



Woolgoolga to Ballina

Pacific Highway Upgrade

*Temporary Intensification of Operations at Moonimba
Borrow Site*

Environmental Impact Assessment Modification Report

August 2017

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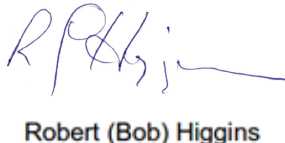
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GLOSSARY / ABBREVIATIONS

ABS	Australian Bureau of Statistics
AFG	Aboriginal Focus Group
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management Systems
Approved Project, the	Woolgoolga to Ballina Pacific Highway Upgrade - <i>project which has been approved by the Minister for Planning</i>
AQIA	Air Quality Impact Assessment
CO	Carbon monoxide
CAQMP	Construction Air Quality Management Plan
CCEMP	Contractor's Construction Environmental Management Plan
CCLMP	Construction Contaminated Land Management Plan
CEMP	Construction Environmental Management Plan
CFFMP	Construction Flora and Fauna Management Plan
CHA	Cultural Heritage Assessment
CSWMP	Construction Soil and Water Management Plan
CTAMP	Construction Traffic and Access Management Plan
CWREMP	Construction Waste, Resource and Energy Management Plan
DA127/95	The current development application for the existing quarry located at the Moonimba Borrow Site.
DA2015.0069	A recent development application that was approved for the expansion of the existing quarry at the Moonimba Borrow Site that was not activated at the time this modification report was prepared.
dB	decibel
DP&E	Department of Planning and Environment
DoE	Department of Environment
DPI	Department of Primary Industries
EEC	Endangered Ecological Communities
EIS	Environmental Impact Statement
EMS	Environmental Management Systems
ENM	Excavated Natural Material
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Authority
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
ER	Environmental Representative: <i>A suitably qualified and experienced person independent of project design and construction personnel employed for the duration of construction. The principal point of advice in relation to all questions and complaints concerning environmental performance. Equates to Environmental Management Representative under Ballina Bypass project Ministerial conditions of approval.</i>
ERG	Environment Review Group. A group of relevant government agencies, Roads and Maritime, Pacific Complete and Contractor staff members who meet monthly to discuss environmental matters on the Approved Project.
EWMS	Environmental work method statements
FCNSW	Forestry Corporation of NSW
GDE	Groundwater dependent ecosystem
ha	Hectares
km	Kilometres

LAeq	Describes the sound level that is representative over a certain period of time that is prescribed
LALC	Local Aboriginal Land Council
LEP	Local environmental plans
L	Litres
m ³	Cubic metres
MCoA	NSW Minister for Planning Conditions of Approval
Minister, the	Minister for Planning
Moonimba Borrow Site	Previously known as the Moonimba Quarry, the subject of this modification assessment
NIA	Noise Impact Assessment
NOx	Nitrogen oxides
OEH	Office of Environment and Heritage
OPM	Operational Plan of Management
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PC	<i>Pacific Complete: entity composed of Laing O'Rourke and Parsons Brinckerhoff/WSP appointed by Roads and Maritime as Delivery Partner for the project</i>
PoEO	<i>Protection of the Environment Operations Act 1997</i>
Project, the	The Woolgoolga to Ballina Pacific Highway Upgrade Project (Sections 3 to 11)
RBL	Rating background level
RL	Relative level
RMS, Roads and Maritime	Roads and Maritime Services
RTA	Roads and Traffic Authority. Previous name for Roads and Maritime Services
Secretary	Secretary of the Department of Planning and Environment
SEPP	State environmental planning policy
SO ₂	Sulphur dioxide
SPIR	Submission / Preferred Infrastructure Report
SSI 4963	State Significant Infrastructure
TEC	Threatened Ecological Community
TIA	Traffic impact assessment
TMP	Traffic management plan
TSP	Total suspended particulate
TTIA	Traffic and transport impact assessment
TSC Act	<i>Threatened Species Conservation Act 1995</i>
VENM	Virgin Excavated Natural Material
VIS	Vegetation Information System
VOC	Volatile Organic Compound
W2B	Woolgoolga to Ballina Pacific Highway Upgrade project

EXECUTIVE SUMMARY

A modification of the Woolgoolga to Ballina Pacific Highway Upgrade project (the Approved Project) is being sought by NSW Roads and Maritime Services (Roads and Maritime) for the use and temporary intensification of operations at the Moonimba Quarry in Bungawalbin, NSW, referred to in this report as the Moonimba Borrow Site. The proposed modification would allow for the extraction and supply of one million tonnes of material per annum (equivalent to 400,000 cubic metres) for a period of two years or until the material demand for the project ceases. This would provide two million tonnes of material in total which would meet the deficit of material in demand for the delivery of the Approved Project.

The current earthworks balance for the Approved Project identifies a large deficit of material, therefore the required material cannot be sourced from within the project boundary. Material would therefore be required to be imported from external quarries or other borrow sites near the project. The Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (W2B EIS) outlines the potential to develop additional borrow sites near the project if there are any shortfalls of material.

The approval to temporarily increase the extraction rate at the Moonimba Borrow Site would alleviate the deficit in material and allow the delivery of the project in accordance with the current programming and staging required to meet Roads and Maritime proposed completion dates of the project. The proposed modification involves the increased extraction of material at an existing quarry site, therefore it is anticipated that the impacts would be less than those associated with the establishment of a new borrow site. A range of other benefits would result from the use of the Moonimba Borrow Site including (but not limited to);

- Sourcing material from one central location, thereby allowing for the more stringent control of one haulage route for the safety for local residents and project efficiency
- Reducing the total distance haulage vehicles travel along the local road network
- Reducing the unit cost of material, providing public value for money for a project that is funded by the NSW and Australian Governments
- Reducing dependence on smaller local quarries that could result in the reduction of available material and increased price of material for other local projects and independent buyers in the region.

This modification report identifies and assesses the potential environmental impacts from the proposed modification. Section 4 of the report provides a detailed assessment of each potential environmental impact. An Environmental Impact Statement (EIS) was prepared in 2014 for the expansion of the existing Moonimba Quarry, referred to in this report as the Moonimba Quarry EIS. Information in the Moonimba Quarry EIS was used in the preparation of this Modification Report.

The Moonimba Quarry currently operates under Development Application (DA127/95). Another Development Application was given consent by Richmond Valley Council in 2015 (DA2015.0069) for the expansion of the excavation areas, however this consent has not yet been activated.

The Moonimba Borrow Site is located within the footprint assessed and approved under DA2015.0069. The proposed Moonimba Borrow Site would consist of:

- Two excavation areas, known as the eastern pit (13 hectares) and the western pit (8 hectares)
- An access track leading from Boggy Creek Road to the two excavation areas
- Associated infrastructure including a site office and staff amenities located adjacent to the access track to the north of the two excavation areas.

The Moonimba Borrow Site is located approximately 15 kilometres from the Approved Project. The extracted material would be hauled along Boggy Creek Road, Reardons Lane and Woodburn-Coraki Road. Vehicles would proceed east along Woodburn-Coraki Road to the intersection with the Pacific Highway where they would then travel north or south along the Pacific Highway before entering the Approved Project boundary for stockpiling or immediate use.

At peak, the Moonimba Borrow Site would generate an estimated 300 truck movements per day that would use the local road network to deliver material to the Approved Project. A traffic impact assessment determined that the local roads that would be used for the haulage of material would provide adequate capacity for the proposed haulage rate. A right-turn treatment would be required on the Pacific Highway, for vehicles to safely and efficiently access Woodburn-Coraki Road. A traffic management plan (TMP) would also be prepared to ensure the safe management of traffic at this intersection. GPS tracking of haulage vehicles would be investigated to monitor the location of haulage trucks during the morning and afternoon school peak traffic times so as to ensure impacts on school bus operations are minimised.

A noise impact assessment determined that sensitive receivers located in the area surrounding the site would experience noise impacts during the operation of the borrow site. This is a result of low background (existing) noise levels and the proposed machinery and equipment to be used at the site. Noise impacts are also predicted for a number of sensitive receivers located adjacent to the haulage route. Existing management measures for the Approved Project would be implemented to minimise the predicted noise impacts. A regular noise monitoring program would also be established to monitor noise levels during the operation of the borrow site and determine the effectiveness of mitigation measures.

Clearing of approximately 9.5 hectares of vegetation would be required within the footprint of the excavation areas. This clearing has been previously approved under DA2015.0069. The clearing would result in the loss of 103 habitat trees that may provide habitat for a range of threatened species. A biodiversity review of existing information and a site inspection confirmed that the proposal is unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitats. Existing management measures for the Approved Project would be implemented to minimise impacts to flora and fauna. In addition, speed limits would be reduced along the internal access track and targeted surveys for the Powerful and Masked Owl will be undertaken prior to clearing to determine whether nesting is occurring within or near the proposed clearing footprint. A Habitat Offset arrangement would also be established in accordance with DA2015.0069.

Operation of the borrow site has the potential to cause an impact through the increase of sediment laden runoff, which may carry pollutants. The main source of sediment would be via erosion of stockpiles, earth barriers, work areas, haul roads and other disturbed areas. Existing management measures for the Approved Project would be implemented to manage sediment and erosion during the operation of the borrow site.

A range of environmental requirements and control measures have been previously prescribed for the Approved Project including mitigation measures listed within in the Submission / Preferred Infrastructure Report (November 2013)(S/PIR), the Conditions of Approval, relevant Roads and Maritime documents and the approved Woolgoolga to Ballina (sections 3-11) Construction Environment Management Plan (W2B CEMP) and associated sub-plans. The proposed modification would be established, operated and maintained in accordance with the requirements included in the W2B CEMP and associated sub-plans. Additional control measures are outlined in Section 6 of this modification report.

HOW YOU CAN COMMENT

Anyone can make a written submission about the Modification Application during the exhibition period from **Monday 11 September 2017** until **Monday 25 September 2017**.

Your submission must reach the Department of Planning and Environment by Monday 25 September 2017. Before making your submission, please read the Privacy Statement at www.planning.nsw.gov.au/privacy/ or telephone 1300 305 695 for a copy. The Department of Planning and Environment will publish your submission on its website in accordance with its Privacy Statement.

To make a submission, use the online form if possible. This is available at www.majorprojects.planning.nsw.gov.au/page/on-exhibition/

If you cannot lodge online, you can write to:

Planning Services, Department of Planning and Environment, GPO Box 39 SYDNEY NSW 2001

(Your submission should be marked, Attention: Director, Transport Assessments and quote project number SSI 13-4963)

1 INTRODUCTION

1.1 BACKGROUND

On behalf of the Australian and NSW governments, NSW Roads and Maritime Services (Roads and Maritime) is progressively upgrading the Pacific Highway to dual carriageway between the Hunter and NSW/Queensland border.

The Woolgoolga to Ballina Pacific Highway Upgrade, (the Approved Project), involves upgrading approximately 155 kilometres (km) of highway to four-lane dual-carriageway road between Woolgoolga (north of Coffs Harbour) and Ballina on the NSW north coast (refer Figure 1-1). The project bypasses the towns of Grafton, South Grafton, Ulmarra, Woodburn, Broadwater and Wardell. The project will include road duplication, alignment modification and new road sections. Once complete, the project will create a four-lane divided road, with two lanes in each direction. It would also allow for the road's upgrade in the future to a six-lane divided highway.

The Approved Project was declared critical State significant infrastructure under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Before approving the application, the Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (RMS, 2012), was publically displayed for 60 days between December 2012 and February 2013, inclusively. The exhibition generated 145 submissions, which were responded to in the Woolgoolga to Ballina Pacific Highway Upgrade Submissions / Preferred Infrastructure Report, issued in November 2013 (RMS, 2013). The project was approved by the Minister for Planning on 24 June 2014.

The Approved Project has also been subject to approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Woolgoolga to Ballina Project was declared by the Commonwealth Minister for Sustainability, Environment, Water, Populations and Communities (now the Department of the Environment and Energy) to be a controlled action under this Act on 20 June 2012. Approval was granted by the Commonwealth Government on 14 August 2014.

Roads and Maritime Services has engaged Pacific Complete (comprising Laing O'Rourke and WSP Parsons Brinckerhoff) to partner with the Pacific Highway Office to deliver the 155 km Woolgoolga to Ballina Pacific Highway upgrade.

1.2 THE APPROVED PROJECT

The Approved Project consists of the upgrade of the Pacific Highway between Woolgoolga to Ballina to a four-lane standard highway (known as a class M highway). This section of the highway is approximately 155 kilometres long (refer to Figure 1-1).

The construction of the Approved Project will be staged to include both arterial sections (known as class A) and motorway standard sections (known as class M). For sections of the project initially upgraded to arterial standard, the design allows for these sections to be upgraded to motorway standard in the future.

At its southern end, the Approved Project will tie in to the northern extent of the Sapphire to Woolgoolga upgrade (about five kilometres north of Woolgoolga). At its northern end, the Approved Project will tie in to the southern extent of the recently opened Ballina bypass. This is about six kilometres to the south-west of Ballina.

The Approved Project excludes the highway upgrades at Glenugie and Devils Pulpit, located between Woolgoolga and Ballina as both projects have been approved and are already built. The Approved Project also does not include the upgrade of the existing dual carriageway located at Halfway Creek. The project will provide a service road along the length of this section only.

The W2B EIS identifies the key sources of material for the project as major cuttings or borrow sites along the project alignment. A number of borrow sites were identified in the W2B EIS and/or the W2B SPIR to provide material for the construction of the project. The potential to develop other borrow sites near the project is

discussed in the W2B EIS in the circumstance where there is a shortfall of material for the construction of the project.

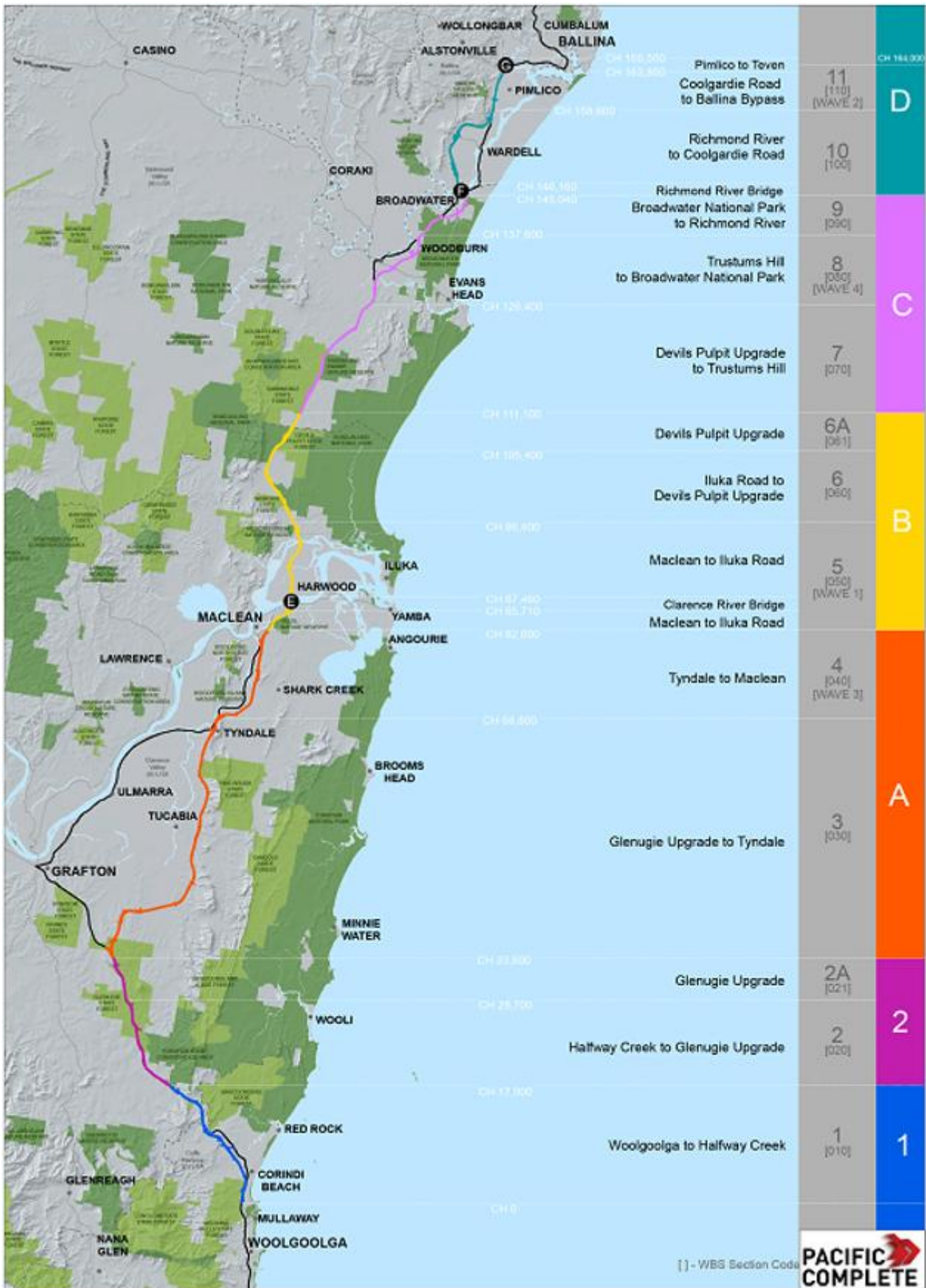


Figure 1-1 Pacific Highway Upgrade Woolgoolga to Ballina Approved Project

1.3 PURPOSE OF THIS REPORT

A modification of the Project Approval is being sought for the use of the Moonimba Borrow Site (previously known as the Moonimba Quarry), for the supply of material for the construction of the Woolgoolga to Ballina Pacific Highway Upgrade.

