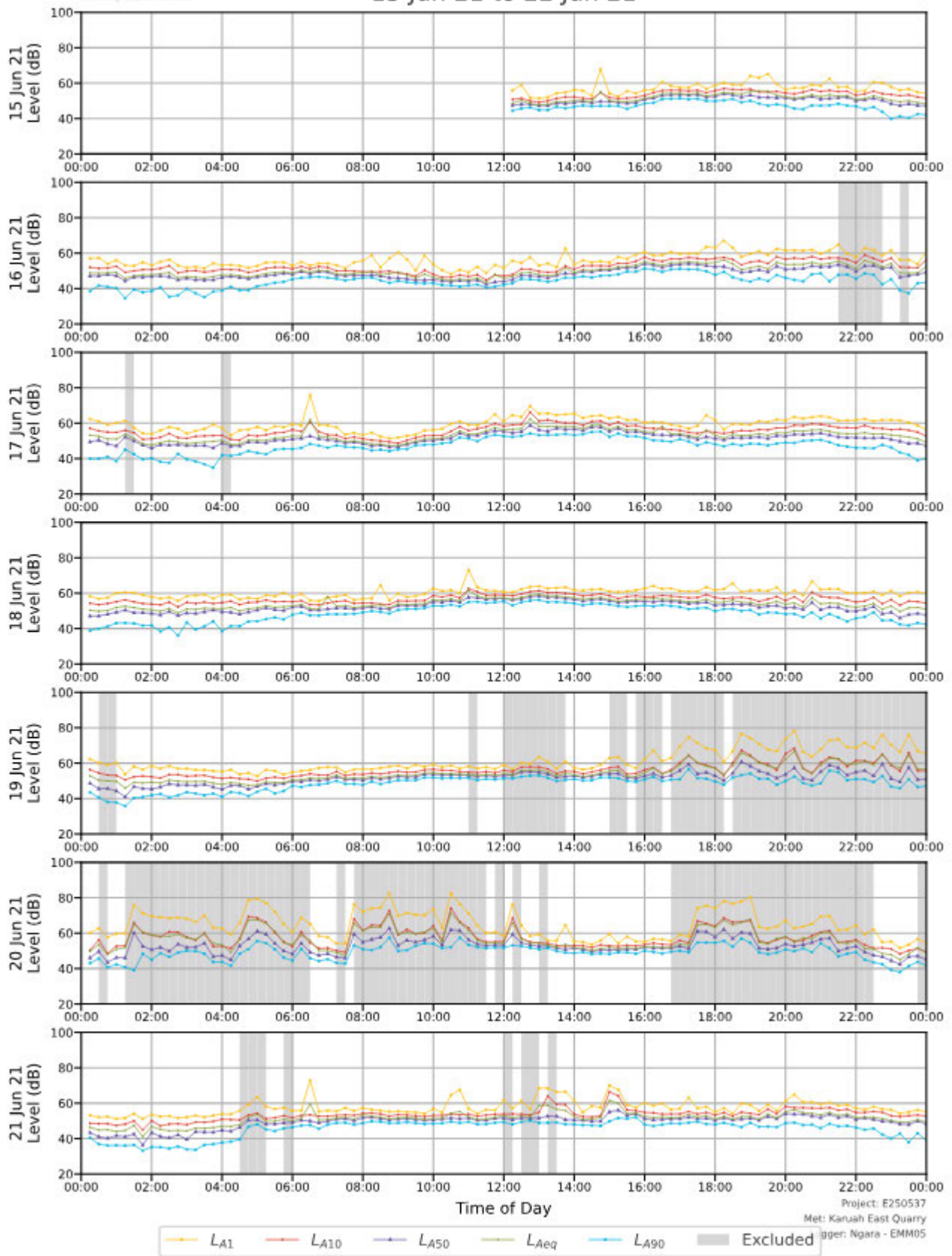
A.3 NM3 – Location A

Table A.3 Summary of daily noise logging results – NM3

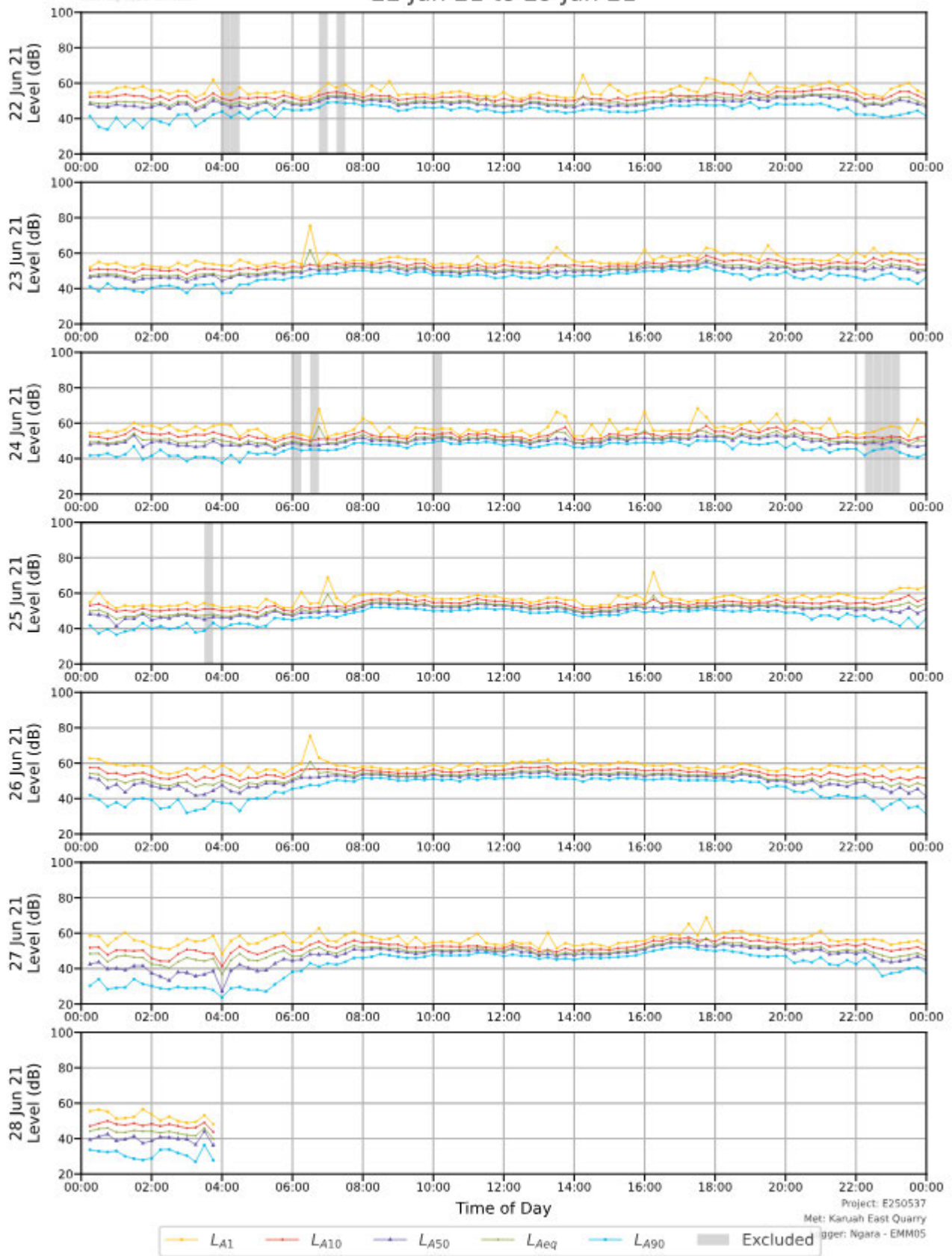
Date	RBL (Day)	RBL (Evening)	RBL (Night)	L _{Aeq,11hour} dB (Day)	L _{Aeq,4hour} dB (Evening)	L _{Aeq,9hour} dB (Night)
Tuesday, 15/06/21	45	46	37	72	54	49
Wednesday, 16/06/21	42	0	38	51	0	52
Thursday, 17/06/21	46	47	39	56	54	52
Friday, 18/06/21	49	46	40	56	54	50
Saturday, 19/06/21	0	0	0	0	0	0
Sunday, 20/06/21	0	0	0	0	0	0
Monday, 21/06/21	48	46	35	54	53	50
Tuesday, 22/06/21	44	45	38	50	53	51
Wednesday, 23/06/21	46	45	40	52	52	51
Thursday, 24/06/21	46	45	39	52	53	50
Friday, 25/06/21	48	46	34	53	53	52
Saturday, 26/06/21	50	41	28	54	52	48
Sunday, 27/06/21	46	43	28	52	52	46
Overall	46	46	38	62	53	50