The environmental assessment for the modification will be submitted to the Secretary of the NSW Department of Planning and Environment in order to request planning approval as part of a Modification of Minister's Approval under Section 115ZI of the EP&A Act.

Subject to the Minister's approval of the modification, the operation of the site would proceed in accordance with the approval conditions.

This environmental assessment for the modification provides an overview of:

- A description of the proposed modification
- An assessment of the potential impacts of the proposed modification and
- The measures proposed to mitigate or manage the potential impacts.

This builds upon the work already undertaken in the W2B EIS and the W2B SPIR.

This modification to the Approved Project seeks planning approval for the use of the Moonimba Borrow Site, for the supply of material for the construction of the Woolgoolga to Ballina Pacific Highway Upgrade Project.

1.4 PROJECT OBJECTIVES

Specific project objectives were developed for the Woolgoolga to Ballina Pacific Highway Upgrade within Section 3.2 of the W2B EIS which align with the overarching Pacific Highway Upgrade program objectives. The project objectives that are relevant to the proposed modification are:

- Integrate environmental, social and economic considerations into project planning and assessment
- Provide the best outcomes, taking into account the balance of environmental, social and economic factors
- Provide a strategy for staging the delivery of the project in accordance with upgrade need and availability of funding

2 DESCRIPTION OF THE PROPOSED MODIFICATION

This modification to the Approved Project seeks planning approval for the temporary use of the Moonimba Borrow Site to extract and supply one million tonnes of material per annum (approximately 400,000 cubic metres) for the construction of the Woolgoolga to Ballina Pacific Highway over approximately two years or until the material demand for the project ceases. This would provide two million tonnes of material in total which would meet the deficit of material in demand for the delivery of the Approved Project.

2.1 LOCALITY AND ENVIRONMENT

The Moonimba Borrow Site is positioned north-west of the township of Woodburn within the Richmond Valley Council local government area, located approximately 15 kilometres from the approved Woolgoolga to Ballina Pacific Highway upgrade (Portion C), refer to Figure 2-1. The site is accessed through the use of local roads including Woodburn-Coraki Road, Reardons Lane and Boggy Creek Road. The borrow site is located within the existing Moonimba Quarry on Lot 193 DP755603. The surrounding areas located on the lower slopes of the Moonimba Ridge are comprised primarily of rural agricultural land and rural residential properties. The closest residential sensitive receiver is located more than 600 metres from the excavation area.

The borrow site is located on the top of the Moonimba Ridge, a prominent landform in the area consisting of Kangaroo Creek Sandstone formed during the Cretaceous Period. The Moonimba Ridge is heavily vegetated and is characterised by a rising elevation from north to south and from west to east with steep slopes on the south-eastern sides (Moonimba Quarry EIS, 2014). The land on which the borrow site is located (Lot 193 DP755603) occupies a large portion of the Moonimba Ridge, excluding the steeper eastern and southern slopes and the ridge's lower elevations. The elevated position of the borrow site and densely vegetated surrounds act as natural buffers which provide a visual screen to the operations within the site (Moonimba Quarry EIS, 2014). The surrounding floodplains to the east, north and north-west of the site have been cleared for approximately 100 to 130 years and are currently used for a range of commercial agricultural businesses. Cattle grazing is a common agricultural use in the area as well as the farming of a number of crops including sugar cane, soy beans and melaleuca shrubs that produce tea-tree oil (Moonimba Quarry EIS, 2014).

2.2 PROPOSED MODIFICATION

The proposed Moonimba Borrow Site consists of:

- Two excavation areas, known as the eastern pit (13 hectares (ha)) and the western pit (8 ha)
- An access track leading from Boggy Creek Road to the two excavation areas
- Associated infrastructure including a site office and staff amenities located adjacent to the access track to the north of the two excavation areas
- Clearing of approximately 9.5 ha of vegetation within the footprint of the excavation areas .

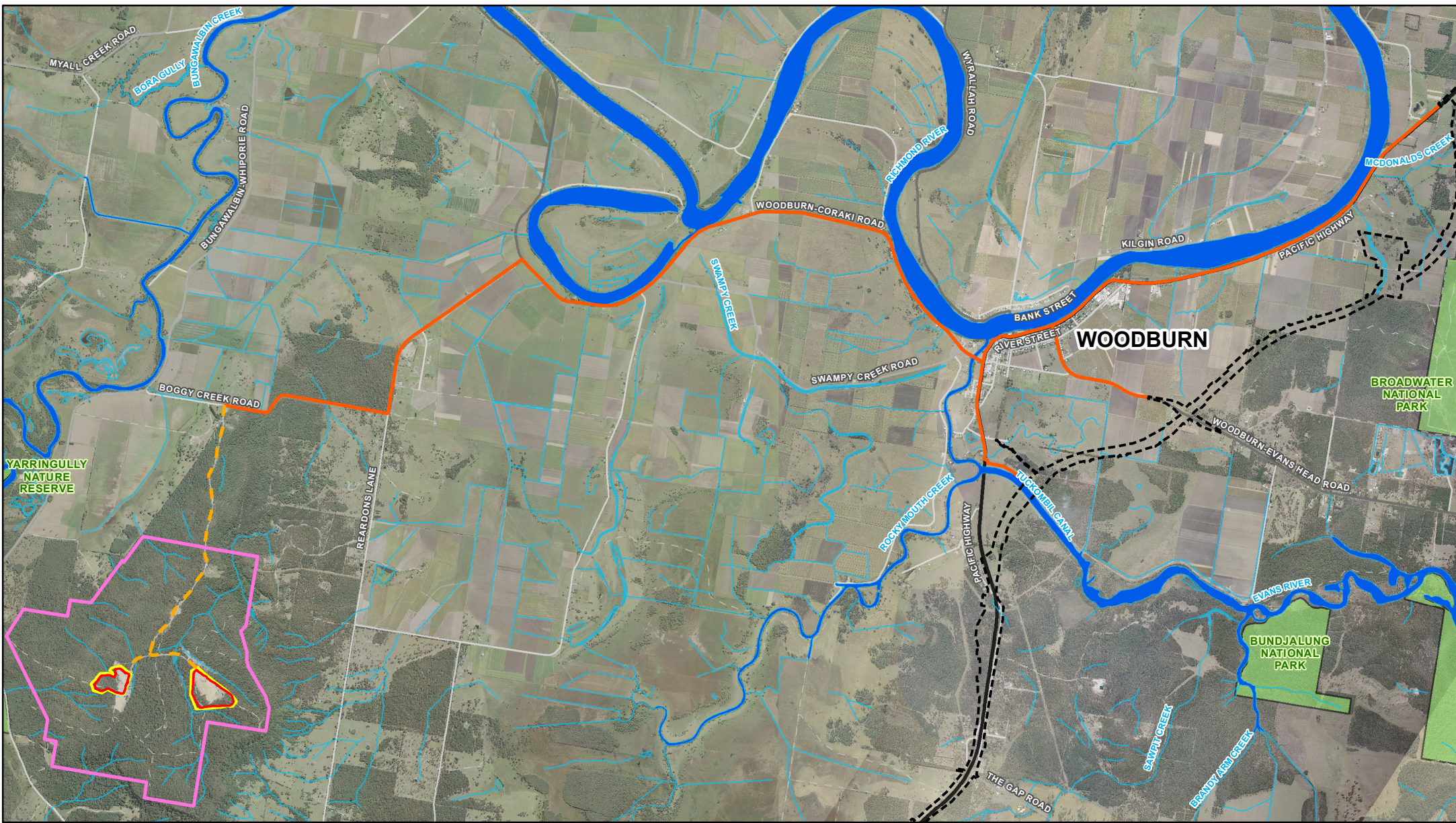
Figure 2-2 provides an indicative layout of the Moonimba Borrow Site.

The material to be extracted from the site is predominantly Kangaroo Sandstone which would be processed within the excavation areas and subsequently transported to the Approved Project. Materials extracted from the site would be used primarily for the construction of Portion C (Sections 7, 8 & 9) of the Approved Project (and other nearby portions if required, however the materials would not be used for any other projects) and would generally consist of:

- Earth fill
- Material for abutments

- Backfilling material, bedding
- Material for pipe laying
- Scour rock used for the protection of sediments around bridge abutments and piers, and
- Select and verge material for road base.

Pacific Complete would appoint and manage a contractor to operate the Moonimba Borrow Site proposed under this modification. All material extracted under this modification would be supplied to the Woolgoolga to Ballina Pacific Highway Upgrade Project only and not to any other project. Prior to any works occurring at the site the contractor would be required to prepare a Contractor's Construction Environmental Management Plan (CCEMP) in accordance with the approved Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11) Construction Environmental Management Plan (W2B CEMP).



PACIFIC COMPLETE

PACIFIC HIGHWAY UPGRADE

Woolgoolga to Ballina

Moonimba Borrow Site Location

Figure 2-1

- Haulage route
- Internal access track
- Proposed excavation area
- Footprint defined in previous EIS (Novoplan, 2014)
- Borrow site property boundary
- Approved Project Boundary Version 11 (June 2016)
- Primary Road
- Arterial Road
- Sub Arterial Road
- Local Road
- Track-Vehicular
- Drainage
- Richmond River
- National Park



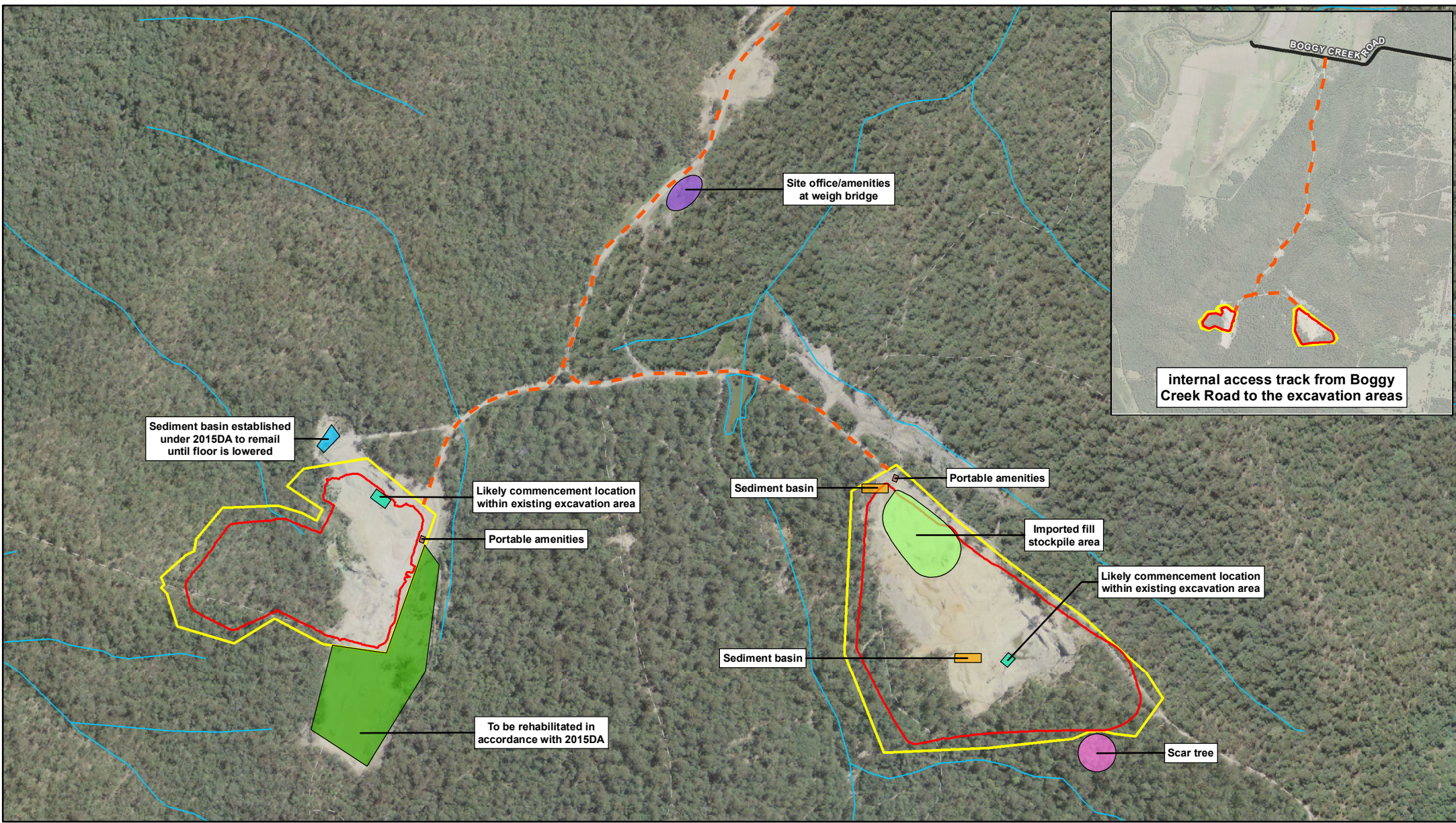
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PACIFIC COMPLETE

PACIFIC HIGHWAY UPGRADE

Woolgoolga to Ballina

Moonimba Borrow Site Layout

Figure 2-2

- - - Internal access track
 - Proposed excavation area
 - Footprint defined in previous EIS (Novoplan, 2014)
 - Imported fill stockpile area
 - Indicative site office/amenities at weigh bridge
 - Portable amenities
 - Scar tree
 - Likely commencement location within existing excavation area
 - Sediment basin
 - Sediment basin established under 2015DA to remain until floor is lowered
 - To be rehabed in accordance with 2015DA prior to use of site
 - Track-Vehicular
 - Drainage
- Note - the location of offices/amenities, sediment basins and starting locations are indicative and may be subject to change*



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2.2.1 STAGING

Works associated with the proposed modification would be undertaken in stages visually represented in Figure 2-3. The first stage of works ('enabling works') would be undertaken by the landowner/current operator, whilst Stages 2, 3 and 4 would be undertaken by Pacific Complete and the appointed contractor.