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

Unattended Logger Levels at NM3 - Location A 15 Jun 21 to 22 Jun 21



Unattended Logger Levels at NM3 - Location A 22 Jun 21 to 29 Jun 21



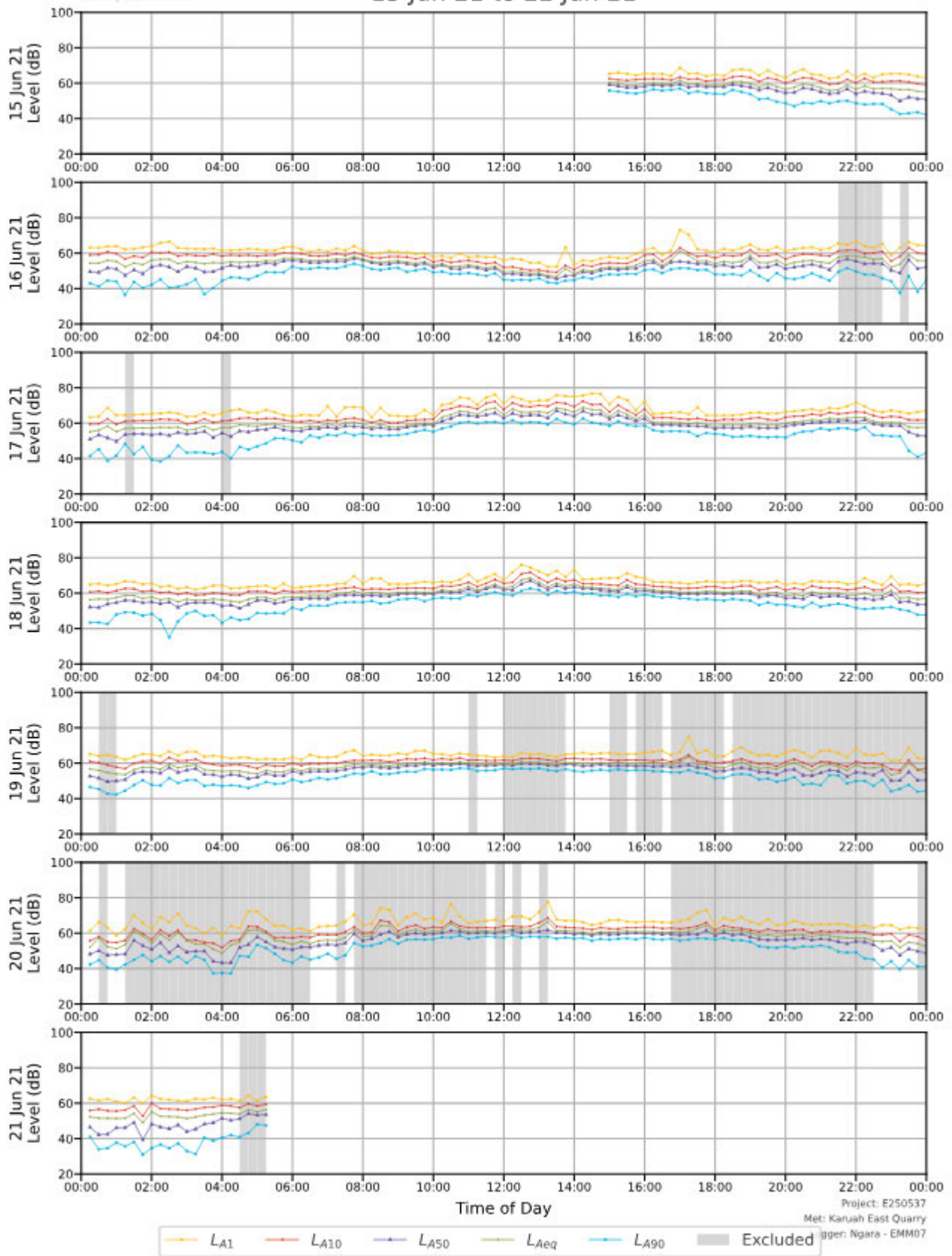
A.4 NM4 – West of Location F

Table A.4 Summary of daily noise logging results – NM4

Date	RBL (Day)	RBL (Evening)	RBL (Night)	L _{Aeq,11hour} dB (Day)	L _{Aeq,4hour} dB (Evening)	L _{Aeq,9hour} dB (Night)
Tuesday, 15/06/21	54	49	41	75	59	56
Wednesday, 16/06/21	45	0	39	54	0	57
Thursday, 17/06/21	53	52	43	65	61	58
Friday, 18/06/21	55	52	46	63	60	57
Saturday, 19/06/21	0	0	0	0	0	0
Sunday, 20/06/21	0	0	34	0	0	54
Overall	54	52	41	70	60	56

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

Unattended Logger Levels at NM4 - West of Location F 15 Jun 21 to 22 Jun 21



Appendix B

Modelled noise sources



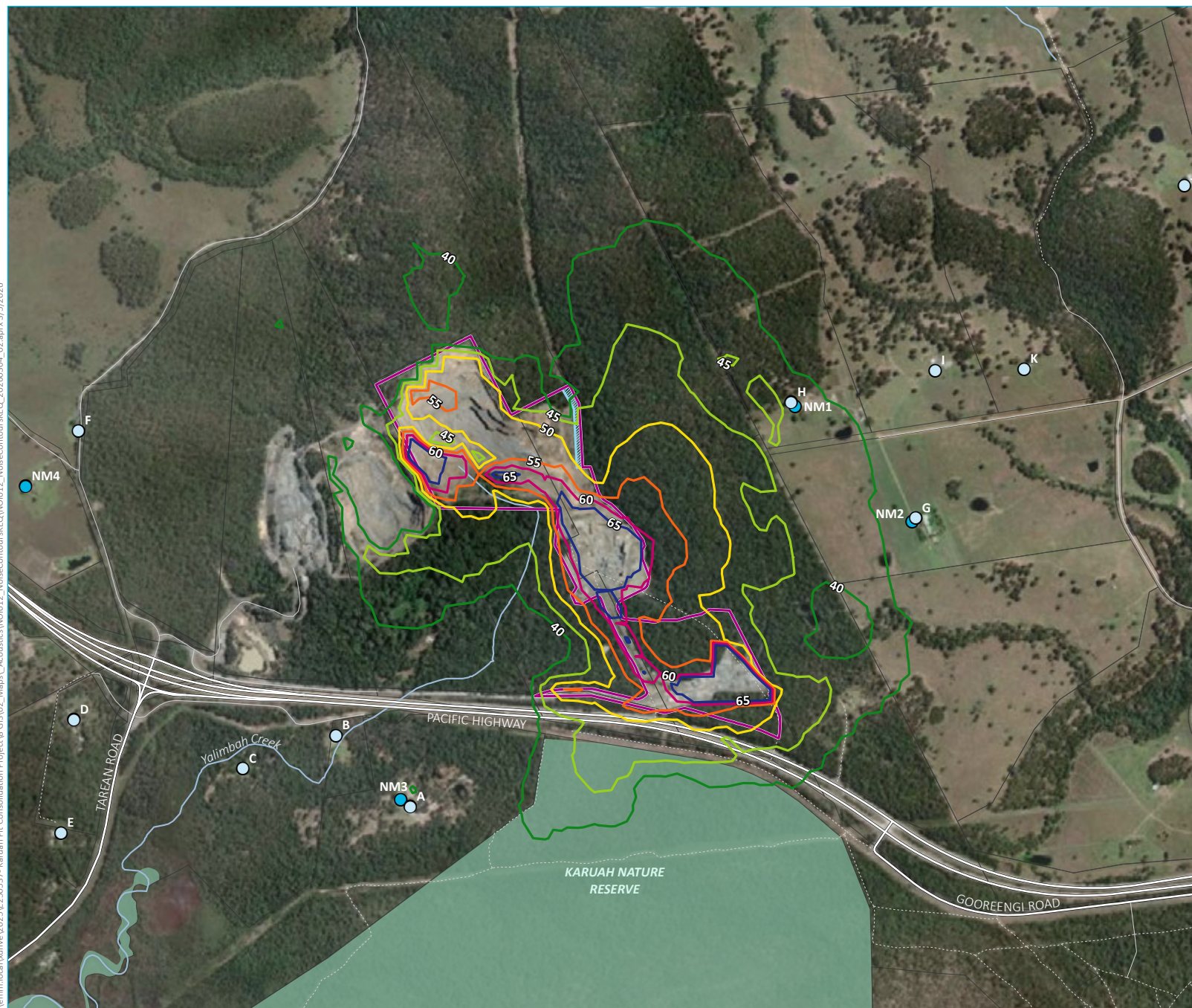




Appendix C

Operational noise contours

\\emm.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Acoustics\NOI012_NoiseContoursKEQ_NOI012_NoiseContoursKEQ_20260304_02.aprx 3/5/2026



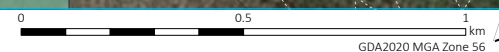
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- KEQ approved disturbance boundary
 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 1
(Day)

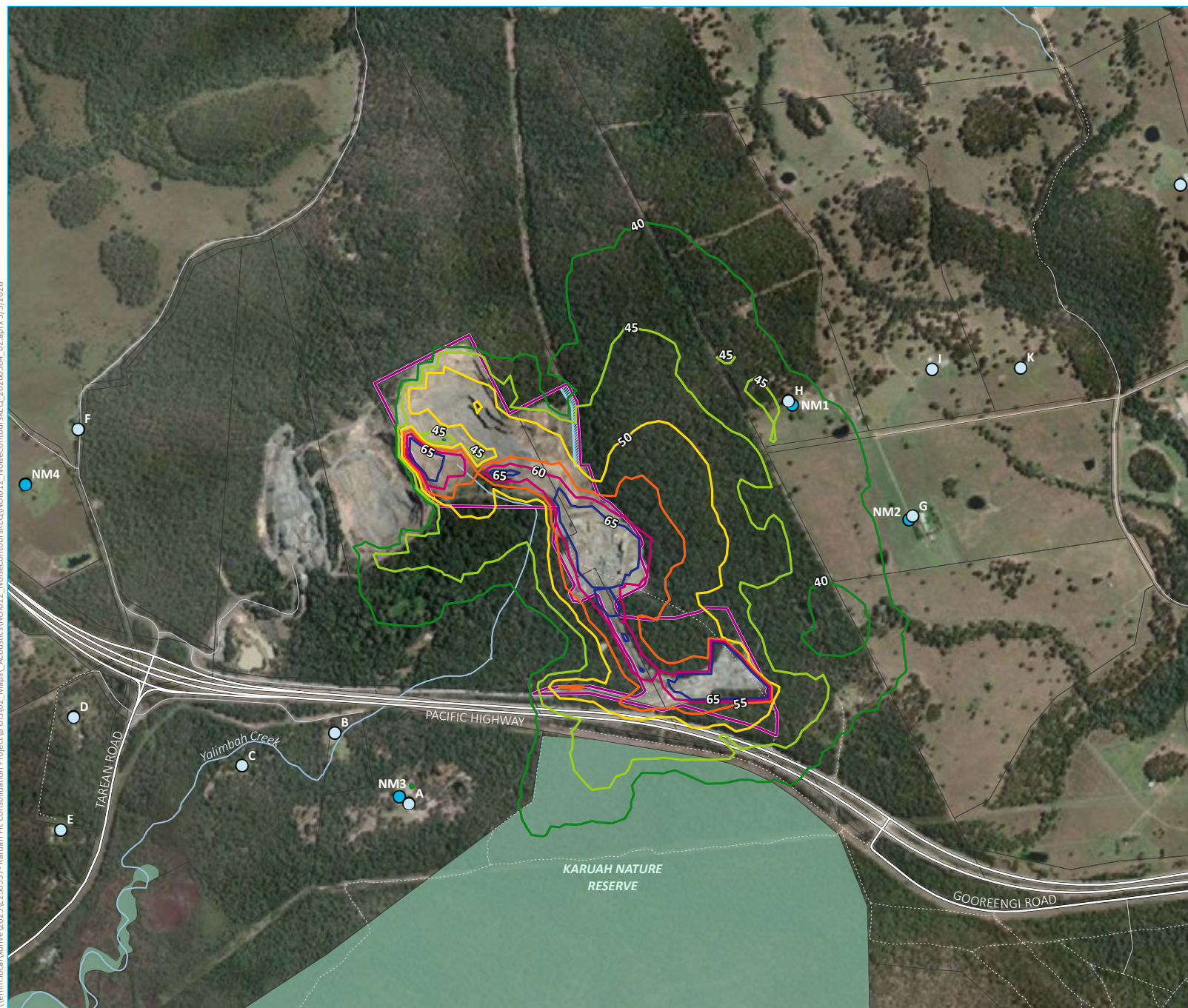
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure C.1



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



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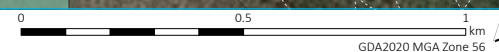
- KEY**
- KEQ approved disturbance boundary
 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)**
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
- Major road
 - Minor road
 - - - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 1 (Evening)

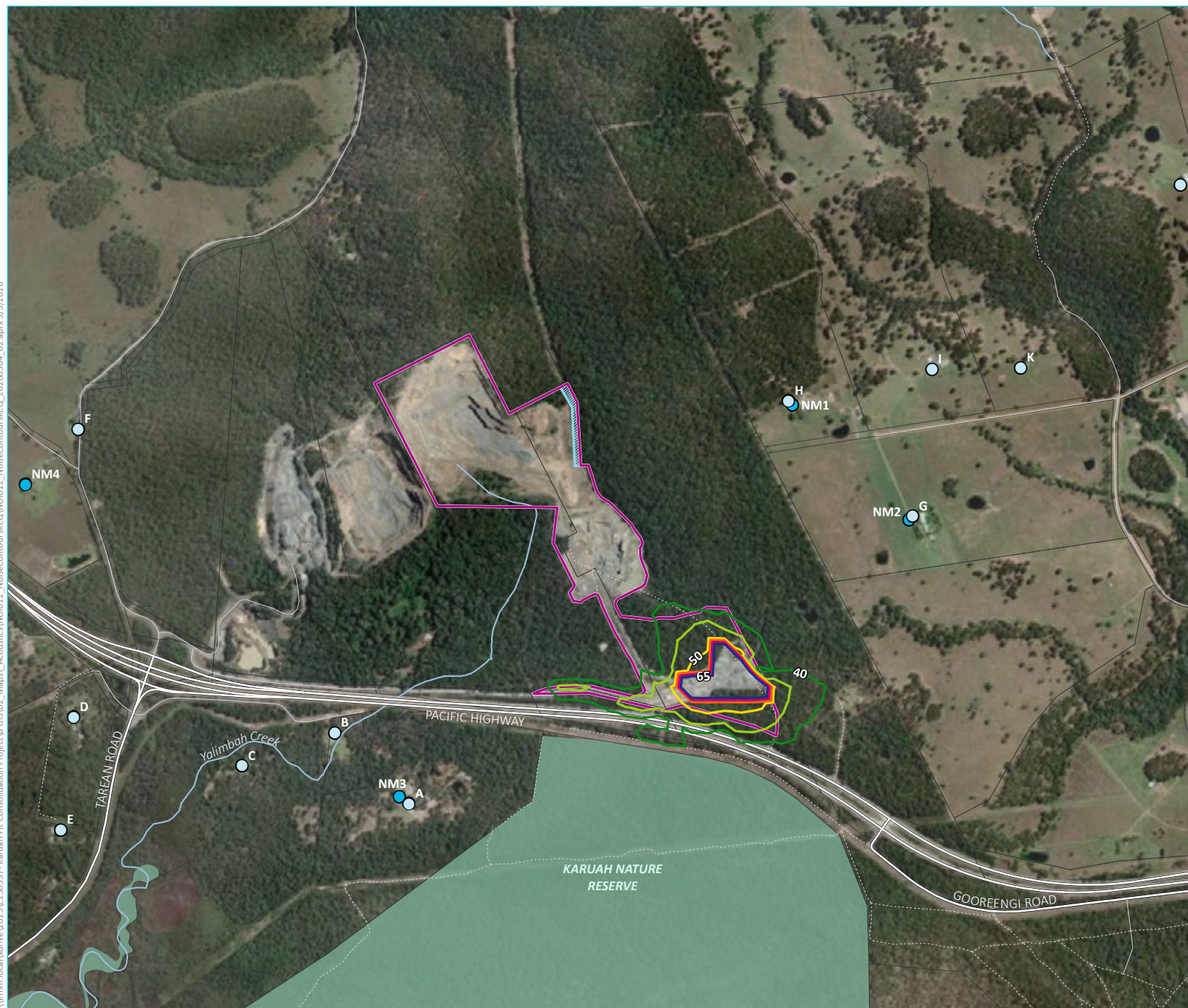
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure C.2



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



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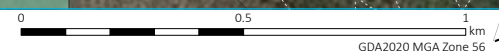
- KEY
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 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 1 (Morning Shoulder)

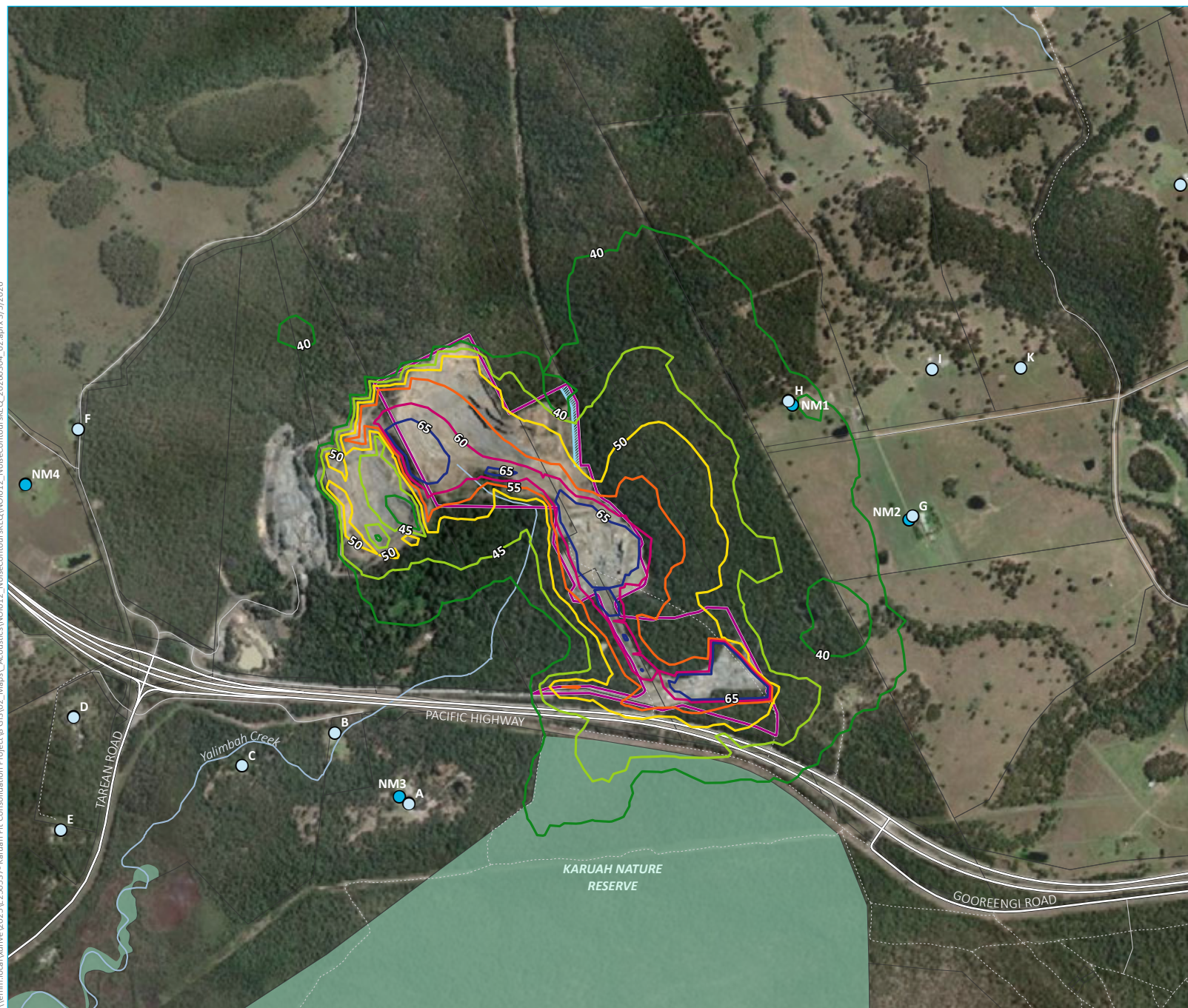
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure C.3



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



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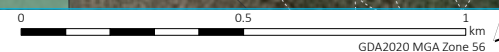
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 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)**
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
- Major road
 - Minor road
 - - - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 2 (Day)