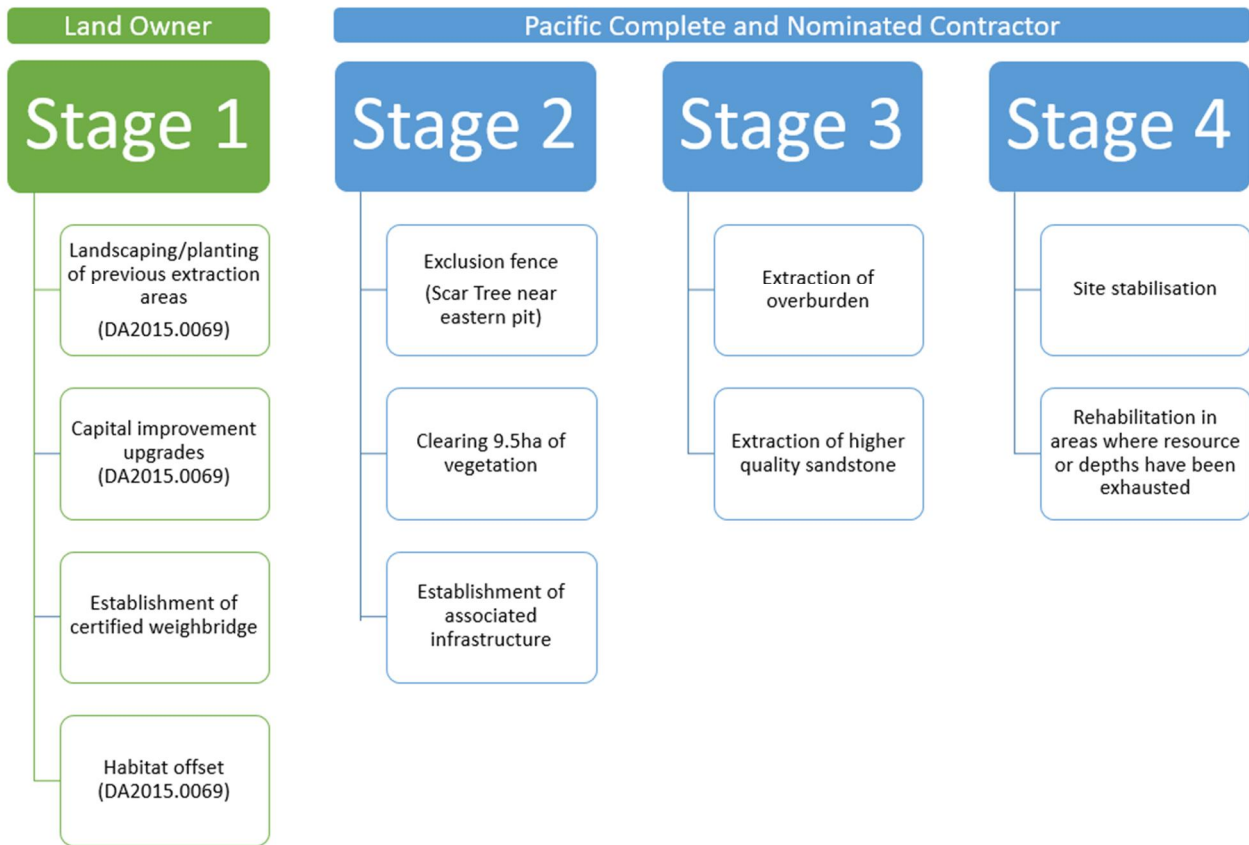


Figure 2-3 Stages of the proposed modification

STAGE 1 – ENABLING WORKS

Works listed within Stage 1 consist primarily of the capital improvement upgrades listed within Development Application No. 2015.0069 (DA2015.0069) (refer to Appendix A) and would be undertaken in accordance with the consent conditions for DA2015.0069 and in consultation with Richmond Valley Council. Capital improvements include road and intersection upgrades to Boggy Creek Road and Reardons Lane, and a noise wall for nearby receiver. It is anticipated that the works within Stage 1 would be completed by the landowner prior to the commencement of site possession by Pacific Complete and the appointed contractor.

In order to prepare the site for operation under the proposed modification, the following works would be undertaken by the landowner prior to site establishment:

- Landscaping and planting of previous extraction areas as shown in Figure 2-2
- Capital improvement upgrades required under DA2015.0069 (refer to Appendix A) including road and intersection upgrades and the installation of a noise wall for a nearby receiver
- Establishment of a certified weighbridge for weighing and recording tonnage of all quarried material
- Habitat offset requirements for proposed clearing, including a legally binding mechanism for the protection in perpetuity of the habitat offset (refer to Section 4.3.5).

STAGE 2 – SITE ESTABLISHMENT AND VEGETATION CLEARING

Prior to the commencement of operations within the site, the following works would be undertaken:

- Establishment of exclusion fencing around the scar tree to the south east of the eastern pit
- Clearing of approximately 9.5 ha of vegetation within the footprint of the excavation areas and within previously approved DA clearing limits
- Establishment of associated infrastructure including a site office and staff amenities located adjacent to the access track to the north of the two excavation areas.

The property boundary is currently accessible via the existing paved access road from Boggy Creek Road, through approximately 1.6 kilometres of unnamed roadway which has been dedicated to the Richmond Valley Council. From the property boundary, an unpaved access road extends for approximately 1.4 kilometres. The access road then forks into two, one leads south-west for approximately 300 metres towards the western pit and the other leads south-east for approximately 600 metres towards the eastern pit. This access route is considered adequate for the increase in haulage vehicle movements therefore no widening would be undertaken.

A temporary site compound and staff amenities would be established adjacent to the access road to the north of the two excavation areas (refer to Figure 2-2). The site compound and staff amenities would be located within a previously cleared area which was identified as a parking area within DA2015.0069. Additional portable amenities (such as ablution blocks or equivalent, etc.) would also be established within both excavation areas. No upgrades to existing utilities (i.e. sewage, power mains, etc) are included under the proposed modification. Indicative locations for these amenities are shown in Figure 2-2.

Clearing would occur within the boundary identified in the Moonimba Quarry Expansion Bungawalbin NSW Environmental Impact Statement (Newman's Quarry & Landscape Supplies, 2014), here on in referred to as the Moonimba Quarry EIS. Clearing works would be undertaken in accordance with the approved Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11) Construction Flora and Fauna Management Plan (CFFMP, Appendix B2 CEMP). Clearing and grubbing may be staged to suit the project's demand for materials. Clearing boundaries would be clearly demarcated prior to the commencement of clearing and grubbing works.

Other site establishment works would include but not be limited to:

- Construction and/or installation of erosion and sediment controls
- Construction and/or installation of sediment basins
- Construction of clean water diversion drains to direct clean water around the site
- Installation of plant and equipment necessary for operations.

STAGE 3 – OPERATION OF THE BORROW SITE

The proposed excavation areas (the eastern and the western pits) would be situated within the same footprint as outlined in the Moonimba Quarry EIS that accompanied DA2015.0069.

The demand for different types of material within the Approved Project would determine the initial excavation location and progression of excavation works. Machinery and equipment would be progressively relocated as excavation works progress within the two excavation areas. Conventional extraction methods would be used within the borrow site which would include (but are not limited to) overburden removal with excavators as well as dozer ripping, hammering, drilling and blasting to fragment the higher strength material. Topsoil, as well as any overburden not required for the Approved Project, would be stripped and stockpiled on the boundary of the excavation areas and used during rehabilitation works.

Depending on the material demands of the project, excavations within the two pits may commence as follows:

- Western pit – In the north-west area of the existing excavation area and continue behind the quarry face towards the west and to the south
- Eastern pit – In the south-east area of the existing excavation area in the existing blast hole.

The proposed final floor level for the western pit. would be approximately 75 metres AHD with sediment basins constructed at approximately 73 metres AHD (maximum). The Proposed final floor level for the eastern pit would be approximately 100 metres AHD with sediment basins constructed at approximately 98 metres AHD (maximum).

It is anticipated that activities within the first year of operation would focus primarily on the removal of overburden and lower strength material that would be used for general fill material. Minimal crushing and screening would be required during this time. The second year would consist of the removal of higher strength sandstone that would require processing (crushing and screening). The second year of operation is therefore anticipated to be the most noise intensive due to the use of crushing and screening plant.

In addition to the extraction of material, excess spoil material from the Approved Project classified as excavated natural material (ENM) or virgin excavated natural material (VENM) may also be imported and stockpiled at the site. As shown in Figure 2-2 the northern portion of the eastern pit would be designated as the stockpile location for imported fill material. This material would be stockpiled and utilised during the rehabilitation of the site where suitable. It is estimated that up to 30,000 cubic metres of material would be imported to the site per annum from the Approved Project. The importation of fill material would utilise the same access route as the excavated material.

STAGE 4 – DECOMMISSIONING AND REHABILITATION

Once the material required for the Approved Project has been extracted, the site would be stabilised and surrendered to the landowner in a similar or better condition as described at commencement of the lease agreement which would be facilitated by a pre-construction land condition assessment. The site rehabilitation would be agreed/ approved by the owner and relevant agencies. The site compound and staff amenities would be decommissioned and removed from the site along with plant and equipment used for material extraction.

Sections of the site would be rehabilitated if the resource has been exhausted or excavation depth has been reached, in consultation with the landowner. If the resource has not been exhausted, the excavation areas (including the floor of the excavation areas) would remain exposed for future extraction activities by the landowner. Exposed areas (including, but not limited to batters) would be stabilised and sediment basins would remain at the site to ensure no impacts would occur to the surrounding environment.

Any rehabilitation works at the site would generally follow the approach outlined under the Moonimba Quarry EIS and the associated Operation Plan of Management (Greg Alderson & Associates, 2014) to keep the rehabilitation works at the site consistent.

2.2.2 MATERIAL HAULAGE

The proposed haulage route used to transport material to the Approved Project is shown in Figure 2-1. The extracted material would be hauled along the internal haulage route to the intersection with Boggy Creek Road. Haulage vehicles would then travel east along Boggy Creek Road, then north along Reardons Lane to the intersection with Woodburn-Coraki Road. Vehicles would then travel east along Woodburn-Coraki Road to the intersection with the Pacific Highway where vehicles would then travel north or south along the Pacific Highway before entering the Approved Project boundary for stockpiling or immediate use. A more detailed explanation of the material haulage route, the predicted traffic to be generated from the site and the associated impacts to the local road network is outlined in Section 4.1.

2.2.3 LENGTH OF OPERATION AND PROPOSED HOURS OF OPERATION

It is proposed to operate the Moonimba Borrow Site for approximately two years to extract two million tonnes of material required to meet the material deficit within Sections 7, 8 and 9 of the Approved Project.

The borrow site would operate under the construction hours outlined in conditions B15 and B16 of the Minister's Conditions of Approval for the Approved Project (SSI-4963). In accordance with condition B15, construction activities associated with the SSI shall be undertaken during the following standard construction hours:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 5pm
- At no times on Sunday and Public Holidays.

In accordance with condition B16 (d), activities and works may also be carried out between Monday to Friday: 6am to 7am and 6pm to 7pm in sparsely populated areas.

Work within the site would not be undertaken outside of the Approved Project construction hours unless required as listed under B16 or where an out of hours works permit has been approved by the Environmental Representative.

In accordance with condition B21, blasting activities associated with the Approved Project shall only be undertaken during the following hours:

- 9:00am to 5:00pm, Monday to Friday, inclusive
- 9:00am to 1:00pm on Saturdays
- At no time on Sunday or public holidays.

Blasting may occur outside the above hours and in accordance with the standard construction hours where:

- No sensitive receivers in sparsely populated areas would be impacted by blasting
- An agreement has been made with receivers within 200 metres of the blast zone to permit blasting in accordance with the standard construction hours.

This condition does not apply in the event of a direction from the NSW Police Force or other relevant authority for safety or emergency reasons to avoid loss of life, property loss and/or to prevent environmental harm.

2.3 HISTORICAL OPERATIONS OF THE SITE

Mining Leases have previously existed on the Moonimba Borrow Site, dating to as far back as 1891 according to 1914 Parish maps (Moonimba Quarry EIS, 2014). A Statement of Environmental Effects (SEE) prepared in support of Development Application No. 127/95 indicated that extraction of material commenced at the borrow site in 1960, with the main users from that time being the Department of Main Roads, Woodburn Shire Council and the local community. The SEE estimated that approximately 20,000 m³ were extracted from Robinson's Quarry between 1960 and 1994.

The mining operations commenced before the first planning controls were introduced on the land under Interim Development Order (IDO) No. 1 - Shire of Woodburn on 13 February 1970.

According to the above-mentioned SEE, Robinson's Quarry, a previous name of the Moonimba Borrow Site, was registered under SEPP 37 (repealed) soon after the SEPP commenced in June 1993, with an extraction limit of 3,000 m³ annually.

2.4 PREVIOUS DEVELOPMENT CONSENT

2.4.1 DEVELOPMENT APPLICATION NO. 127/95 (DA127/95)

Initial development consent to operate a gravel, sand and sandstone extractive industry within Lot 193, DP 755603, Bungawalbin-Whiporie Road, Bungawalbin, Parish of Bungawalbin was granted by Richmond River Shire Council on 19th February 1997 (DA 127/95). The conditions of the development consent are presented in Appendix B.

DA127/95 granted consent for the extraction of a maximum of 30,000m³ per year. The consent contained 27 conditions of approval for the development including a limitation on the maximum extraction rate of 30,000 m³ per annum, and did not allow fill importation without further consent. Other key conditions included (but were not limited to):

- Requirement for a formalised access to be constructed and dedicated to Council to provide access from Boggy Creek Road through Crown land to Lot 193 and the quarry operation. The access would facilitate transport of equipment and materials to and from the quarry. The road was to be constructed and maintained at the cost of the applicant and was to be built to Council standard
- Requirements for other road and intersection works to be carried out on Boggy Creek Road, Readons Lane, Whiporie Road, and Woodburn-Coraki Road.
- The applicant/operator was required to pay an annual road improvement and maintenance levy based on the amount (in tonnes) of material hauled from the site

2.4.2 DEVELOPMENT APPLICATION NO. 2015.0069 (DA2015.0069)

Development Application No. 2015.0069 (DA2015.0069) and the accompanying *Moonimba Quarry Expansion Bungawalbin NSW Environmental Impact Statement* (Newman's Quarry & Landscape Supplies, 2014) (Moonimba Quarry EIS) were submitted to Richmond Valley Council for consideration in September 2014. The application was referred to the Northern Joint Regional Planning Panel pursuant to Clause 8(a) Schedule 4A of the *Environmental Planning and Assessment Act 1979*. The development was classified as Designated Development being an Extractive Industry that obtains or processes for sale more than 30,000 m³ per annum, or that will disturb a significant area greater than two hectares pursuant to Clause 19, Schedule 3 of the *Environmental Planning and Assessment Regulation 2000*.

The proposal included (but was not limited to):

- An increase of the approved annual extraction maximum of sandstone material from 30,000 to 90,000 cubic metres (equivalent by weight to approximately 193,000 tonnes)
- Extraction that would occur within two areas called the western pit (8 hectares) and eastern pit (13 hectares). Together the sites cover a surface area of 21 hectares with depths of extraction extending to approximately 100 metres AHD for the eastern pit and 75 metres AHD for the western pit and sediment basins extending an additional two metres below the proposed finished floor levels
- Volume of the total resource under the application is calculated as 2.4 million cubic metres or 4.92 million tonnes over a 25 year life span (based on 2.1 tonnes per cubic metre for sandstone and 1.6 tonnes per cubic metre for sand)
- Importation of fill at a maximum rate of 30,000 cubic metres per annum for use in site rehabilitation. Fill availability and import activities would cease on completion of the Pacific Highway Upgrade project.

Development consent was granted in May 2015, with 34 conditions of approval, however this consent has not been activated and therefore, works have not commenced under this consent.

2.5 JUSTIFICATION

The W2B EIS discusses the earthworks balance for the overall project and identifies that the key sources of material would be major cuttings or borrow sites along the project alignment. Four borrow sites were identified in the W2B EIS and/or the Submissions/Preferred Infrastructure Report (SPIR) to provide material for the construction of the project. These sites include Lang Hill, Lumleys Hill, Gibsons and Eatons. Three of the four sites (Lumleys Hill, Gibsons and Eatons) are unable to provide material to Portion C as the Richmond River Bridge would not be constructed prior to when the material is required. Lumleys Hill and Gibsons Borrow Sites have also been identified to supply material to Portion D of the Approved Project.

The W2B EIS outlines the potential to develop additional borrow sites near the project if there are any shortfalls of material.

“...the priority would be to obtain material from nearby road projects and licensed quarries.. If nearby road projects and quarries are not able to supply the material within the timeframe, or have the quantity required, other material sources near the project would be investigated. Any material source areas would need to be:

- *More than 40 metres from waterways*
- *Of low ecological and heritage value*
- *Greater than 100 metres from the closest receiver (unless a negotiated agreement is in place.)”*

The borrow sites identified in the W2B EIS and SPIR have been included in the overall earthworks balance for the project. The current earthworks balance for the project identifies a large deficit of material in Portion C, therefore the required material cannot be sourced from within the project boundary and would be required to be imported from external quarries or other borrow sites near the project.

Section 6.4.1 of the W2B EIS outlines local quarries that could supply material to the project. The quarry at Moonimba Borrow Site was identified as a potential source of material under the name of Robinsons Pit, a previous name of the quarry property.

Roads and Maritime has entered into a lease agreement with the landowner to extract the required material for the project. The approval to temporarily increase the extraction rate to one million tonnes of material per annum would alleviate the deficit in material and allow for the delivery of the project in line with the current programming and staging required to meet Roads and Maritime proposed completion dates of the project. The proposed modification involves the increased extraction of material at an existing quarry site, therefore it is anticipated that the impacts would be less than those associated with the establishment of a new borrow site.

As the project is publicly funded, Roads and Maritime is committed to providing public value for money for the design, construction and operation of the Woolgoolga to Ballina Pacific Highway Upgrade. Increasing the extraction rate at the site would allow for the reduced unit cost of material due to economies of scale.

Other local quarries within the area have been identified as potential alternative sources of material for the project, however they are located further from the project alignment and do not possess the types and quantities of material necessary to fill the deficit of material in Portion C. Sourcing the required material from the Moonimba Borrow Site would reduce the distance travelled by haulage vehicles travelling to and from the alignment which would decrease the potential impacts to the wider local road network, increase safety for local residents, and provide project efficiency.

Sourcing the required material from Moonimba Borrow Site could also reduce the project's dependence on smaller quarries whose resources and/or annual extraction limits could be depleted by providing material to the project. This would reduce the amount of available material for other local projects and independent buyers in the region. Additionally, this could inadvertently encourage quarries to exceed their extraction limits in order to meet the demands of the project and their other clients.

Sourcing material from one central location also allows for a number of additional benefits including:

- Localising the impacts of haulage movements to a singular haulage route whilst reducing the number of local roads required to haul material to the project corridor
- Allowing for the more stringent control of one haulage route, increasing safety along local roads affected by the project
- Allowing for the borrow site and haulage route to be operated under the Woolgoolga to Ballina Pacific Highway Upgrade project approval and the approved Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 - 11) Construction Environmental Management Plan (CEMP).

Without the proposed modification, the project could result in a number of impacts including (but not limited to):

- The need to source material from further distances, increasing congestion and the likelihood of vehicle accidents on the local road network
- Impacts to the wider local road network resulting in additional impacts to townships/villages
- An increased cost for sourcing material, resulting in an increase in capital expenditure for the project
- Additional strain could be placed on smaller local quarries impacting the supply of available material for local projects.

3 LEGISLATIVE AND PLANNING FRAMEWORK

3.1 NSW ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979 (EP&A ACT)

3.1.1 APPROVED PROJECT CONTEXT

An environmental impact statement was required for the project when Roads and Maritime Services formed the opinion that the project would be likely to significantly impact on biodiversity, Aboriginal heritage and hydrology. An application was made to the Minister for Planning and Infrastructure for the project to be approved under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Subsequently the project was declared as critical State Significant Infrastructure under section 115V of the EP&A Act, by virtue of clause 16 and Schedule 5, clause 1(c) of State Environmental Planning Policy (State and Regional Development) 2011, as it is considered to be essential for the State for economic, environmental or social reasons.

In accordance with clause 16 of State Environmental Planning Policy (State and Regional Development) 2011, the project is also State Significant Infrastructure under section 115U of the EP&A Act and is permissible without consent under Part 4 of the EP&A Act. The project was therefore assessed under Part 5.1 of the EP&A Act.

On 23 November 2011, the Director-General of the Department of Planning and Infrastructure notified Roads and Maritime Services of the environmental assessment requirements for preparation of an environmental impact statement (EIS) by (or on behalf of) Roads and Maritime Services. The Director-General of the Department of Planning and Infrastructure issued supplementary environmental assessment requirements from the Commonwealth Department of Sustainability, Environment, Water, Population (now the Department of the Environment and Energy) on 11 July 2012 following consultation.

The W2B EIS was publically displayed for 60 days between December 2012 and February 2013, inclusively. The exhibition generated 145 submissions which were responded to in the Pacific Highway Upgrade: Woolgoolga to Ballina Submissions / Preferred Infrastructure Report (SPIR) issued in November 2013. The Woolgoolga to Ballina Pacific Highway Upgrade Project (excluding the proposed modification) was approved on 24 June 2014 by the Minister for Planning subject to the Minister's conditions of approval (MCoA). Any refinements to the project which are not consistent with the Approved Project must be approved by the Minister under Section 115ZI(2) of the EP&A Act.

Two modifications to the conditions of approval have been requested and approved and included the following:

1. Modification of Conditions of Approval 15 January 2015 – SSI 4963 Modification 1: Minor amendment to the definition of construction and updating of the public authority references
2. Modification of Conditions of Approval 7 October 2015 - SSI 4963 Modification 2: Amendment to capture additional works outside the project boundary that may impact on heritage items to require archaeological investigations and conditions of approval.

A third modification has been submitted to the Department of Planning and Environment for consideration for works near Glenugie, in Portion A of the project.

3.1.2 PROPOSED MODIFICATION

Roads and Maritime considers that the proposed modification outlined in this environmental assessment is not consistent with the approval for the Woolgoolga to Ballina Pacific Highway Upgrade Project. Accordingly, Roads and Maritime seeks a modification of the Minister's approval under Section 115ZI of the EP&A Act.

This modification to the Approved Project has been prepared for the purposes of seeking approval for the use of the Moonimba Borrow Site as a modification to the Woolgoolga to Ballina Pacific Highway Upgrade Project.

3.2 COMMONWEALTH ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT 1997 (EPBC ACT)

The Woolgoolga to Ballina Project was referred to the Commonwealth Minister for the Environment in accordance with the requirements of the *Environmental Protection and Biodiversity Conservation Act 1997* (EPBC Act). The Minister's decision (2012/6394) was received on 14 August 2014 subject to a number of conditions being met. There have been no modifications of the approval since the decision was received.

An Ecological survey has been undertaken within the proposed Moonimba Borrow Site which has confirmed the vegetation types and habitat potential for fauna and did not identify the presence of an EPBC listed community or species, refer to Section 4.3. An additional referral under the EPBC Act is therefore not necessary for the proposed modification.

3.3 ENVIRONMENTAL PLANNING INSTRUMENTS

Under section 115ZF(2), Part 5.1 of the EP&A Act, environmental planning instruments do not apply to State significant infrastructure except for the declaration of infrastructure as State significant infrastructure or as critical State significant infrastructure. Therefore, the following State environmental planning policies (SEPPs) and local environmental plans (LEPs), which may have otherwise applied, do not apply to the Approved Project and, subsequently, this modification:

- SEPP No. 14 – Coastal Wetlands
- SEPP No. 26 – Littoral Rainforests
- SEPP No. 44 – Koala Habitat Protection
- SEPP No. 55 – Remediation of Land
- SEPP No. 71 – Coastal Protection
- North Coast Regional Environmental Plan (a deemed SEPP)
- Richmond Valley LEP 2012

Each of these instruments and their purposes is provided below.

SEPP No. 14 – Coastal Wetlands

State Environmental Planning Policy No. 14 – Coastal Wetlands aims to ensure that coastal wetlands are preserved and protected in environmental and economic interests of the state

There are no previously identified SEPP No. 14 – Coastal Wetlands or nationally important wetlands in the vicinity of the proposed Modification.

SEPP No. 26 – Littoral Rainforests

SEPP Environmental Planning Policy No. 26 – Littoral Rainforests provides a mechanism for the consideration of applications for development that are likely to damage or destroy littoral rainforest areas with a view to the preservation of those areas in their natural state. The SEPP also applies to land within 100 metres of the boundary of a SEPP 14 wetland.

There are no previously identified littoral rainforests identified in the vicinity of the proposed Modification.

SEPP No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection aims to encourage the proper conservation and management of natural Koala habitat to ensure that there is a permanent free-living population throughout their present range and to reverse the current trend of population decline. SEPP No. 44 does not apply to the Project, however Roads and Maritime has adopted a similar approach to assessing koala habitat as described under SEPP No. 44.

There are no areas of previously assessed koala habitat within the footprint of or in the immediate vicinity of the proposed Modification.

SEPP No. 55 – Remediation of Land

The aims and objectives of State Environmental Planning Policy No. 55 – Remediation of Land are to provide a state-wide planning approach to contaminated land remediation. It also promotes the remediation of contaminated land.

Richmond Valley LEP 2012

The Richmond Valley Local Environment Plan 2012 was gazetted in March 2012. The provisions of the new Local Environment Plan commenced on 21 April 2012. The Richmond River plan aims to ensure adequate land is available in suitable locations for the needs of a range of beneficial and appropriate land uses.

3.4 OTHER ENVIRONMENTAL LEGISLATION

A number of approvals that generally apply under other NSW legislation are not required for State significant infrastructure approved under Part 5.1 of the EP&A Act (EP&A Act s.115ZG). A full list of exemptions is presented in Section 2.3 of Chapter 2 – Assessment Process within the Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (RMS, 2012).

- Exemptions potentially relevant to the proposed modification include:
- An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*
- Part 6 (division 8) of the *Heritage Act 1977*, does not apply to, prevent, or interfere with the carrying out of approved State significant infrastructure
- An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*
- An authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act repealed by that Act) to clear native vegetation or State protected land
- A bushfire safety authority under section 100B of the *Rural Fires Act 1997*
- A water use approval under section 89, a water management work approval under section 90 of an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*.

Approvals under other NSW legislation may apply to the project including:

- An environmental protection licence for road construction under Chapter 3 of the *Protection of the Environment Operations Act 1997*. In accordance with section 115ZH of the EP&A Act, such a licence cannot be refused for an Approved Project and is substantially consistent with the Part 5.1 approval.
- An approval under the *Crown Lands Act 1989* to grant a relevant interest (i.e. licence, permit, easement or right of way) over a Crown Reserve.

Other legislation may apply to the proposed modification including:

- *Native Title (New South Wales) Act 1994*: This applies to the project on land affected by native title claim in NSW. The Act requires notification to native title claimants affected by the project alignment

- *Native Title Act* (Commonwealth): The main objective of the Act is to recognise and protect native title claim in NSW. The Act requires notification to native title claimants affected by the project alignment.
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Commonwealth): The main objective of this Act is to protect and preserve places, areas and objects of Aboriginal cultural significance. In situations where traditional Aboriginal cultural heritage may be at risk, the Aboriginal community has the right to ask the Minister to intervene. The Minister may make declarations which can override approvals and stop activities.

Due to the Approved Project (and therefore the proposed modification) being declared critical State significant infrastructure, the following directions, orders or notices cannot be made so as to prevent or interfere with the carrying out of the approved critical State significant infrastructure (EP&A Act s. 115ZG(3)):

- An interim protection order (within the meaning of the *National Parks and Wildlife Act 1974* or the *Threatened Species Conservation Act 1995*)
- An order under Division 1 (Stop work orders) of Part 6A of the *National Parks and Wildlife Act 1974*, Division 1 (Stop work orders) of Part 7 of the *Threatened Species Conservation Act 1995* or Division 7 (Stop work orders) of Part 7A of the *Fisheries Management Act 1994*
- A remediation direction under Division 3 of Part 6A of the *National Parks and Wildlife Act 1974*
- An environmental protection notice under Chapter 4 of the *Protection of the Environment Operations Act 1997*
- An order under section 124 of the *Local Government Act 1993*.

In addition, certain third party appeal provisions do not apply (EP&A Act s.115ZK).

4 ENVIRONMENTAL ASSESSMENT

4.1 TRAFFIC, TRANSPORTATION AND ACCESS

4.1.1 INTRODUCTION

This section considers the potential traffic and transport impacts that may result from the Moonimba Borrow Site. Impacts to traffic and transport for the Approved Project were discussed in Chapter 14 of the Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (W2B EIS) (RMS, December 2012) and Section 5.6 of the Moonimba Quarry Expansion Environmental Impact Statement (Moonimba Quarry EIS, 2014).

By reviewing and utilising the Transport and Traffic Impact Assessment prepared by Greg Alderson & Associates (2014) for the Moonimba Quarry EIS, Pacific Complete has prepared a traffic impact assessment (TIA) as part of the proposed modification, refer to Appendix C.

4.1.2 METHODOLOGY

A Traffic Impact Assessment (TIA) was prepared to explore the implications of increasing haulage and heavy vehicle activity associated with the proposed modification with respect to road performance, general traffic operation, school bus routes and land uses both current and future. The proposed modification is anticipated to affect local road network performance within Woodburn and Bungawalbin.

As part of the Moonimba Quarry EIS, associated with DA2015.0069, a Traffic and Transport Impact Assessment (Moonimba Quarry TTIA) was prepared by Greg Alderson & Associates in 2014. The Moonimba Quarry TTIA has been utilised in preparing this TIA for the proposed modification.

For the purpose of this TIA, the following assumptions were made:

- Traffic volumes calculated within the TTIA (Greg Alderson & Associates, 2014) would be utilised and conservatively grown at 2% per annum, to account for future traffic volumes within Woodburn. Despite the anticipated drop in vehicles using the Pacific Highway following the completion of the W2B upgrade, this growth would ensure a worst-case scenario analysis.
- The Pacific Highway is capable of servicing increases in the proportion of heavy vehicles.
- As stipulated within Richmond Valley Council's approval (DA 2015/0069), upgrades and maintenance of the haulage route are to be carried out by the owner of the borrow site prior to Pacific Complete occupation of the borrow site.
- Increased traffic volumes have been assumed to be split through the network; based on land usage, points of interest and dominant directions of traffic flow.
- The results and future impacts from the TTIA (Greg Alderson and Associates, 2014) would be used as the basis for further mitigation measures and strategies.
- A Road Safety Audit (RSA) would not be performed as the results from the RSA undertaken for the TTIA (Greg Alderson and Associates, 2014) remain relevant and applicable to the haulage route for the proposed modification.
- Potential upgrades to the haulage route have been considered by Richmond Valley Council. It has been acknowledged that the severe storm events within the region warrant adequate maintenance and upgrade of the haulage route, particularly Woodburn-Coraki Road.
- This TIA focuses on the impacts generated by traffic associated with the proposed modification.

4.1.3 EXISTING ENVIRONMENT

STUDY AREA

The Moonimba Borrow Site is situated approximately 16 kilometres south-west of Woodburn, NSW. The borrow site is currently accessed by Boggy Creek Road which joins with Reardons Lane approximately 3 kilometres east of the site and adjacent to a residential property (Lot 2 DP 805371). The first 300 metres of the borrow site access road is sealed so as to minimise potential noise and dust impacts to residents.

The existing haulage route passes through eight intersections on the approach to the Pacific Highway at Woodburn. The major intersections that have been examined for the purpose of the assessment include:

- Pacific Highway (River Street) and Woodburn-Coraki Road
- Reardons Lane and Woodburn-Coraki Road
- Site access road and Boggy Creek Road.

Land uses surrounding the borrow site consist predominantly of agricultural and rural residential land. Within the Bungawalbin region, the main land use activity is agriculture and nature reserves. The TTIA (Greg Alderson & Associates, 2014 for DA2015.0069) forecasted that an additional 84 residential lots are to be released/developed by 2024.

SCHOOLS AND SCHOOL BUS ROUTES

The following schools are located within the Woodburn-Coraki-Broadwater area:

- St Joseph's Woodburn Primary School
- St Joseph's Coraki Primary School
- Woodburn Public School
- Evans River K-12 School
- Coraki Public School
- Broadwater Public School.

Year to year bus routes are susceptible to change, depending on student enrolments and the proximity of schools to residents. As such, bus routes or graphical representations of the bus corridors are not available. However, bus routes and timetables are publicly available. Table 4-1 summarises the number of buses operating along the haulage corridor, during the morning and afternoon school peaks which are defined as 7.00 am to 9.00 am and 2.55 pm and 5.00 pm respectively.

Table 4-1 Over-lapping haulage and bus routes

Bus routes	Suburb	Street	Number of buses (pm)	Number of buses (pm)
Locality	Bungawalbin	Boggy Creek Road	8	7
		Reardons Lane	10	7
	Woodburn	Woodburn-Coraki Road	7	7
		Pacific Highway	20	20

Following a high level assessment, bus routes and roads used in the local area were identified as follows:

- Local roads:
 - Boggy Creek Road, Reardons Lane and Woodburn-Coraki Road support approximately 4-5 buses per hour during the morning and afternoon school peaks
- Pacific Highway services:
 - Buses transport students to schools north and south of the study area
 - Bus frequency is about 10 buses per hour during the morning and afternoon school peaks.

RESIDENCES AND BUSINESSES

The current haulage route used by the existing operation overlaps most of Woodburn’s residential access along the Pacific Highway. The Woodburn-Coraki Road and Pacific Highway intersection is the focal point within the study area servicing schools, residents and businesses.

ROAD CAPACITY AND TRAFFIC COUNTS

At the time that the TIA was prepared, existing road quality and capacity are assumed to be as presented in Table 4-2. Provisions in the DA2015.0069 require upgrades to haulage routes and intersections which would be undertaken prior to the commencement of any haulage for the modification – refer section 4.1.5 for further details of this mitigation.