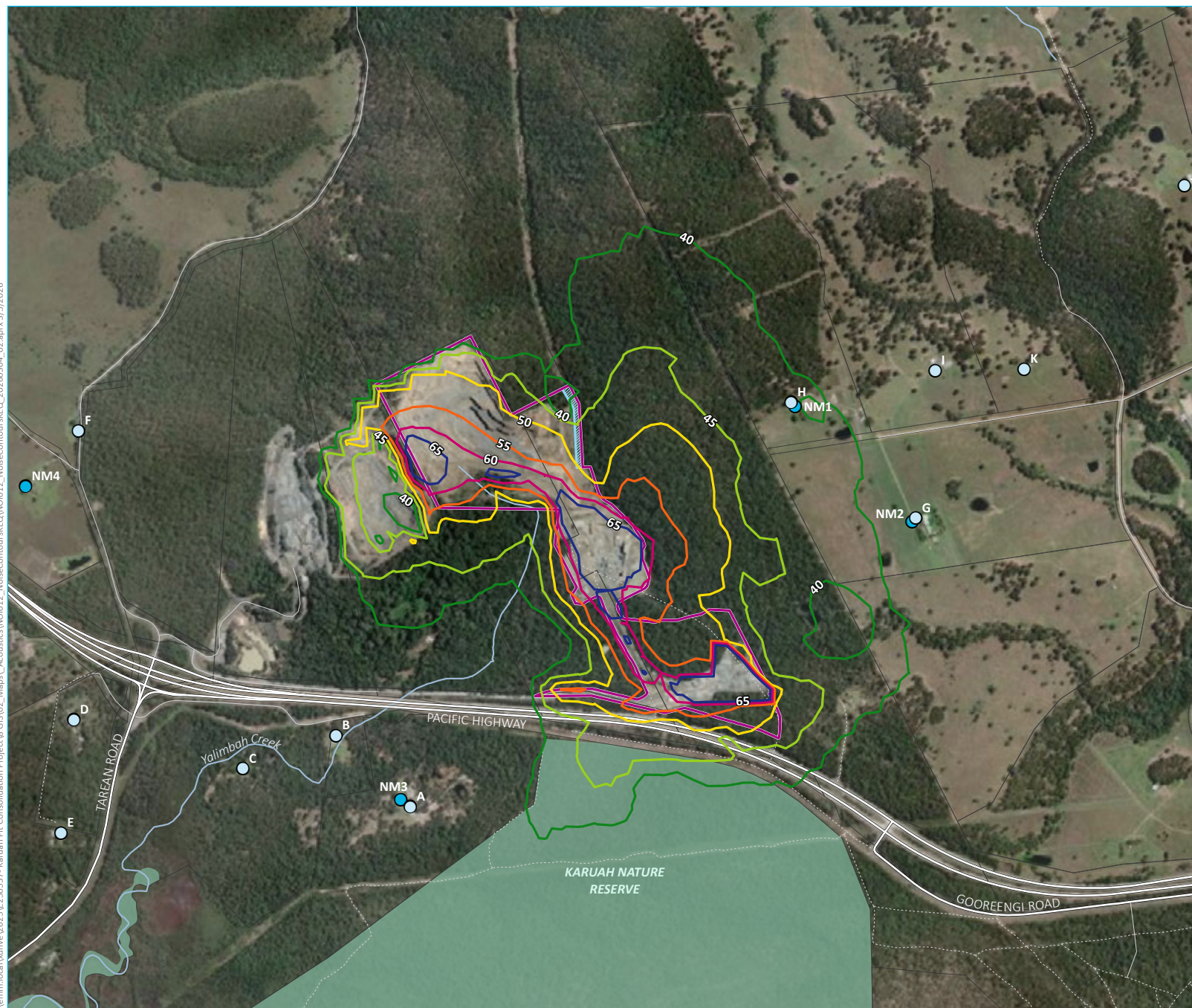
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure C.4



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



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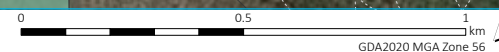
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 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 2
(Evening)

Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure C.5



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



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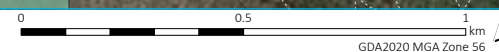
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 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)**
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
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 - Minor road
 - - - - - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 2 (Morning Shoulder)

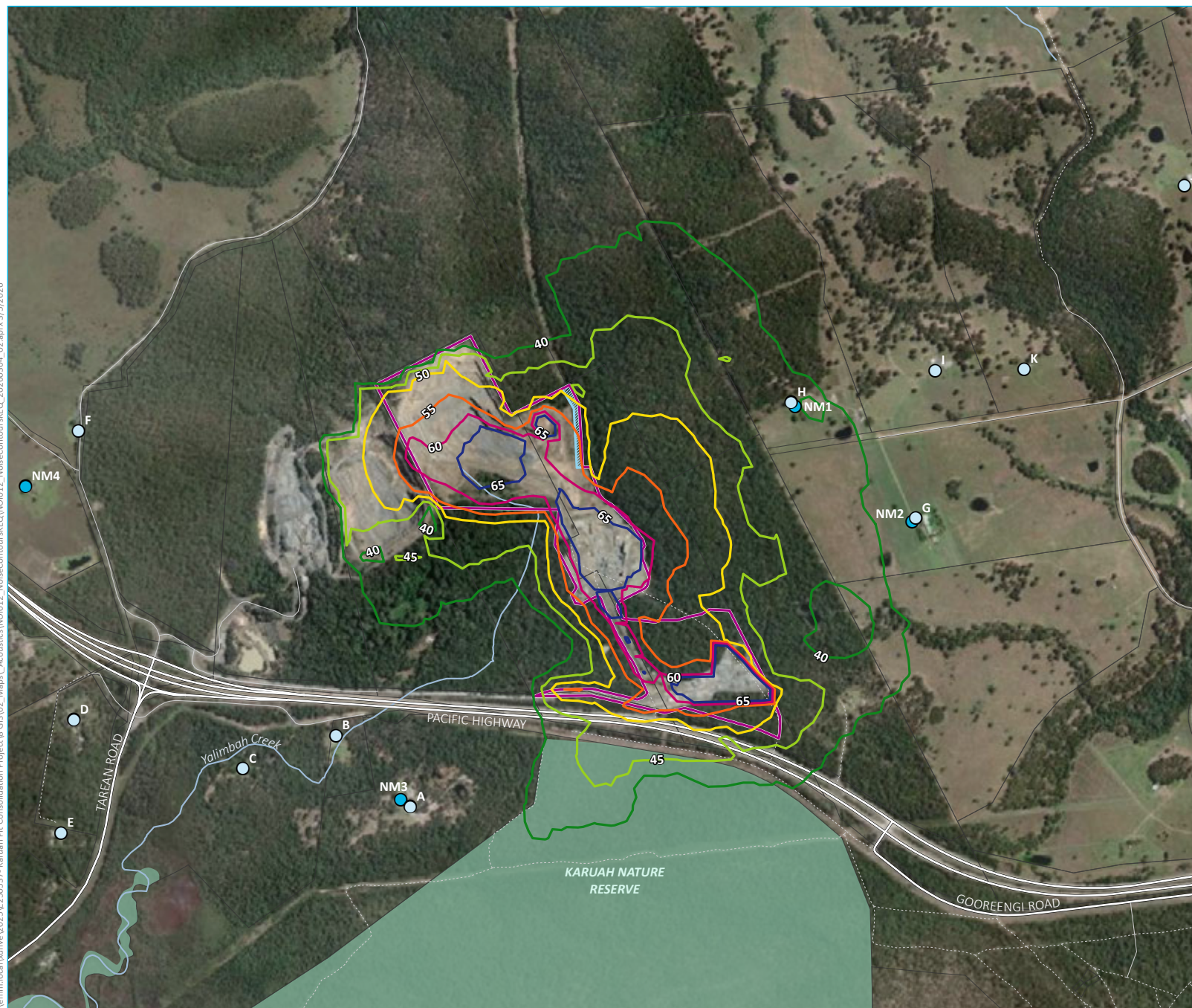
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure C.6



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



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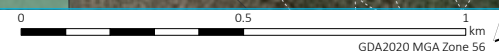
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 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 3
(Day)

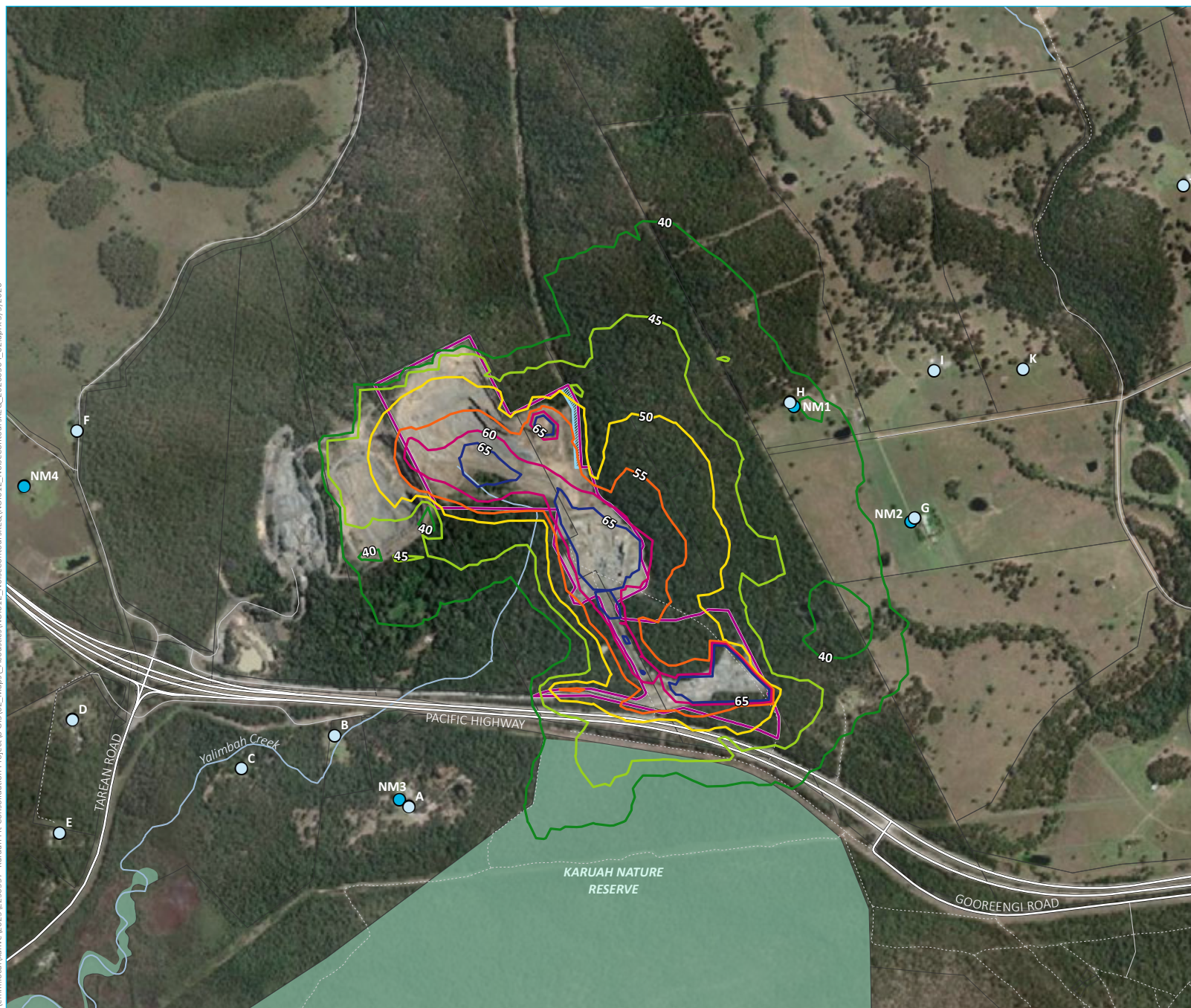
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure C.7