Table 4-2 Average traffic volumes (2014)

Location	Daily traffic (Vehicles per day - vpd)	Peak hourly volumes (Vehicles per hour - vph)
Reardons Lane	220	25
Woodburn-Coraki Road	1,397	133
Boggy Creek Road	132	<10
Site Access Road	30	

Source: Greg Alderson and Associates (2014)

HAULAGE OPERATIONS AND SITE ACCESS

The existing entrance for the Moonimba Borrow Site is located on Boggy Creek Road approximately two kilometres west of the intersection with Reardons Lane. It is noted that the first 300 metres of the site access road has been sealed. The TTIA (2014) indicated that the site access road incurs 30 truckloads per day. Following the DA2015.0069 approval (for 90,000 cubic metres per annum), it was forecasted that 40 trucks movements per day, plus an additional 14 backfill trucks per day would meet the yearly demand, thus resulting in 54 movements per day.

In conjunction with the Moonimba Borrow Site operation, Coraki Quarry and Champions Quarry are operating within the study area. The Coraki Quarry currently has approval to dispatch 21 trucks per hour between 7.00 am and 6.00 pm. It should be noted that Coraki Quarry has recently applied for approval to dispatch 31 truckloads per hour in order to facilitate the supply of material to the upgrade of the Pacific Highway. Furthermore, there is an additional ‘private’ quarry known as ‘Petersons Quarry’ within the Coraki complex, which generates minor traffic movements along the Coraki Quarry haulage route. The haulage route for Coraki Quarry is along Woodburn-Coraki Road towards the Pacific Highway. There is approximately six kilometres of Woodburn-Coraki Road where haulage vehicles from Coraki/Petersons Quarry and Moonimba Quarry overlap. For this assessment, these volumes have been considered as a cumulative impact with the Moonimba Borrow Site.

Champions Quarry, which is situated in Tuckarimba, north-west of Woodburn, contributes 11 to 30 trucks per day, with restrictions to operate between 7.00 am and 5.30 pm. The identified haulage route for this site, is via the Bruxner Highway for deliveries to Lismore, with the preferred access to the Pacific Highway via

Wyrallah Road. The indicative traffic impacts of haulage operations from Champions quarry, are wholly restricted to Wyrallah Road and the Pacific Highway. Therefore the Moonimba Borrow Site haulage route does not incur any cumulative impacts from the operation of Champions Quarry.

Figure 4-1 illustrates the location of Peters/Coraki Quarries and Champions Quarry and their respective haulage routes.

4.1.4 IMPACT ASSESSMENT

PROPOSED HAULAGE OPERATIONS

It is proposed to increase the maximum annual extraction rate of the Moonimba Borrow Site to one million tonnes per annum. The borrow site is proposed to operate six days per week (7 am to 6 pm weekdays and 8 am to 5 pm on Saturdays). The TIA undertaken to support the proposed modification identified an operational threshold of 300 truck movements per day or 33 movements per hour (16 vehicles per hour) and has been considered to account for increases in construction demands. The average number of heavy vehicle movements per day would range between 230 and 250.

Four roads have been identified within the proposed haulage route including Reardon's Lane, Boggy Creek Road, Woodburn-Coraki Road and the existing Pacific Highway. The existing Pacific Highway was identified within the W2B EIS as a haulage route to be used throughout the duration of construction. The other three roads were not identified within the W2B EIS as haulage routes. However, the haulage route proposed is similar to the existing haulage route being used by the existing Moonimba Quarry, as well as the nearby Coraki Quarry. Once on the Pacific Highway, haulage vehicles are anticipated to access the construction corridor via a number of local roads including: Watsons Lane and Alfred Street (that lead into Wagner Street and then onto Woodburn-Evans Head Road). These roads were identified in Section 6.6.1 of the W2B EIS as local roads that could potentially be used for construction access or haulage routes. The impacts to these local roads have not been considered as part of this modification as they have already been addressed within the W2B EIS for the delivery of material to the construction corridor.

The proposed haulage route is inconsistent with the haulage routes identified within the W2B EIS and would result in additional impacts to Reardon's Lane, Boggy Creek Road and Woodburn-Coraki Road throughout the duration of the proposed increase in annual extraction from the Moonimba Borrow Site.

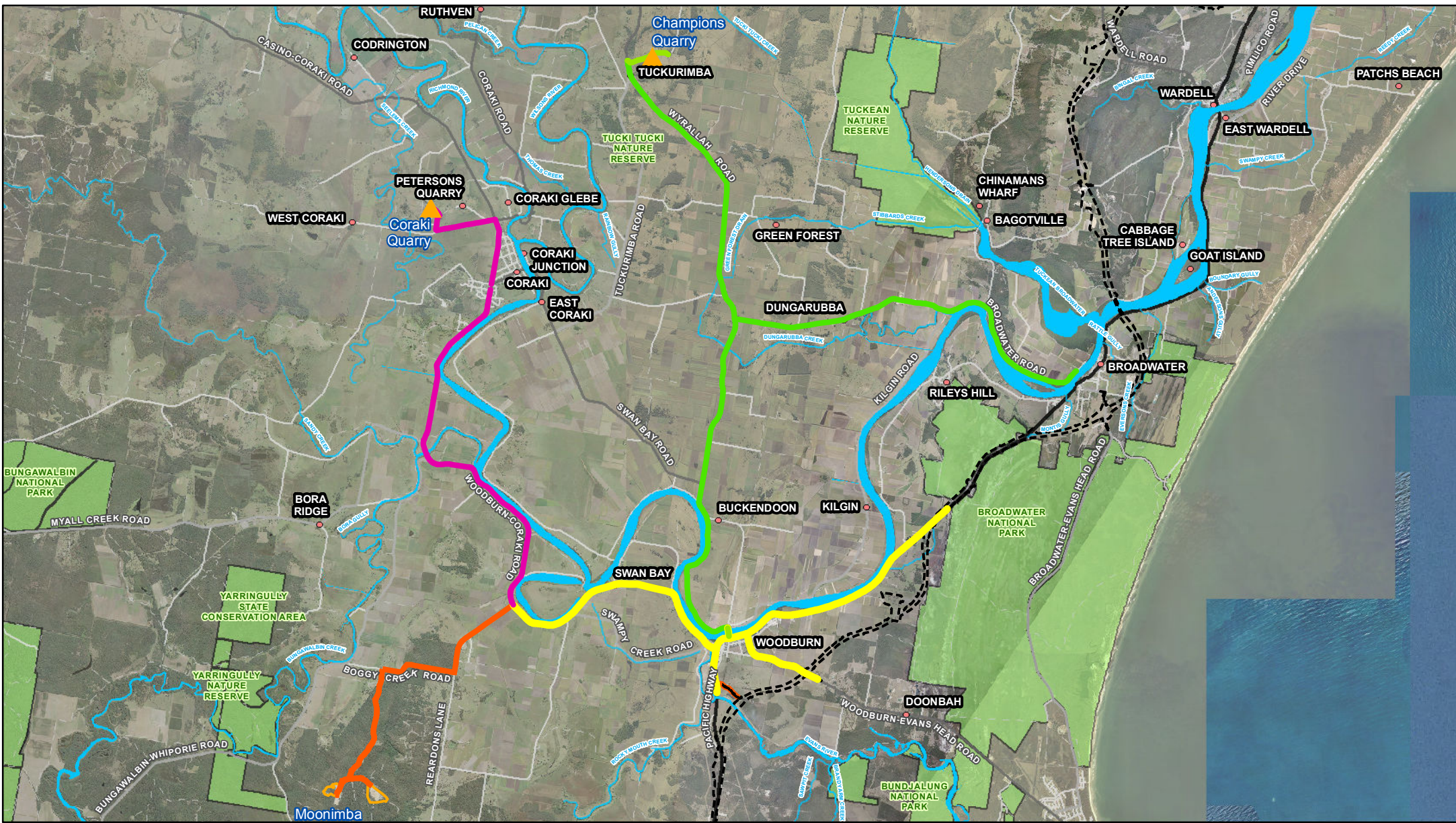
INTERSECTION IMPACTS

Three intersections have been identified within the TIA which would be impacted throughout the duration of operations under the proposed modification including:

- Site Access / Boggy Creek Road,
- Reardon's Lane / Woodburn – Coraki Road, and
- Woodburn – Coraki Road / Pacific Highway.

Based on the assumption that the road upgrades specified by approved DA2015.0069 have been completed prior to commencement of haulage for the modification, Boggy Creek Road, Reardons Lane and the borrow site access road would provide adequate capacity to service the one million tonnes per annum (400,000 m³ per annum) extraction and associated backfill vehicle movements.

Of the three intersections identified, the intersection between Woodburn-Coraki Road and the Pacific Highway is the most critical. The resulting increase in traffic associated with the proposed increase in extraction of material from the borrow site would necessitate a right-turn treatment on the Pacific Highway, for vehicles to safely and efficiently access Woodburn-Coraki Road. The appropriate treatment is a channelised right-turn bay on the Pacific Highway, southbound, as shown in Figure 4-2.



PACIFIC COMPLETE

PACIFIC HIGHWAY UPGRADE

Woolgoolga to Ballina

Moonimba, Coraki & Champions Quarry Haulage Routes

Figure 4-2

- ▲ AOI Quarries (Excluding Moorinmba)
- Coraki Haulage Route
- Shared Haulage Route
- Champions Haulage Route
- Moonimba Haulage route
- Footprint defined in previous EIS (Novoplan, 2014)
- Approved Project Boundary Version 11 (June 2016)
- Primary Road
- Arterial Road
- Sub Arterial Road
- Local Road
- Track-Vehicular
- Drainage
- Richmond River
- National Park



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Author:	ORFANOSM

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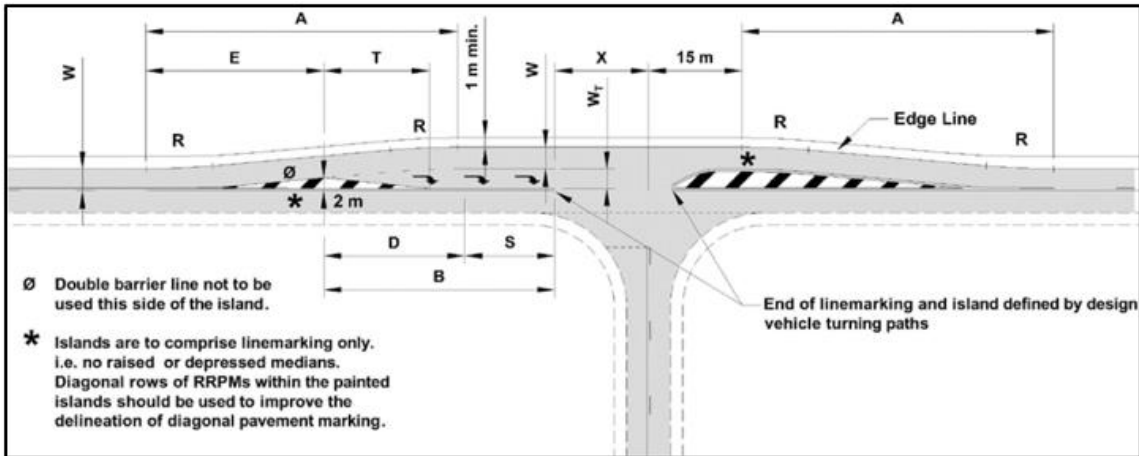


Figure 4-2 Channelised Right Turn Bay on the Pacific Highway

Due to the locality of St Joseph’s Primary School (immediately west of the intersection of Woodburn-Coraki Road and Pacific Highway), the morning and afternoon peaks incur greater bus and light vehicle volumes accessing Woodburn-Coraki Road. The introduction of a channelised lane would improve the safety and manoeuvrability of construction and local vehicles. This treatment would require the reconfiguration of the intersection’s layout and realignment of the existing line marking.

Due to fluctuations in project demands, there would be circumstances where the frequency of haulage operations would increase or decrease. An alternative to line marking amendments, would be the introduction of a traffic management plan (TMP). Traffic controllers, variable message signs and adequate tapering, would be provided to manage this intersection during peaks in construction haulage activities. Already operating at 50 kilometres per hour and within a school zone, the slowing down of traffic typically takes place at this location. Therefore, to accommodate the number of turning vehicles accessing (entering and exiting) Woodburn-Coraki Road, a TMP would be applied.

TMPs would be prepared in accordance with the approved Woolgoolga to Ballina Pacific Highway Upgrade (Sections 3 to 11) Construction Traffic and Access Management Plan (CTAMP), Appendix B1 of the Construction Environmental Management Plan. Pacific Complete construction staff and their contractor will liaise with the Pacific Complete logistics team so as to ascertain details of other construction activities, such as, concrete and precast unit deliveries to ensure proposed TMPs account for project specific traffic movements.

In addition, the implementation of GPS tracking of haulage vehicles would be investigated to monitor the location and speed of haulage trucks during the morning and afternoon school peak traffic times so as to ensure impacts of school bus operations are minimised.

CONSISTENCY WITH THE APPROVED PROJECT

Traffic and transport is considered to generally be consistent with the approved project. In particular, haulage numbers would generally be consistent with those predicted for the Pacific Highway for the Approved Project. The haulage route from Moonimba Borrow Site has been assessed in the TIA for this modification and found that there would be a large increases of haulage vehicles on this route. However, the assessment has determined that Boggy Creek Road, Reardons Lane and the borrow site access road would provide adequate capacity to service the predicted vehicle numbers. Additionally, it has been assessed that where intersection treatments and upgrades to the route are undertaken, Woodburn-Coraki Road and the Pacific Highway intersection would also have adequate capacity to service the increased haulage.

4.1.5 MITIGATION / MANAGEMENT MEASURES

Construction traffic impacts associated with the proposed modification would be managed in accordance with the Woolgoolga to Ballina Pacific Highway Upgrade (Sections 3 to 11) Construction Traffic and Access Management Plan (CTAMP), Appendix B1 of the Construction Environmental Management Plan. In addition, the following mitigation/management measures identified by the TIA would be implemented:

- Road upgrades specified by approved DA2015.0069 would be completed prior to the commencement of increased haulage of extracted material from the borrow site.
- Right-turn treatment on the Pacific Highway, for vehicles to safely and efficiently access Woodburn-Coraki Road with the appropriate treatment being a channelised right turn bay on the Pacific Highway, southbound would be installed to provide a right-turn treatment on the Pacific Highway for vehicles to safely and efficiently access Woodburn-Coraki Road. This treatment require the reconfiguration of the intersection's layout and realignment of the existing line marking.
- A traffic management plan (TMP) would be prepared in accordance with the W2B CTAMP (Appendix B1 of the CEMP). This would include traffic controllers, variable message signs and adequate tapering, which would be provided to manage this intersection during peaks in construction haulage activities.
- The implementation of GPS tracking of haulage vehicles would be investigated to monitor the location of haulage trucks during the morning and afternoon school peak traffic times so as to ensure impacts of school bus operations are minimised.

4.3 NOISE AND VIBRATION

4.3.1 INTRODUCTION

This section considers potential noise and vibration impacts that may result from the Moonimba Borrow Site. Noise and vibration impacts were discussed in Chapter 15 of the Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (W2B EIS) (RMS, December 2012) and section 5.7 of the Moonimba Quarry Expansion Bungawalbin NSW Environmental Impact Statement (Newman's Quarry & Landscape Supplies, 2014) (Moonimba Quarry EIS).

4.3.2 METHODOLOGY

A Noise Impact Assessment (NIA) was prepared to assess the impacts of the proposed modification to the borrow site's extraction rate, refer to Appendix D. The objectives of the NIA were to assess the following matters:

- Clearing of approximately 9.5 hectares of vegetation within the footprint of the excavation areas (in addition to the clearing limits specified in SSI-4963 (MCoA B1))
- Airborne noise from extraction processes on the site according to the NSW Industrial Noise Policy (EPA, 2000)
- Airborne noise impacts from haulage vehicles travelling on the public road network according to the NSW Road Noise Policy (EPA, 2011).
- Specifically, the following were included in the assessment as required by these policies:
 - Identification of noise sensitive receiver locations
 - Description of existing acoustic environment around the borrow site and the haulage route
 - Establishment of the appropriate noise assessment criteria for extractive processes and road traffic noise
 - Predictive worst case noise modelling for extractive processes
 - Prediction of impacts from additional heavy vehicle movements travelling on public roads generated by the increased site operations
 - Assessment of impacts and recommendations for mitigation and management measures.

The noise modelling predicted noise levels at the nearest noise sensitive receivers surrounding the borrow site from extraction process scenarios located in the western pit and eastern pit. The predicted noise levels for each scenario were compared with the criteria derived from the Industrial Noise Policy to assess impacts.

The assessment also undertook a desktop study to predict the potential impact from the increase in road haulage movements generated by the increased extraction rate. The assessment considered impacts on Boggy Creek Road, Reardons Lane and Woodburn-Coraki Road until the route meets the Pacific Highway. It considered the potential impacts at receivers adjacent to these public roads that access the borrow site. The increase in road traffic noise levels was predicted and compared with the assessment criteria in the Road Noise Policy.

The noise impact assessment does not address overpressure or vibration from blasting operations, which are managed via the W2B CEMP Appendix B3 Construction Noise and Vibration Management Plan (CNVMP).

4.3.3 EXISTING ENVIRONMENT

EXISTING APPROVALS

The borrow site's current extraction processes were approved in the 1997 Development Application No. 127/95 (DA 127/95). The conditions did not nominate specific noise, vibration or blasting limits other than with reference to the EPA requirements. The approval also required noise emission must not be offensive and operational hours were limited to:

- 7am to 8 pm Monday to Friday
- 8 am to 12 noon Saturdays.

The Moonimba Quarry EIS assessed the noise and blasting impacts from the expanded extraction processes. An NIA was conducted for the EIS in 2014 by Greg Alderson and Associates, (Moonimba Quarry NIA), to assess the increased extraction rate proposed in 2015. The Moonimba Quarry NIA predicted no exceedance above the Industrial Noise Policy criteria from extractive processes. It identified several exceedances of the Road Noise Policy criteria and recommended speed limits for heavy vehicles on the haulage route.

The DA2015.0069 approval contained specific measures for the control of noise and blasting from the site, in addition to road traffic noise. At the time of this report, the application has not been activated and the approval conditions are not in effect.

EXISTING ACOUSTIC ENVIRONMENT

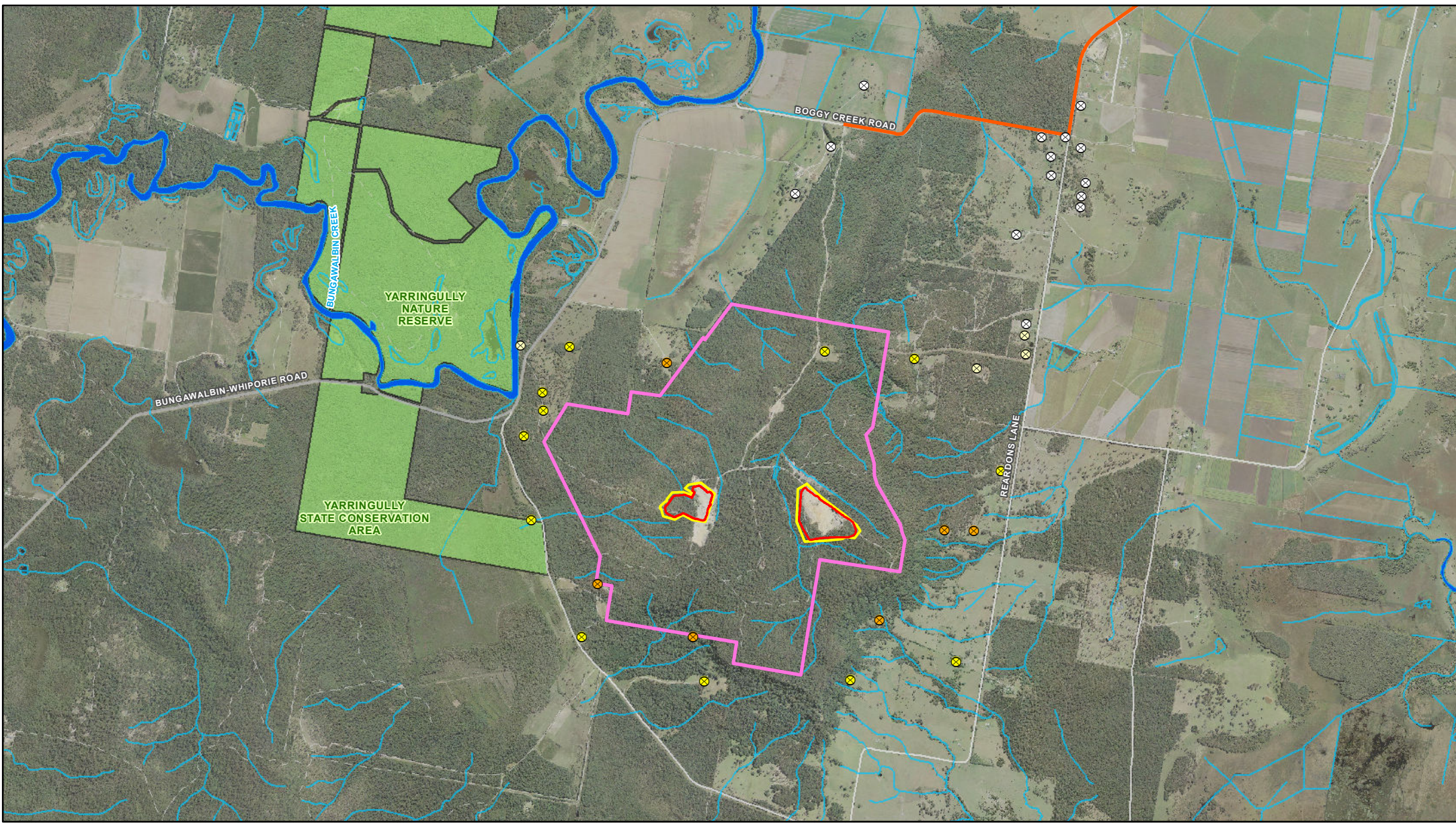
The borrow site is situated in a rural environment surrounded by isolated rural residential properties, farming land and nature reserves. Thirty-six noise sensitive receivers were identified in the vicinity of the borrow site, with one receiver located inside the site boundary (being the landowner of the quarry), refer to Figure 4-3.

The existing acoustic environment was defined using measurements undertaken in 2014 for the Moonimba Quarry EIS. These measurements showed that the existing background noise levels were close to or below 30 dB(A) for the nearest sensitive receivers. As a result, the rating background level (RBL) for the assessment was set to 30 dB(A), which is the minimum permissible according to the Industrial Noise Policy.

The existing road traffic noise level on the haulage route was defined using road traffic noise measurements carried out for the Moonimba Quarry EIS on Boggy Creek Road and Reardons Lane. The haulage route from the borrow site potentially affects the following existing roads:

- Public areas of the Quarry Access Road
- Boggy Creek Road (east of access road)
- Reardons Lane (north of Boggy Creek Road)
- Woodburn-Coraki Road (east of Reardons Lane).

Woodburn-Coraki Road is an arterial road which carries vehicles between Casino and the Pacific Highway at North Woodburn. Heavy vehicles from Coraki and other quarries and developments in the area would also use the route and therefore noise generated from heavy vehicle movements would not be attributed solely to the borrow site.



PACIFIC COMPLETE

PACIFIC HIGHWAY UPGRADE

Woolgoolga to Ballina

Moonimba Borrow Site Sensitive Receivers

Figure 4-3

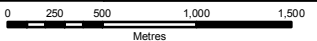
Sensitive Receivers

- 500 - 1000m
- 1000 - 1500m
- 1500 - 2000m
- 2000m >
- Haulage route
- Proposed excavation area
- Footprint defined in previous EIS (Novoplan, 2014)
- Borrow site property boundary

- SubArterialRoad
- LocalRoad
- Track-Vehicular
- Drainage
- Richmond River
- National Park



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Author: **ORFANOSM**

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The Moonimba Quarry EIS identified the above sections of roads as a 'principal haulage route' defined by Richmond Valley Council. Therefore they are considered as sub-arterial/arterial type road for the purposes of noise assessment due to their specific purpose. The daytime road traffic noise levels were defined at 10 metres from the road as:

- Boggy Creek Road 57 dB(A) Leq,15hr
- Reardons Lane was 61 dB(A) Leq,15hr.

The existing traffic volume on Woodburn-Coraki Road is considered to be 1397 vehicles per day, with 30 percent categorised as being heavy vehicles.

4.3.4 IMPACT ASSESSMENT

ON-SITE OPERATIONAL NOISE EMISSIONS

The assessment of extractive processes was undertaken using three dimensional predictive noise modelling. The modelling considered the effect of weather conditions on noise emissions. Neutral conditions with no effect from weather and an enhanced condition that considered the wind blowing from noise source to receiver were included. The borrow site would not operate during the night and was therefore only assessed for operations during the day.

Three operational scenarios were considered as follows:

- Scenario 1 - Site establishment
- Scenario 2 - Extraction, crushing and loading operations in the existing excavation area (typical relative level (RL) of 90 metres western pit and RL 120 metres eastern pit)
- Scenario 3 - Extraction, crushing and loading operations in the worst case highest works elevation (typical RL 109 metres western pit and RL 145 meters eastern pit).

The noise emitting equipment assessed included:

- Transportation vehicles, semi-trailers and delivery trucks
- Small mobile cranes
- Graders and rollers
- Excavators, front end loaders and dozers
- Impact crusher screen, Jaw crusher and reclaimer screen
- Watercart and light vehicles.

The noise emissions for the equipment were assessed for modifying factors as defined in the Industrial Noise Policy, including tonal, intermittent, impulsive and low frequency noise. The NIA found that no modifying factors were applicable.

Based on the rating background level derived from onsite noise measurements, the operational noise criteria was established as 35 dB(A) Leq,15min in accordance with the procedure in the Industrial Noise Policy.

The assessment identified exceedances under both neutral and enhanced weather conditions, with the enhanced conditions representing the highest impact. Table 4-3 presents the predicted exceedances for receivers.

Table 4-3 Summary of predicted exceedances under enhanced weather conditions

Scenario	Number of receivers exceeding criteria within range			
	1-5 dB	6-10 dB	11-20 dB	> 20dB
Site establishment	1	0	0	0
Operations in existing excavation area	1	7	1	0
Operations in the worst-case location	3	2	7	0

For the site establishment scenario, only one receiver was predicted to experience noise levels above the criteria.

For operations in the existing excavation area, up to nine receivers were predicted to be impacted above the criteria by up to 14 dB(A). These receivers were located to the west of the site, closest to the western pit.

For operations in the worst-case location, 12 receivers were identified to be impacted above the criteria by up to 19 dB(A). The impacted receivers were located surrounding the western side of the borrow site.

Receivers to the east of the site were not predicted to be impacted above the criteria as the natural topography provides acoustic shielding from the works.

Noise levels were predicted to be up to 54 dB(A) LAeq,15min from the work in their worst-case locations. Noise levels were predicted to be up to 49 dB(A) LAeq,15min when the work is being carried out in the existing excavation area, meaning there is some existing shielding from the pit walls. The NIA considers this to be representative of work occurring with localised screening of plant in place.

The predicted noise levels were well above the operational criteria derived in accordance with the Industrial Noise Policy, which is designed to manage long term impacts of noise from permanent industrial operations. The proposed increase in extraction at the borrow site is limited to a short-term period of approximately two years (or until the material demand for the project ceases) as necessary to meet construction material requirements for the W2B project and would not be a permanent operation. As such, the resulting impacts are considered to be reduced due to the limited duration of the work.

Further to this, whilst the noise levels are higher relative to the background level, the absolute predicted noise level is not a particularly high noise level, in the same order of magnitude as the Industrial Noise Policy day time acceptable amenity criteria level of 50 dB(A) Leq,11hr for rural residential areas.

In comparison to the Moonimba Quarry EIS the predicted noise impacts are greater for extractive processes. This is largely due to the different equipment that is being proposed for this proposal. The equipment proposed would emit higher noise levels, especially the crushers and screens. In addition, the modelled worst case work areas would have less topographical screening to the receivers and therefore more noise would be transmitted from the work.

CUMULATIVE ASSESSMENT

A cumulative assessment was undertaken to assess noise impacts from more than one activity operating at the same time. It is anticipated that the eastern and western pit would operate with alternating activities, such that crushing and screening would take place in one pit while loading and processing would be undertaken in the other.

The cumulative assessment has predicted exceedances above background levels for a number of receivers, with the majority of exceedances in the range of 1 to 10 dBA.

It is important to note that a cumulative assessment represents a worst case scenario which includes all plant and equipment operating at 100 per cent for the total assessment duration. This situation is unlikely to occur as plant and equipment will move around within the quarry, resulting in variable noise emission levels.

Noise monitoring during operation of the quarry would be undertaken at representative receiver locations to measure the actual noise levels and ensure that noise emissions are minimised for nearby sensitive receivers. Refer to section 4.2.5 below for further mitigation.

ROAD TRAFFIC NOISE EMISSIONS

In accordance with Section 2.2.2 of the Road Noise Policy criteria for Arterial/Sub-Arterial roads is set at 60 dB $L_{Aeq(15hour)}$ during daytime hours (07.00 – 22.00) and 55 dB $L_{Aeq(9hour)}$ during night time hours (10 pm to 7 am). The noise impacts from heavy vehicles travelling to and from the borrow site on the haulage route are expected to exceed the Road Noise Policy criteria at one receiver on Reardons Lane.

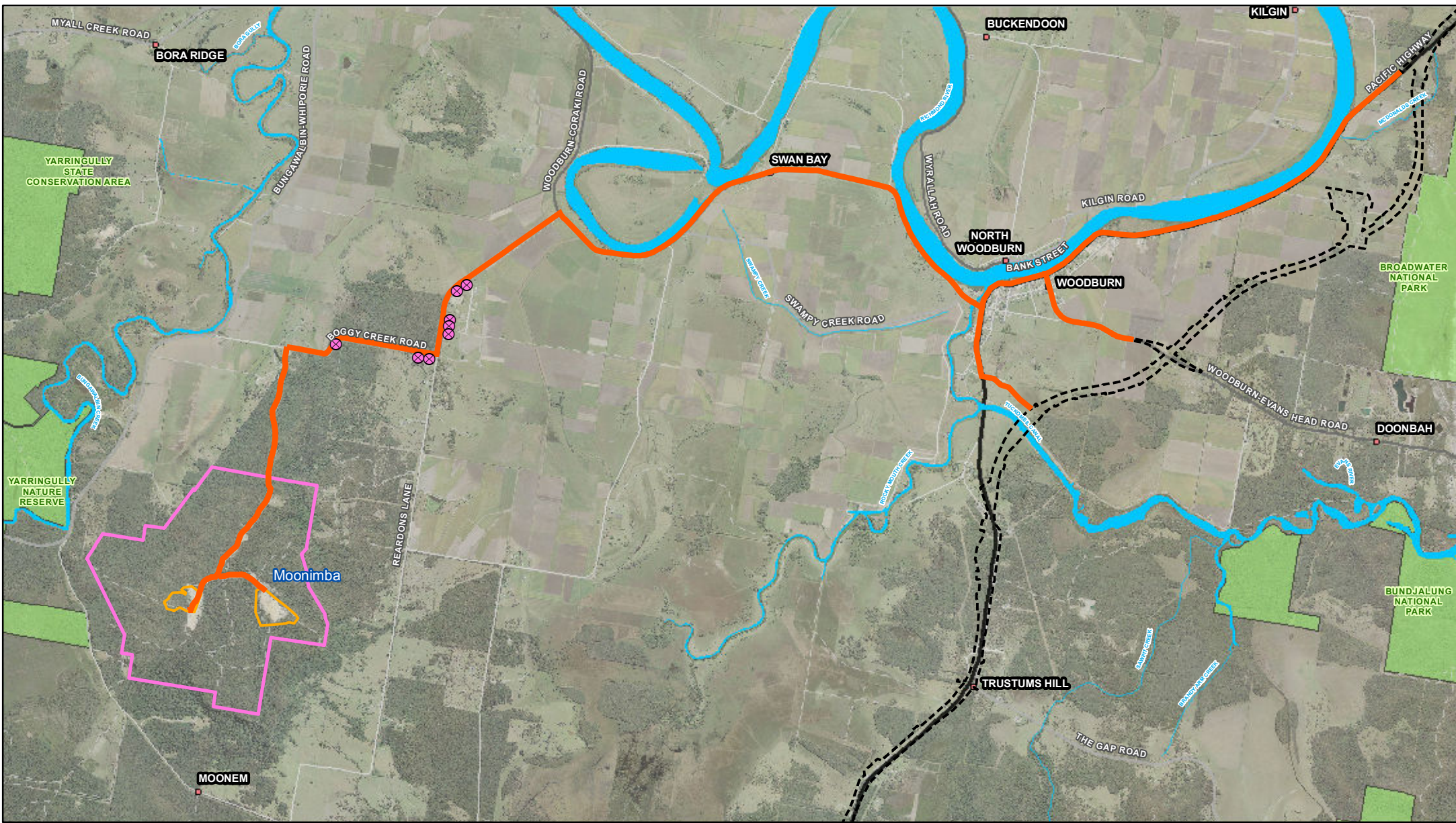
One of the objectives of the Road Noise Policy is also to consider the increase in noise level from the existing background level. An increase in traffic noise levels of more than 2 dBA may cause potential impacts. Eight sensitive receivers on Boggy Creek Road, Casuarina Drive and Reardons Lane are predicted to experience more than a 2 dBA increase in noise levels from haulage vehicles. Figure 4-4 illustrates the location of these eight sensitive receivers.