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



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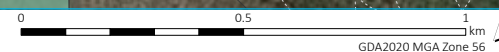
- KEY
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 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 3 (Evening)

Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure C.8



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



\\emm.local\drive\2025\250537-Karuah Pit Consolidation Project\8 GIS\02_Maps\Acoustics\NOI012_NoiseContoursKEQ\NOI012_NoiseContoursKEQ_20260304_02.aprx 3/5/2026



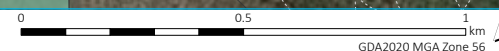
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 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 3 (Morning Shoulder)

Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure C.9



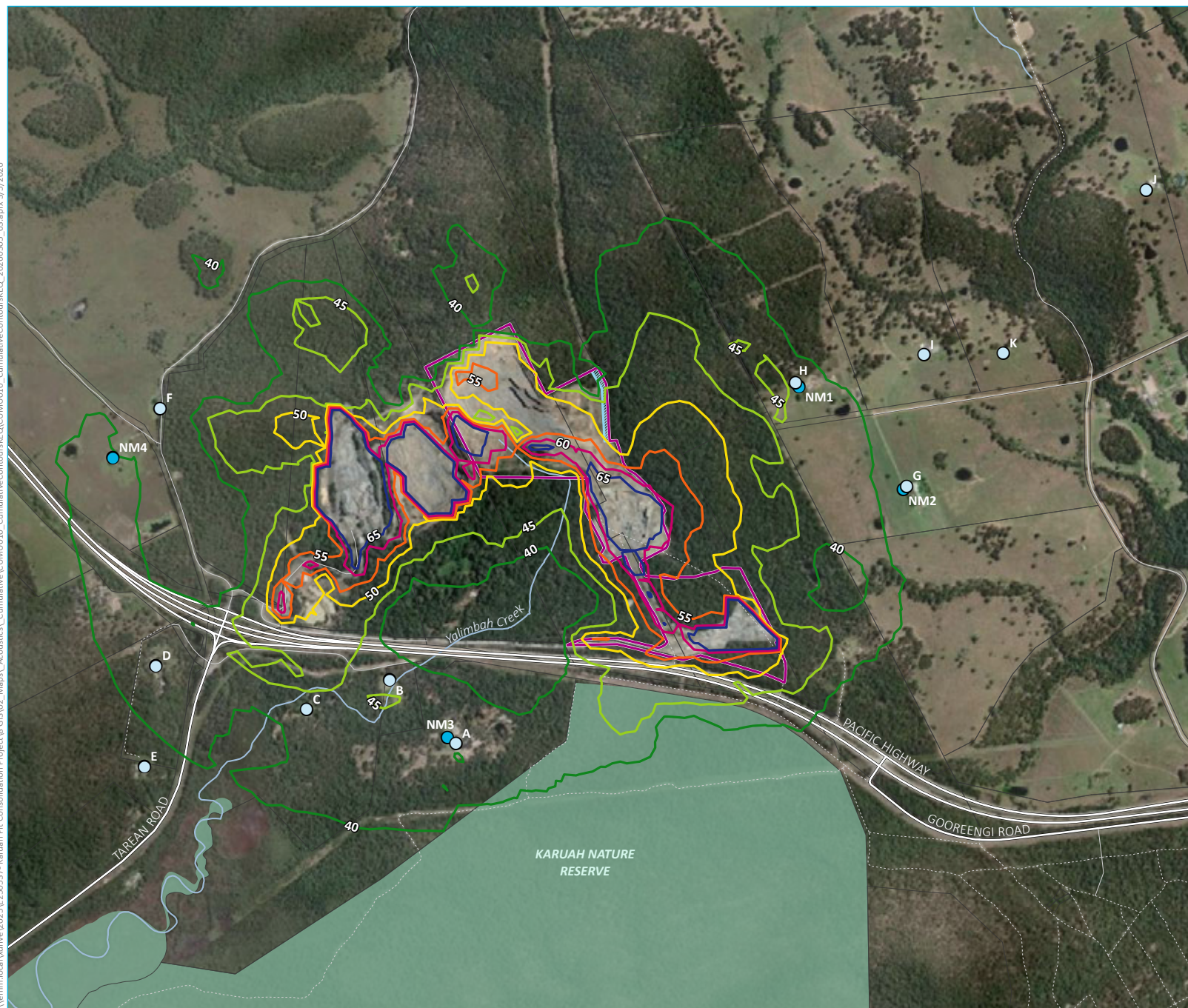
Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



Appendix D

Cumulative operational noise contours (KEQ & KHRQ)

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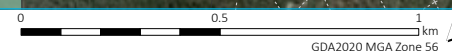
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 - Noise assessment location
- Noise contour (dB)**
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 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 1
(Day)

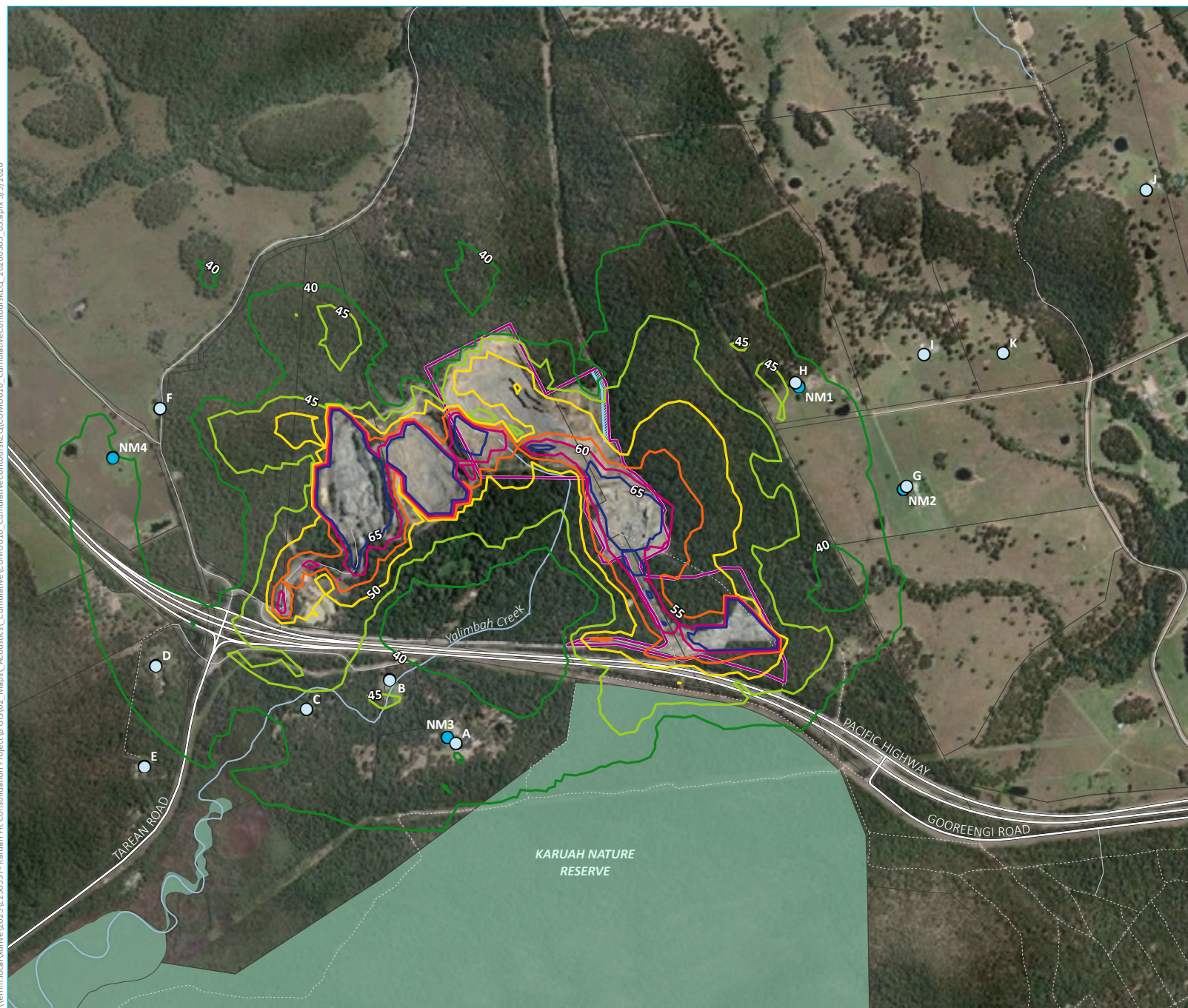
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure D.1



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



\\emm.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Acoustics\Cumulative\CUMU010_CumulativeContoursKEQ_20260305_03.aprx 3/5/2026



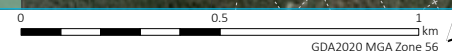
- KEY**
- KEQ approved disturbance boundary
 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)**
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 1
(Evening)