Mitigation and management measures to reduce potential noise impacts are discussed in Section 4.3.5.

CONSISTENCY WITH THE APPROVED PROJECT

The noise generated under the proposed modification would be higher than those already generated by the approved quarry operations identified in the Moonimba Quarry EIS and represent additional impacts to those identified in the W2B EIS. The W2B EIS did not specifically address noise and vibration from the extractive processes at the borrow site as, at the time, it was not expected that there would be an intensification of quarry operations and therefore a change in noise levels from this activity.

The use of local quarries and resources was always planned to supply material to the project (refer Section 2.6) and whilst the intensification of work at the quarry is expected to temporarily increase noise levels in the vicinity of the quarry and haulage route, the borrow site is not a new source of noise. The Moonimba Quarry EIS recommended a noise wall be constructed for 240 Reardons Lane which will be completed by the landowner during stage one of the proposed modification. Details of the noise wall are not currently available, however a standard noise wall would break line-of-sight with the road and would likely provide a reduction in noise of at least 5dB. Therefore this would be sufficient to ensure compliance with the applicable noise criteria. Where this measure is constructed, no additional impacts would be expected at this receiver.



PACIFIC COMPLETE

PACIFIC HIGHWAY UPGRADE

Woolgoolga to Ballina

Moonimba Borrow Site
Sensitive Receivers Impacted by Haulage Vehicles

Figure 4-4

<ul style="list-style-type: none"> ⊗ Sensitive receivers impacted by haulage vehicles — Moonimba Haulage route □ Footprint defined in previous EIS (Novoplan, 2014) □ Borrow site property boundary 	<ul style="list-style-type: none"> — Approved Project Boundary Version 11 (June 2016) — Primary Road — Arterial Road — Sub Arterial Road — Local Road — Track-Vehicular — Drainage 	<ul style="list-style-type: none"> — Richmond River — National Park
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4.3.5 MITIGATION / MANAGEMENT MEASURES

Noise mitigation and management measures have been defined in the W2B CEMP Appendix B3 Construction Noise and Vibration Management Plan (CNVMP). The CNVMP addresses potential impacts from noise and blasting from borrow sites in addition to noise from vehicles using haulage routes to access the borrow sites.

The borrow site would be managed in accordance with relevant measures in the CNVMP.

The local community is currently being engaged with to inform them of the reasons for the short-term increase in noise from the borrow site. In addition to the consultation currently being undertaken, local residents will be provided with ongoing updates and will be provided a suitable means of contact to make enquiries during operations under the proposed modification. A site specific complaints management procedure will also be developed in the event that complaints are made with respect to noise.

Noise mitigation measures have been recommended in the NIA and would be undertaken as follows:

- Establish a program of regular noise monitoring. As a minimum, noise monitoring would be undertaken for the following:
 - The first time any new or altered operations occur at the facility to meet the increased extraction rate (with the exception of Site Establishment works)
 - Any time equipment changes are made
 - Any time operations are commenced concurrently for the first time
 - Where operations move to a new location within the approved work area
 - As a result of a valid complaint from a surrounding noise sensitive receiver.
- Where any exceedances of the criteria are measured, the operator of the facility is to implement all reasonable and feasible measures to reduce noise levels towards the criteria. Measures may include:
 - Erecting noise barriers, screening or forming bunds around activities which are found to cause exceedances of the criteria. Depending on the surrounding topography, localised screening around equipment may reduce noise emissions by up to 10-15 dB(A).
 - Performing all noise intensive activity such as crushing and/or screening at deep excavation areas in existing pits, irrespective of extraction location.
 - Managing activities that are undertaken concurrently in order to meet noise criteria. This may change dependent on the location on site due to topographical screening and distance to the surrounding receivers. In certain areas more work may be permissible concurrently than when the same work is undertaken on a different part of the site.
 - Where reversing alarm noise is identified to be a source of disturbance, the alarm noise level would be checked against the appropriate regulatory and health and safety requirements and the necessary mitigating action taken to achieve an acceptable noise reduction without compromising safety standards.
 - In line with the CNVMP, alternative methods to traditional beeper alarms may be used.
 - In the event that rumble grid noise is considered to be a source of disturbance, mitigation applied in the form of lower posted speeds at the grids or localised screening to be installed if appropriate.

In order to manage the haulage route noise impacts, the measures detailed in the CNVMP would be followed and implemented where feasible and reasonable. An inspection of the noise wall to be constructed at the

affected received on Reardons Lane would be undertaken and noise monitoring carried out to ensure sufficient noise reductions are being provided for this receiver.

A blast management plan would be prepared by the contractor prior to any blasts occurring at the site to ensure compliance with overpressure and vibration limits outlined in the Approved Project's Conditions of Approval, specifically MCoA B22 and B23.

4.5 BIODIVERSITY

4.5.1 INTRODUCTION

This section addresses the biodiversity impacts of the Moonimba Borrow Site. Biodiversity impacts associated with the borrow site were assessed in the Moonimba Quarry Expansion Bungawalbin NSW Environmental Impact Statement (Newman's Quarry & Landscape Supplies, 2014) (Moonimba Quarry EIS) and associated Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014) located in Appendix 4 of the Moonimba Quarry EIS, herein referred to as the Moonimba Quarry Flora and Fauna Assessment. As part of the Moonimba Quarry Flora and Fauna Assessment for the Moonimba Quarry EIS the following was undertaken:

- Review of previous assessments
- Desktop searches (Atlas of NSW Wildlife and EPBC Protected Matters Search)
- Targeted site assessment over five days and five nights (30 September-5 October 2013)
- Habitat Tree Inventory (7-10 February 2014)
- Powerful Owl Survey (29 June-3 July 2014).

In order to confirm the existing site attributes, current condition, and findings of the Flora and Fauna Assessment undertaken for the Moonimba Quarry EIS, a biodiversity review was prepared to support the modification which included a site inspection undertaken on 28 February 2017, refer to Appendix E.

4.5.2 METHODOLOGY

A desktop review of the Moonimba Borrow Site was undertaken which included the following:

- Atlas of NSW Wildlife
- EPBC Protected Matters Search Tool
- Relevant reports and documents on the Moonimba Borrow Site, including previous environmental assessments of the Moonimba Quarry and Approved Project (refer to Section 4.1.1)
- Previous data and mapping

A site inspection was undertaken to confirm the findings and existing habitat condition identified in the Moonimba Quarry Flora and Fauna Assessment Fauna (Appendix 4, Moonimba Quarry EIS). The site inspection was undertaken on 28 February 2017 and was focussed around the two approved quarry cell areas referred to within this modification as western pit (8 ha) (referenced as 'Pit B' in the Flora and Fauna Assessment) and eastern pit (referenced as 'Pit C' in the Flora and Fauna Assessment) (13 ha).

4.5.3 EXISTING ENVIRONMENT

The borrow site is situated on top of the Moonimba Ridge. The property in which the borrow site is located is heavily vegetated except for the footprint of the existing quarry and access tracks that are cleared and highly disturbed. Vegetation surrounding the footprint of the existing quarry comprises dry sclerophyll forest predominately consisting of Blackbutt, with secondary species of Pink Bloodwood, Red Mahogany, Scribbly Gum and occasional Tallowwood. The Moonimba Ridge sub-regional wildlife corridor has also been identified within the property surrounding the borrow site which connects the larger vegetated landscapes adjacent to the borrow site.

MOONIMBA QUARRY FLORA AND FAUNA ASSESSMENT (MOONIMBA QUARRY EIS, 2014)

The Moonimba Quarry Flora and Fauna Assessment Fauna (Appendix 4, Moonimba Quarry EIS) focussed on a study area of approximately 522 ha which surrounds the proposed borrow site. A summary of the threatened flora and fauna species and vegetation communities identified in the Moonimba Quarry Flora and Fauna is included below.

Flora

Vegetation within the study area comprises dry sclerophyll forest predominately consisting of Blackbutt, with secondary species of Pink Bloodwood, Red Mahogany, Scribbly Gum and occasional Tallowwood. The south west of the study area comprises grassy open forest dominated by Smudgy Apple, which grades into open forest in the far west dominated by Large-leafed Spotted Gum. Wet Brush Box forest and rainforest occur in the southern escarpment and in the north east adjacent to the access track. This vegetation in the north east of the study area was identified as Lowland Rainforest in the NSW North Coast and Sydney Basin bioregion, listed as an Endangered Ecological Community (EEC) under the Threatened Species Conservation Act 1995 (TSC Act). This community is also representative of the Commonwealth listed critically endangered ecological community Lowland Rainforest of Subtropical Australia and contains Arrowhead Vine which is listed as threatened under the TSC Act. This community occurs immediately east of the access track and approximately 1.7 kilometres north of the eastern pit. Water courses and drainage lines are dominated by open emergent Broad-leafed paperbark.

The vegetation within the expanded footprint of the two borrow site pits was identified as Blackbutt/ Pink Bloodwood with the western portion of the western pit expansion footprint identified as Smudgy Apple. The vegetation occurring within the proposed borrow site footprint is not indicative of any threatened or endangered ecological community. The assessment identified 103 habitat trees within the borrow site that would require clearing. Refer to Appendix F for the vegetation plan extracted from the Flora and Fauna Assessment.

Fauna

Ten threatened species under the TSC Act were confirmed at the time of survey within the study area and are presented in Table 4-4.

Table 4-4 Threatened fauna species confirmed within the Moonimba Borrow Site footprint

Threatened Species	Status	Comment
Brush-tailed Phascogale <i>Phascogale tapoatafa</i>	Vulnerable (TSC Act)	Single animal trapped in the northern Elliott trap line in the western pit
Eastern Long-eared Bat <i>Nictophilus bifax</i>	Vulnerable (TSC Act)	Two individuals captured in the eastern harp trap
Glossy Black Cockatoo <i>Calyptorhynchus lathami</i>	Vulnerable (TSC Act)	A pair and a juvenile observed foraging in Black she-oak in the central portion of the site; chewed cones observed under several mature she-oak in this area. A pair also recorded during owl searches (July 2014 foraging in Black she-oak in the western pit.
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	Vulnerable (TSC Act)	Recorded by Anabat in western cell and along the central track
Grey-headed Flying-fox <i>Petropus poliocephalus</i>	Vulnerable (TSC Act) Vulnerable (EPBC Act)	Six animals observed overflying the western pit
Little Bentwing-bat <i>Miniopterus australis</i>	Vulnerable (TSC Act)	Recorded by Anabat in the western pit

Threatened Species	Status	Comment
Masked Owl <i>Tyto novaehollandiae</i>	Vulnerable (TSC Act)	An individual was seen and another heard between the two quarry cells during Powerful Owl surveys in 2014; a pair therefore occurs at the site. Interestingly Masked Owls were heard and seen during two of the five nights of owl survey in 2014 that coincided with calling Squirrel Gliders in the central portion of the site on these occasions. Follow up targeted investigations within and around the proposed quarry footprint found no signs of owl roosting or nesting; however it is possible that active nest/roost trees may exist elsewhere at the site
Powerful Owl <i>Ninox strenua</i>	Vulnerable (TSC Act)	An animal responded to call playback in the eastern pit on the final night of the 2013 survey, and may have been calling 200-300m from the playback point. Whether this animal occurs at the site or was attracted from adjacent habitat areas is unknown. Dedicated owl survey (active listening) in 2014 during the nesting period failed to confirm Powerful Owls at the site, despite excellent conditions. Follow up targeted investigations within and around the proposed quarry footprint found no signs of owl roosting or nesting; however it is possible that active nest/roost trees may occur elsewhere at the site.
Red-legged Pademelon <i>Thylogale stigmatica</i>	Vulnerable (TSC Act)	One animal flushed from within the northern rainforest remnant
Squirrel Glider <i>Petaurus norfolcensis</i>	Vulnerable (TSC Act)	One individual observed in the adjacent habitat around the eastern pit; gliders heard calling around the middle track between the two pits during the 2014 owl survey.

In addition, Anabat analysis identified calls which may be attributed to three threatened species including:

- Eastern Freetail-bat *Mormopterus beccarii* (Vulnerable, TSC Act),
- Eastern False Pipstrelle *Falsistrellus tasmaniensis* (Vulnerable, TSC Act), and
- Hoary Wattled Bat *Chalinolobus nigrogriseus* (Vulnerable, TSC Act).

Refer to Appendix G for locations of threatened fauna sightings during the site investigation. No signs of Koala were observed as the borrow site is relatively poor habitat due to the low incidence of preferred feed trees.

DUE DILIGENCE BIODIVERSITY REVIEW (2017)

Desktop Assessment

A desktop search of the Atlas of NSW Wildlife was undertaken on 3 February 2017, centred on the borrow site with a 10 kilometre search radius. The search identified 32 fauna species and 9 flora species within the 10 kilometre search radius listed under the *Threatened Species Conservation Act 1995* (TSC Act).

A search of the Protected Matters Search Tool was also undertaken on 3 February 2017, centred on the borrow site with a 10 kilometre search radius. The search identified one Threatened Ecological Community (TEC) – Lowland Rainforest of Subtropical Australia, 60 Threatened Species (17 flora and 43 fauna species) and 35 Migratory Species listed under the *Environment, Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Biodiversity Review

As outlined in Section 4.1.1, a biodiversity review was undertaken which involved a desktop review of the Moonimba Quarry Flora and Fauna Assessment (Appendix 4, Moonimba Quarry EIS) and a due diligence site inspection was undertaken to confirm the findings of the Flora and Fauna Assessment produced for the Moonimba Quarry EIS.

The site inspection confirmed the vegetation within and surrounding the eastern pit as Open forest (Blackbutt, Pink Bloodwood). This community corresponds to the equivalent vegetation type Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast identified in the Approved Project. The vegetation extent of this community was confirmed to be consistent with the area documented in the Moonimba Quarry Flora and Fauna Assessment.

The vegetation within and surrounding excavation western pit was confirmed as Open Forest (Blackbutt, Pink Bloodwood) and Open Forest (Smudgy Apple). In terms of equivalent vegetation community types, Open Forest (Blackbutt, Pink Bloodwood) corresponds to Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast whilst Open Forest (Smudgy Apple) does not correspond to a vegetation type identified within the Approved Project boundary. Open Forest (Smudgy Apple) is consistent with the NSW Vegetation Information System (VIS) Classification vegetation type Pink Bloodwood - Red Mahogany - Smudgy Apple shrubby open forest on sandstone of northern NSW North Coast Bioregion.

The Moonimba Quarry Flora and Fauna Assessment produced for the Moonimba Quarry EIS confirmed the presence of the following threatened species and ecological communities within the property:

- Two threatened flora species (Arrowhead Vine and Slender Milkvine) listed under the TSC Act were recorded within the study area. Slender Milkvine was referenced in the Moonimba Quarry Flora and Fauna Assessment as being previously identified at the property, however was not sighted during the associated site inspection. Habitat and specimens of these species were not recorded within the borrow site.
- The endangered ecological community, Lowland Rainforest, was recorded within the study area. This community was not recorded within the borrow site.
- Thirteen threatened fauna species listed under the TSC Act were recorded within the study area. No additional threatened species were observed during the recent site inspection.

4.5.4 IMPACT ASSESSMENT

MOONIMBA QUARRY EIS 2014

The key impacts identified in the Moonimba Quarry Flora and Fauna Assessment (Appendix 4, Moonimba Quarry EIS) include:

- Gradual clearing of an estimated 9.5 ha of existing vegetation/habitat.
- Loss of 103 habitat trees (66 within eastern pit and 37 within western pit).
- Loss of known forage and shelter/roost habitat for threatened species listed under the TSC Act including:
 - Glossy Black-cockatoo,
 - Brush-tailed Phascogale,
 - Grey-headed Flying-fox, and
 - Squirrel Glider.