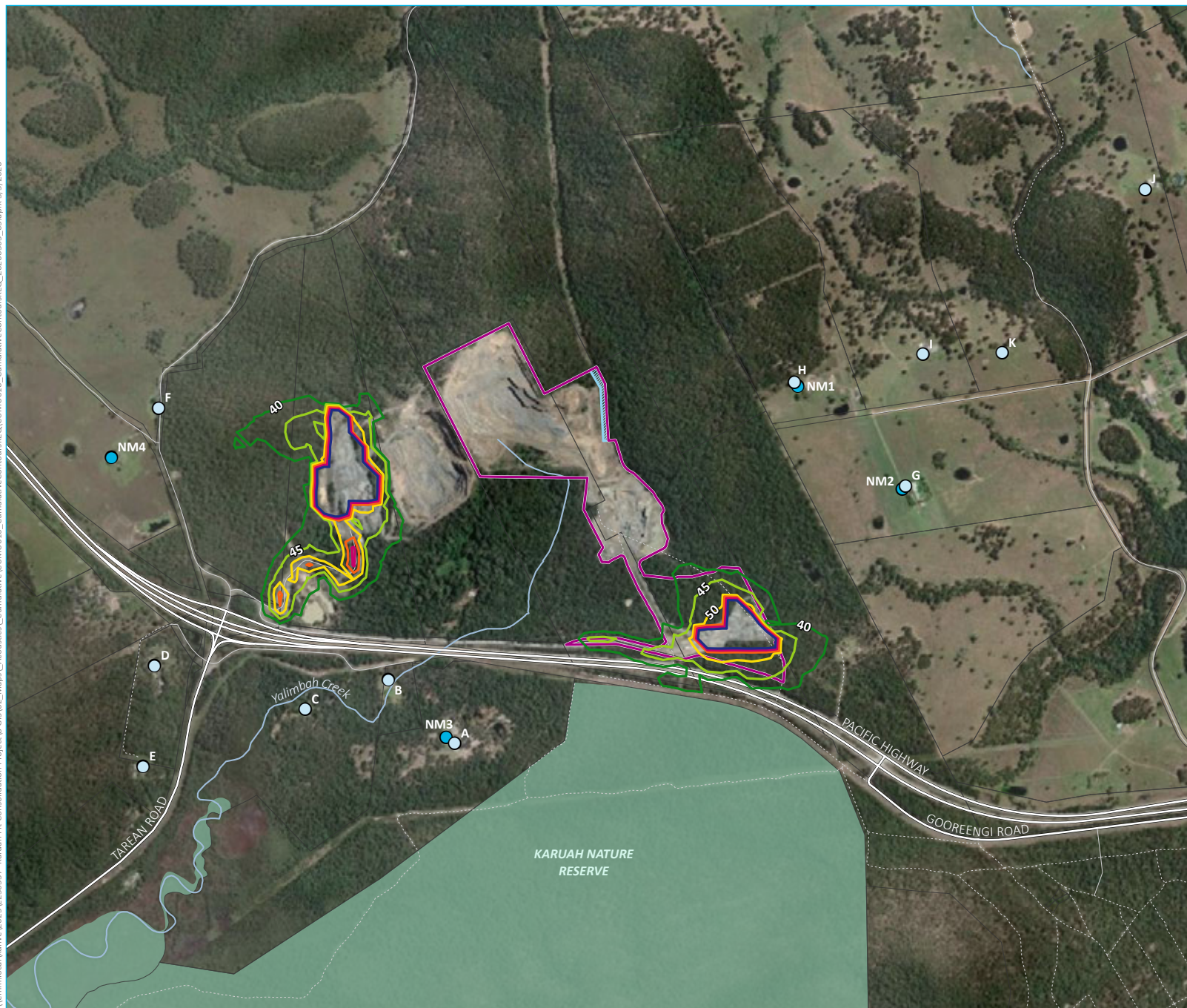
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure D.2



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



\\emm.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Acoustics\Cumulative\CUMU010_CumulativeContoursKEQ_20260305_03.aprx 3/5/2026



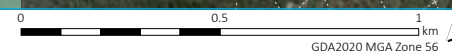
- KEY**
- KEQ approved disturbance boundary
 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)**
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
- Major road
 - Minor road
 - - - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 1
(Morning Shoulder)

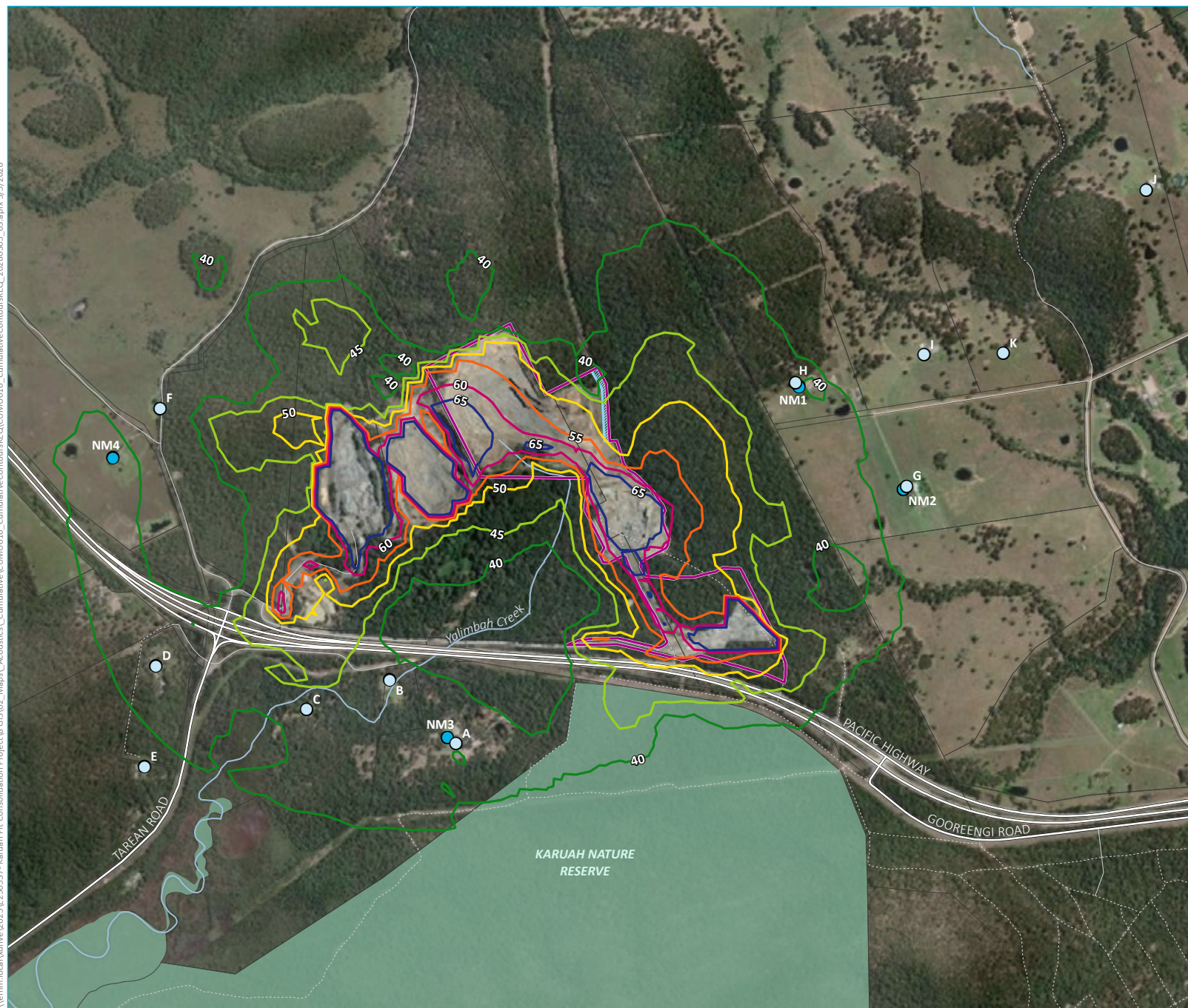
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure D.3



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



\\emm.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Cumulative\CUMU010_CumulativeContoursKEQ_20260305_03.aprx 3/5/2026



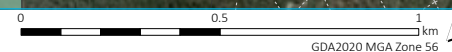
- KEY**
- KEQ approved disturbance boundary
 - ▨ Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)**
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 2
(Day)

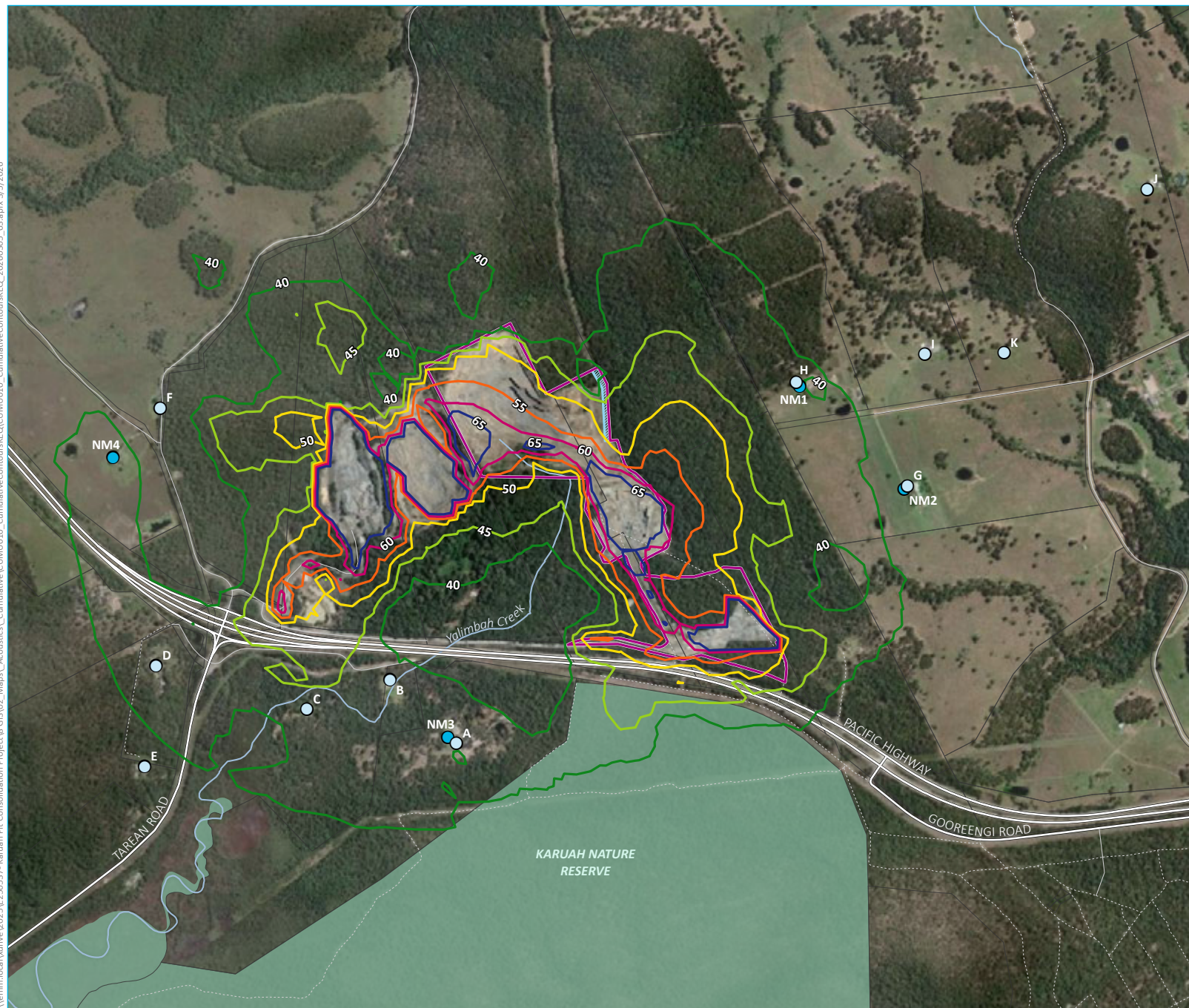
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure D.4



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



\\emm.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Cumulative\CUMU010_CumulativeContoursKEQ_20260305_03.aprx 3/5/2026



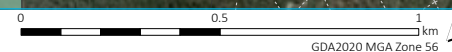
- KEY**
- KEQ approved disturbance boundary
 - ▨ Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)**
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
- Major road
 - Minor road
 - - - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 2
(Evening)

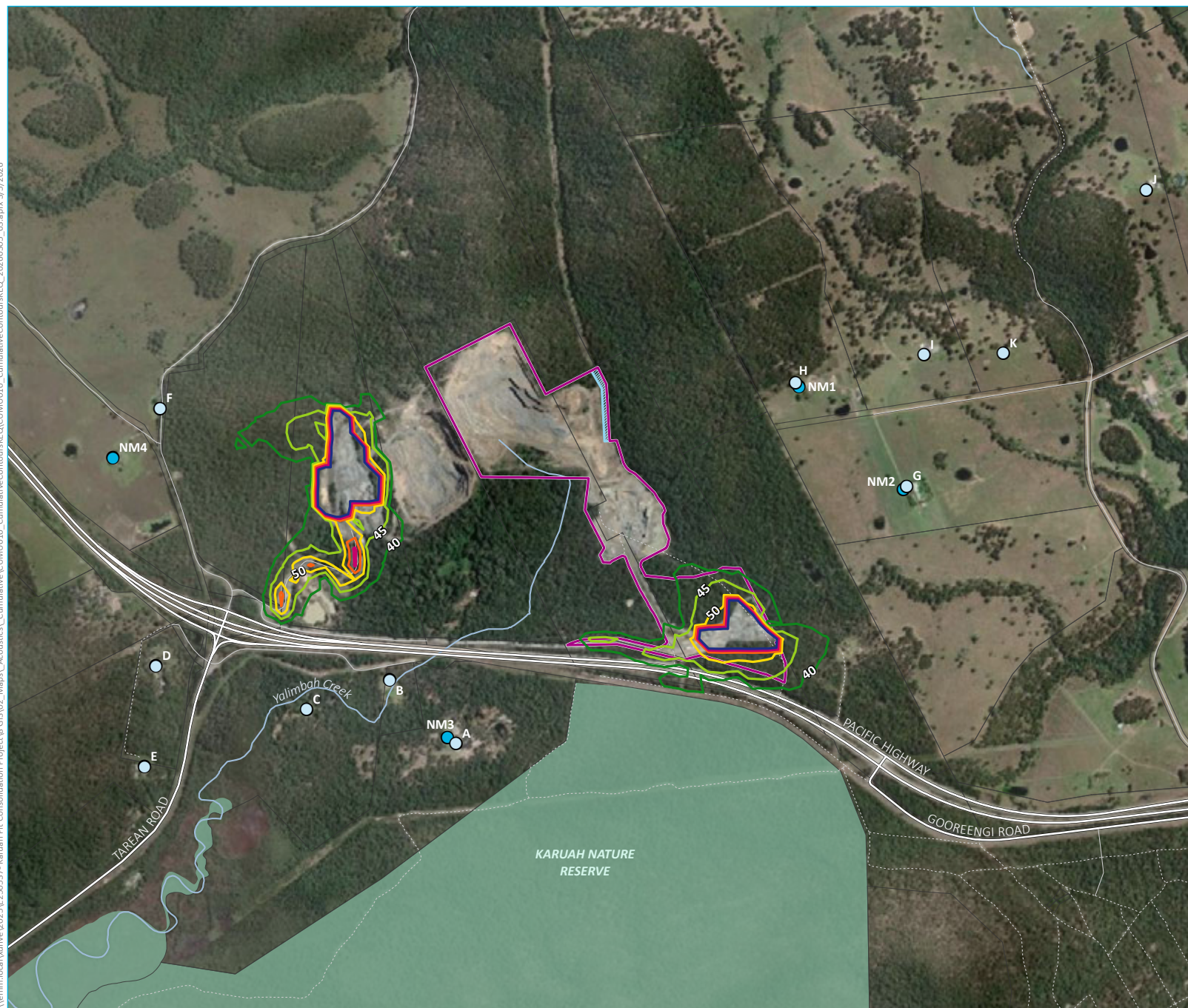
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure D.5



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



\\emm.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Acoustics\Cumulative\CUMU010_CumulativeContoursKEQ_20260305_03.aprx 3/5/2026



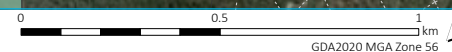
- KEY
- KEQ approved disturbance boundary
 - Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 2 (Morning Shoulder)

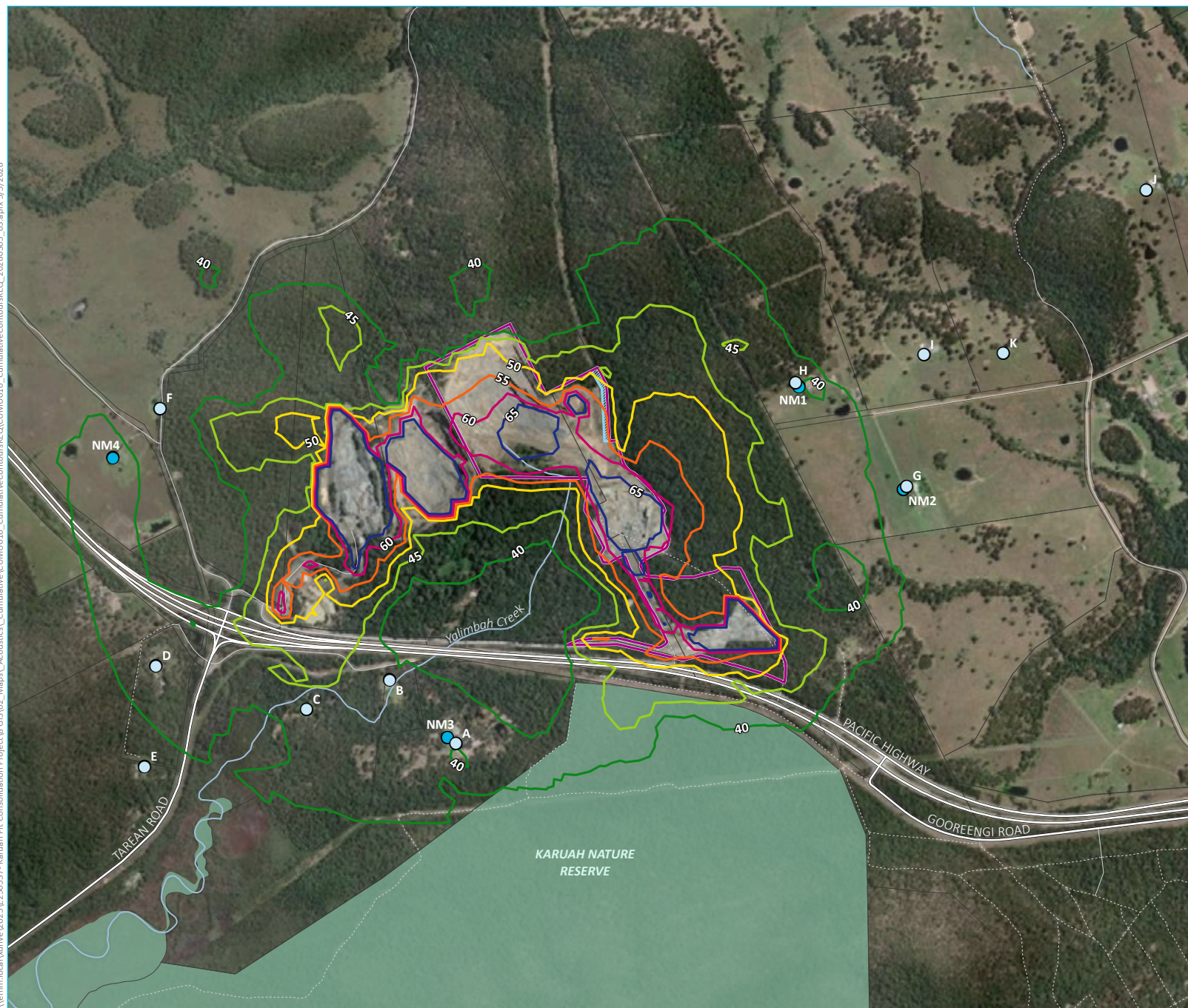
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure D.6



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



\\emm.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Cumulative\CUMU010_CumulativeContoursKEQ_20260305_03.aprx 3/5/2026



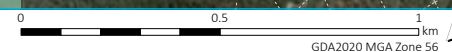
- KEY**
- ▬ KEQ approved disturbance boundary
 - ▨ Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)**
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - ▭ Cadastral boundary
 - ▭ NPWS reserve

Noise Contours- Stage 3
(Day)

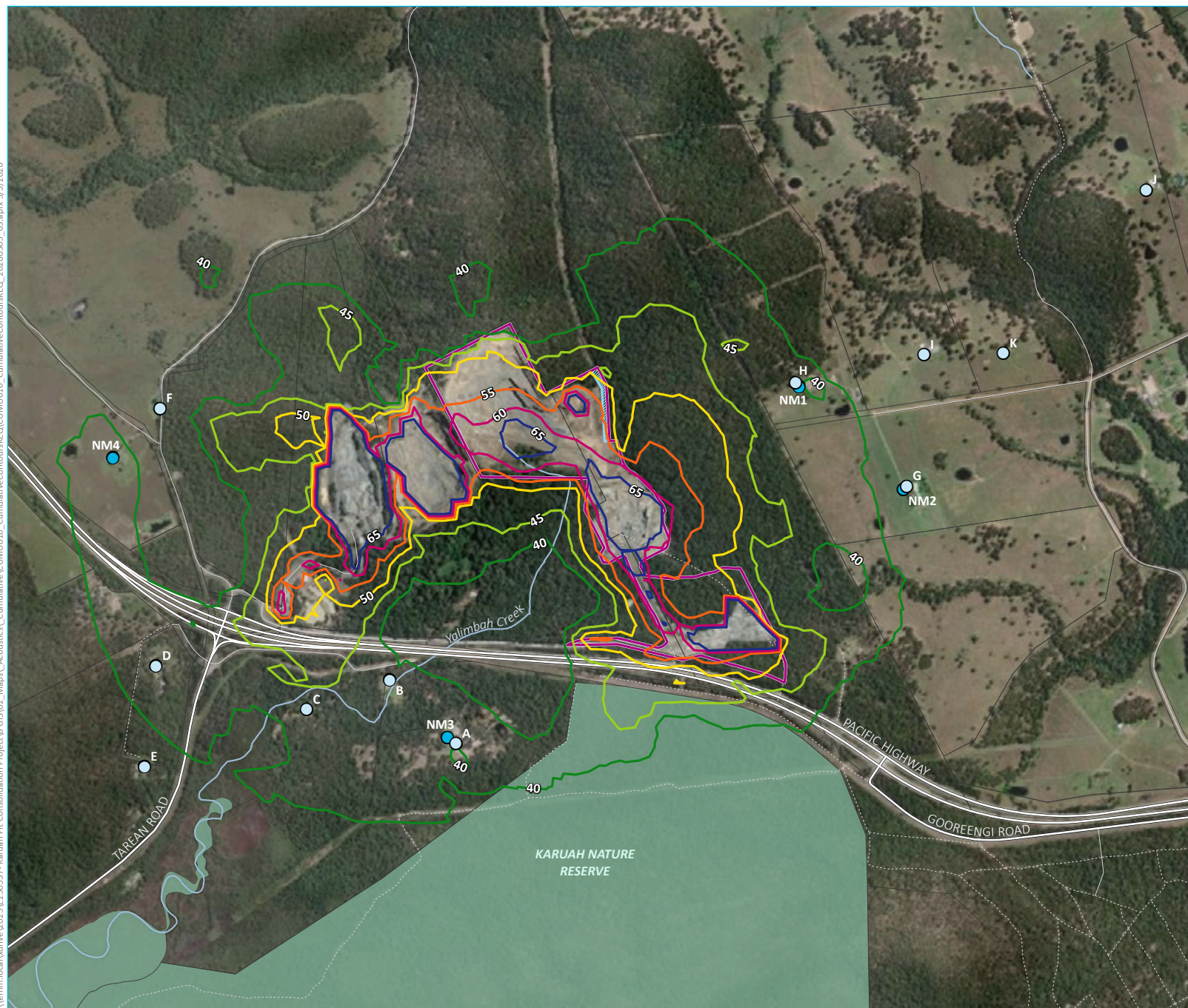
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure D.7



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



\\emm.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Cumulative\CUMU010_CumulativeContoursKEQ_20260305_03.aprx 3/5/2026



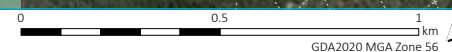
- KEY**
- KEQ approved disturbance boundary
 - ▨ Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
 - Noise assessment location
- Noise contour (dB)**
- 40
 - 45
 - 50
 - 55
 - 60
 - 65
- Existing environment**
- Major road
 - Minor road
 - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 3 (Evening)

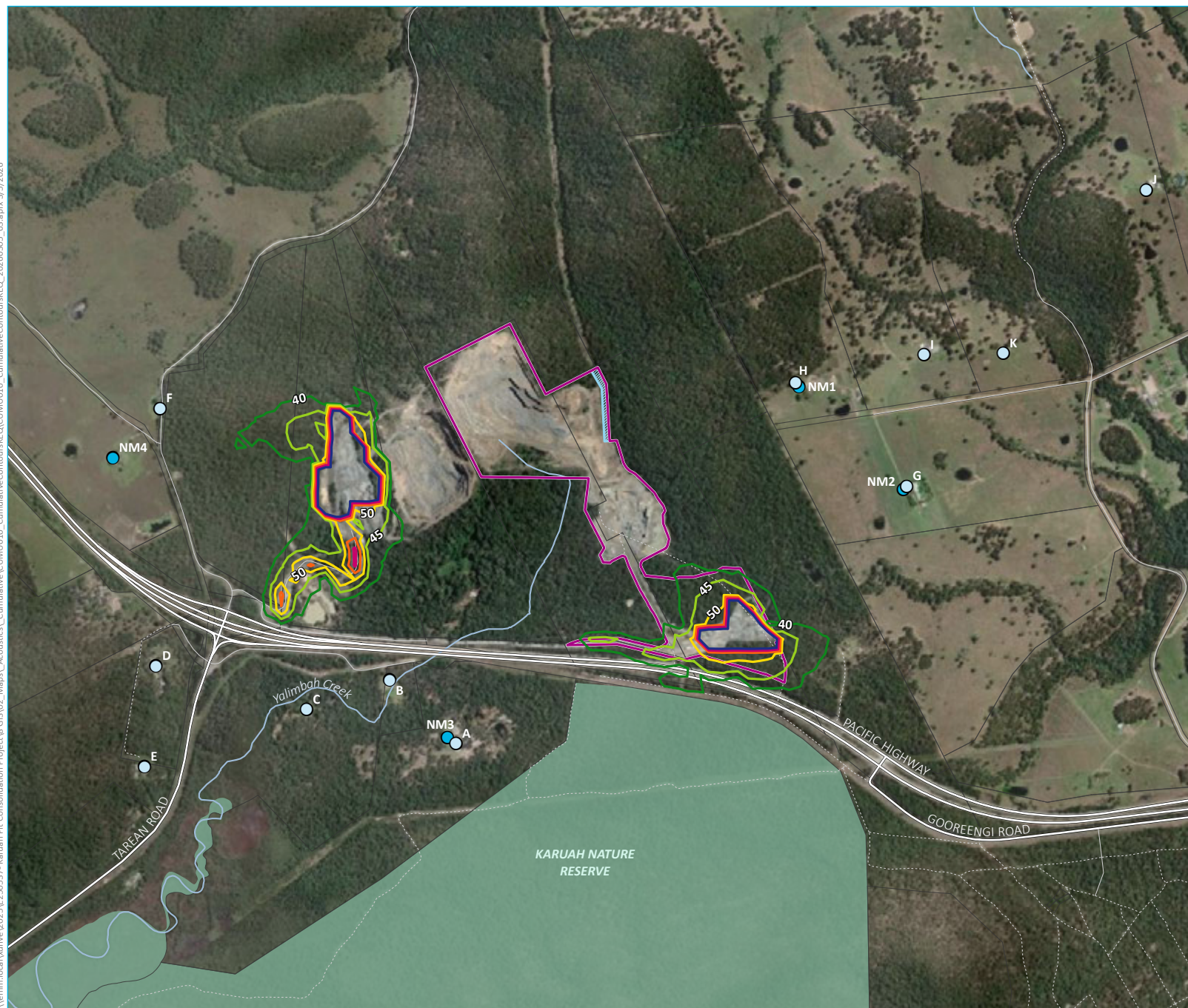
Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure D.8



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



\\emmi.local\drive\2025\250537- Karuah Pit Consolidation Project\8 GIS\02_Maps\Acoustics\Cumulative\CUMU010_CumulativeContoursKEQ_20260305_03.aprx 3/5/2026



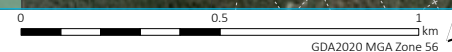
- KEY**
- ▬ KEQ approved disturbance boundary
 - ▨ Proposed KEQ Mod 11 additional disturbance area
 - Noise monitoring location
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- 40
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- Existing environment**
- Major road
 - Minor road
 - - - Vehicular track
 - Named watercourse
 - Cadastral boundary
 - NPWS reserve

Noise Contours- Stage 3 (Morning Shoulder)

Karuah Pit Consolidation Project
Karuah East Quarry
Noise Impact Assessment
Figure D.9



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



Australia

SYDNEY

Level 10 201 Pacific Highway
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE

Level 3 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE

Level 2 95 North Quay
Brisbane QLD 4000
T 07 3648 1200

CANBERRA

Suite 2.04 Level 2
15 London Circuit
Canberra City ACT 2601

ADELAIDE

Level 4 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE

Suite 9.01 Level 9
454 Collins Street
Melbourne VIC 3000
T 03 9993 1900

PERTH

Suite 3.03
111 St Georges Terrace
Perth WA 6000
T 08 6430 4800

Canada

TORONTO

2345 Yonge Street Suite 300
Toronto ON M4P 2E5
T 647 467 1605

VANCOUVER

2015 Main Street
Vancouver BC V5T 3C2
T 604 999 8297

CALGARY

700 2nd Street SW Floor 19
Calgary AB T2P 2W2



[linkedin.com/company/emm-consulting-pty-limited](https://www.linkedin.com/company/emm-consulting-pty-limited)



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