- Loss of habitat trees which may be utilised by threatened species including:
 - Brush-tailed Phascogale,
 - Glossy-Black Cockatoo
 - Masked Owl,
 - Microchiropteran bat species
 - Powerful Owl, and
 - Squirrel Glider.
- Fragmentation of habitat for the Squirrel Glider and Brush-tailed Phascogale.

The Moonimba Quarry Flora and Fauna Assessment also identified a range of other potential direct and indirect impacts which may result from the approved expansion of the Moonimba Quarry including potential injury/mortality and disturbance to fauna, potential introduction and establishment of weeds, noise disturbance to local fauna and potential for sediment to enter watercourses in proximity to excavation of the eastern pit.

The expansion was considered unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitats. Key differences between the proposed modification and DA2015.0069 regarding impacts to biodiversity include:

- Clearing proposed under DA2015.0069 would be undertaken in a single event under the proposed modification (as opposed to staged clearing).

Management methods for the impacts to biodiversity are discussed in section 4.3.5.

BIODIVERSITY REVIEW 2017

The Moonimba Quarry Flora and Fauna Assessment confirmed the presence of the 15 threatened species (two flora species and 13 fauna species) and one ecological community from the study area.

Project impacts were assessed for these threatened species and other likely species as part of DA2015.0069 approval. The Moonimba Quarry was considered unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitats. However, since the 2014 Moonimba Quarry Flora and Fauna Assessment report, a number of threatened species listed under both the TSC Act and the EPBC have been updated. As a result, assessments of significance have been undertaken for species that have a moderate or higher likelihood of occurrence within the study area. Findings of the significance assessments for Moonimba Borrow Site concluded the following:

- The borrow site is unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitat listed under the TSC Act.
- A Species Impact Statement is not required for the borrow site.
- The borrow site is unlikely to have a significant impact on matters of national environmental significance
- An EPBC Act referral of the borrow site for consideration of a controlled action is not required.

As this modification is proposing to utilise the same footprint as assessed under the Moonimba Quarry Flora and Fauna Assessment within the Moonimba Quarry EIS, and the findings and outcomes of that assessment were considered to be appropriate and relevant for the Moonimba Borrow Site proposal, no additional impacts are anticipated.

CONSISTENCY WITH THE APPROVED PROJECT

Both direct and indirect biodiversity impacts associated with the Moonimba Borrow Site are consistent with the biodiversity assessment undertaken for the Approved Project. The main impacts of the borrow site are:

- Removal of 9.5 hectares of native vegetation previously approved under DA2015.0069
- Impacts on threatened species (those outlined in significance assessments)
- Removal of breeding and/or sheltering habitat for threatened fauna, in particular hollow bearing trees
- Loss of foraging resources for fauna
- Direct mortality of fauna from construction activities; and
- Potential impacts from construction to water quality and surrounding natural hydrological flows.

The area previously assessed as Commonwealth listed critically endangered ecological community Lowland Rainforest of Subtropical Australia (EPBC) occurs immediately east of the access track and approximately 1.7 kilometres north of the eastern pit (refer to Appendix F). No widening of the access track would be undertaken during operations under the proposed modification. It is considered unlikely that this area of vegetation would be impacted under the proposed modification.

The plant community type - Pink Bloodwood - Red Mahogany - Smudgy Apple shrubby open forest on sandstone of northern NSW North Coast Bioregion and one additional threatened species (Red-legged Pademelon (*Thylogale stigmatica*)) were identified within the study area but not assessed under the Approved Project. Based on the potential associated direct and indirect impacts on these entities, mitigation measures developed for the Approved Project are considered adequate to minimise adverse effects to these matters.

4.5.5 MITIGATION / MANAGEMENT MEASURES

The borrow site would be established, operated and managed in accordance with the approved *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3-11) Construction Flora and Fauna Management Plan* (CFFMP, Appendix B2, CEMP). This would include (but not limited to) implementation of approved clearing procedures and the management of weeds.

In addition to the measures outlined in the CFFMP the following would be implemented to ensure the protection of biodiversity during the establishment, operation and management of the borrow site:

- To reduce the potential for injury to resident fauna (especially macropods), speed limits along access roads and tracks would be limited to 40-50 kilometres per hour to reduce likelihood of road collision and road mortality. Warning signs along regularly used roads would be erected to warn road users of potential wildlife within the vicinity along road verges.
- While targeted surveys did not record nesting or roosting sites of the Powerful and Masked Owl within the proposed clearing footprint, pre-clearing surveys would help determine whether nesting is occurring within or near the proposed clearing footprint. In the event that a nest tree or roost tree is located and an active breeding pair are utilising the hollow, it must be clearly marked and a buffer of a minimum 50 metres radius must be applied and clearly delineated. Clearing of any identified roosting tree would be removed outside breeding season (March – September) and when individuals have vacated the nest.
- Revegetation areas required under DA2015.0069 are further examined to ensure compliance with conditions of approval and ensure DA operation is possible in a timely manner.
- A Habitat Offset arrangement of a minimum of 68 hectares with a legally binding mechanism for the protection in perpetuity of the habitat offset would be implemented in accordance with the

requirements outlined in DA2015.0069. Prior to approval of the offset a suitably qualified person would be engaged to:

- Undertake detailed assessment of the 90 hectare area to determine the location of the final 68 hectare area. The area shall provide habitat on a like for like basis proportional to the impacted vegetation communities.
- The offset shall comprise a single contiguous area incorporating logical management and/or landscape boundaries that are easily identifiable and designed to minimise edge effects.
- Investigate opportunities for securing the Habitat Offset. Preference shall be given to use of the BioBanking Scheme or alternatively a Conservation Agreement pursuant to the National Parks and Wildlife Act 1974.
- Submit for approval of Richmond Valley Council details of the investigations referred to.
- Undertake any such recommendations or requirements in association with the approved method of securing the Habitat Offset
- The offset shall remain in force in perpetuity and the final offset area and mechanism for securing the habitat offset shall be approved by Richmond Valley Council.

4.6 HYDROLOGY, WATER QUALITY AND SOIL MANAGEMENT

4.6.1 INTRODUCTION

This section addresses the hydrological, water quality and soil impacts of the borrow site. The impacts for the Approved Project were addressed in the Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (W2B EIS) (RMS, December 2012) in Chapter 8 – Hydrology and Flooding, Chapter 9 – Soils, Sediment and Water as well as Working Paper 2 – Hydrology and Flooding, Working Paper 3 – Water Quality and Working Paper 4 – Groundwater. This section evaluates the impacts and mitigation required for hydrology, water quality and erosion and sediment control.

4.6.2 METHODOLOGY

A desktop review of existing information was undertaken including a review of the Moonimba Quarry EIS, specifically:

- The Operational Plan of Management (OPM) that forms Appendix 3 of the Moonimba Quarry EIS
- The Soil and Water Management Plan that forms Appendix A of the OPM

A groundwater memo, included in Appendix H, was also prepared in June 2017 to consider the potential for local and regional impacts to the groundwater regime in the Moonimba Borrow Site area.

4.6.3 EXISTING ENVIRONMENT

The borrow site is situated within a large forested area, on a major ridgeline known as Moonimba Ridge. The ridgeline extends north south with a maximum elevation of approximately 190 metres AHD (Australian Height Datum) at the southern end. The borrow site is located along this ridgeline at an elevation of approximately 100-130 metres AHD. The borrow site generally has a northerly aspect, with drainage to the north, which eventually flows to the surrounding low lying floodplain areas.

SURFACE WATER

A small creek separates through the centre of the site and separates the two excavation areas (the eastern pit and western pit) and flows to a rainforest to the north of the excavation areas. Pumping currently occurs from this creek area for watering of haul roads, crushers and screens and stock piles at the site. In general the majority of the creeks and drainage lines are intermittent with flowing water only occurring from prolonged rainfall events. The main creek line drains to low lying, disturbed land to the north of the borrow site and continues in constructed drainage lines and connects to Bungawalbin Creek prior to discharging to the Richmond River approximately six kilometres to the north.

The borrow site is located on the top of the Moonimba Ridge, at an elevation of approximately 100-130 metres AHD and is therefore not subject to flooding.

GROUNDWATER

The Moonimba Borrow Site is located within the Clarence-Moreton Basin, an extensive sediment basin in the north east of New South Wales and southern Queensland. A number of groundwater flow systems are present at and surrounding the Moonimba Borrow Site, however they are generally limited to rainfall recharge and gradient profiles and so are not present close to the surface. The Kangaroo Creek Sandstone, the material to be quarried, is considered to be a confined aquifer or aquitard that has low hydraulic connectivity. Groundwater within the Kangaroo Creek Sandstone bedrock typically occurs as a shallow perched aquifer that is present during periods of heavy or prolonged rainfall events and has limited connectivity to deeper bedrock groundwater systems.

Three registered, and one non-registered, groundwater bores are located within two kilometres of the borrow site including:

- A licensed bore on the borrow site property, GW305748, that was constructed in 2006 and passes through sandstone and shale from a depth of 4.5 metres to 60 metres and sandstone from 60 metres to 9 metres. The groundwater level was recorded at a depth of 66 metres below ground level, equivalent to 33 metres Australia Height Datum (AHD). This bore is considered to access water from the Walloon Coal Measures.
- Two groundwater bores GW032869 and GW301828, located more than 1.5 kilometres from the borrow site, at lower elevations. Both these bores are shallow bores.
- An additional bore, GW053626, is located to the south west of the site, however the license for this bore has lapsed.

GROUNDWATER DEPENDENT ECOSYSTEMS

Groundwater dependent ecosystems (GDEs) are also beneficial users of groundwater. The GDE Atlas (BOM, 2017) categorises GDEs into three classes:

- Ecosystems that rely on the surface expression of groundwater – this includes all the surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs
- Ecosystems that rely on the subsurface presence of groundwater – this includes all vegetation ecosystems
- Subterranean ecosystems – this includes cave and aquifer ecosystems

Within a two kilometre radius of the Moonimba Borrow Site, five types of ecosystems were identified that rely on the subsurface presence of groundwater with these being Lowland Red Gum winter flowering, Paperbark, Lowlands Grey Box, Clarence Lowlands Spotted Gum and Sub-Tropical and Warm Temperate Rainforest. These GDEs have a low to high potential for groundwater interaction.

A search of the GDE atlas also identified that Bungawalbin Creek and associated floodplain wetlands rely on the surface expression of groundwater and have a low to high potential for groundwater interaction.

SOIL

The majority of the soils at the borrow site are classified as podzolic soils (weathered/ low nutrient type soils) with minor areas containing, skeletal soils and sandy podzolics. The area mapped as sandy podzolics is in the general vicinity of the eastern pit.

Within the footprint of the existing quarry, the topsoil has been removed and the sandstone parent material remains exposed. Due to the topography of the site there is anticipated to be a thin layer of topsoil beneath the vegetated areas that would be cleared for the expansion of the borrow site. Kangaroo Sandstone is the predominant material at the site. Low strength overburden material overlays the solid sandstone. The topsoil would be removed and stockpiled at the site for use in rehabilitation. Within the first year of operation it is anticipated that the overburden material would be excavated and transported for use on the project, therefore minimal to no processing would be required during the first year of operation. The second year of operation would then include the excavation and removal of the high strength sandstone, require a range of excavation and processing techniques.

4.6.4 IMPACT ASSESSMENT

Operation of the borrow site has the potential to cause an impact through the increase of sediment laden runoff, which may carry pollutants. The main source of sediment is via erosion of stockpiles, earth barriers, work areas, haul roads and other disturbed areas. Sediment basins would be the primary collection point for sediments, for the eastern pit and western pit. These are located within and/or adjacent to the excavation area in the western pit (one sediment basin identified in DA2015.0069, would remain in place until the quarry floor is lowered) and the eastern pit (two sediment basins) as shown in Figure 2-2. The location of the basins has been selected to maximise the collection of sediment-laden runoff generated from the site throughout construction.

The depth to groundwater at GW305748 (at the time of drilling) was 66 m below ground level (33 m AHD) whilst the minimum final floor depth within the eastern and west pits would be approximately 75 and 100 m AHD respectively. Since the water table in the deeper bedrock is likely to be located below the level of the proposed pit floor, it is unlikely to be intersected by the borrow site activities. As such, it is anticipated that negligible direct impact would be caused to this aquifer by the proposed activities. Groundwater bores GW032869 and GW301828, located more than 1.5 kilometres from the site, are also not anticipated to be affected by the excavation works at the borrow site.

Groundwater may occur locally as a perched aquifer within the Kangaroo Creek Sandstone after heavy or continuous rainfall and is anticipated to be a shallow system (within one to five metres below ground level) of short duration after direct rainfall recharge. However, a perched aquifer is not expected to be present at the borrow site during normal conditions.

Activities at the borrow site are not anticipated to affect surface or subsurface water bodies connected to groundwater. All GDEs that rely on surface water bodies connected to groundwater are associated Bungawalbin Creek and the floodplain areas of Bungawalbin Creek.

GDEs that rely on groundwater are expected to occur within localised water bearing zones typically characterised by localised recharge-in/recharge-out processes associated with rainfall infiltration. Small reductions to the groundwater flow to the downhill side of the site can be anticipated. Since the immediate surroundings of the borrow site area lacks any threatened/ endangered communities potentially sustained by groundwater, this constraint to groundwater recharge is not considered to pose a meaningful ecological impact. As such, and given the distance from the excavation pits, activities on site are unlikely to present a risk of adversely affecting GDEs.

The potential impacts to hydrology, water quality and soil management from the proposed borrow site are considered similar to those outlined in the Operational Plan of Management (OPM) that forms Appendix 3 of the Moonimba Quarry EIS and the Soil and Water Management Plan that forms Appendix A of the OPM.

The key difference between the proposed borrow site and DA2015.0069 regarding hydrology, water quality and soil management would be the removal of vegetation in a single clearing event leading to the exposure of larger areas of soil and rock material, increasing the likelihood of sediment laden runoff leaving the site. Section 4.4.5 outlines the mitigation and management approach for the operation of the site.

CONSISTENCY WITH THE APPROVED PROJECT

The borrow site would have similar construction and operational impacts on hydrology, water quality and soil management as described within the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (EIS) (RMS, December 2012). No additional impacts to hydrology, water quality and soil management are anticipated beyond those previously assessed.

4.6.5 MITIGATION / MANAGEMENT MEASURES

Hydrology, water quality and soil would be managed in accordance with the approved *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3-11) Construction Soil and Water Quality Management Plan* (CSWQMP, Appendix B4, CEMP) and *Managing Urban Stormwater, Soil and Construction* (Landcom, 2004) (known as the Blue Book). In particular, relevant mitigations that would be undertaken for the borrow site include, but are not necessarily limited to, the following:

- An erosion and sediment control plan (ESCP) would be prepared by the contractor to detail how the site would be managed. This would be prepared in accordance with the CSWQMP, (Appendix B4 of the W2BCEMP) and the Blue Book.
- A surface water monitoring program would be established prior to the operation of the site in order to establish baseline levels of the drainage lines near the borrow site and continue through the operation of the site. Water quality monitoring would be undertaken in accordance with the approved *Woolgoolga to Ballina (sections 3 to 11) Water Quality Monitoring Program*.
- During the decommissioning of the site, the exposed areas would be stabilised prior to the site being handed back to the landowner.
- In the unlikely event that the Moonimba Borrow Site does encounter a permanent water table in the bedrock, and penetrates this water table, to a depth in excess of 5 metres, a review of management measures shall be undertaken which would include re-evaluation of the groundwater impact and return of captured water (inflows) to local drainages after treatment in an appropriate sedimentation pond (to capture suspended solids).

4.7 ABORIGINAL HERITAGE

4.7.1 INTRODUCTION

This section considers potential impacts to Aboriginal heritage that may result from the borrow site. Aboriginal heritage impacts were discussed in Chapter 12 ('Aboriginal heritage') of the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (RMS, December 2012) and section 5.5 ('Cultural Heritage Assessment') of the *Moonimba Quarry Expansion Bungawalbin NSW Environmental Impact Statement* (Newman's Quarry & Landscape Supplies, 2014) (Moonimba Quarry EIS).

4.7.2 METHODOLOGY

The desktop assessment for Aboriginal heritage at the Moonimba Borrow Site included:

- A search and review of the Aboriginal Heritage Information Management Systems (AHIMS) on 5 April 2017 (refer to Appendix I)
- Archaeological sensitivity of the Moonimba Borrow Site and the need for any further assessment or consultation was then determined by considering the following factors:
 - Location of the Moonimba Borrow Site
 - The proximity to known Aboriginal heritage sites
 - Review of previous cultural heritage assessment undertaken for the Moonimba Quarry EIS (Everick Heritage Consultants, 2014)
 - Review of other existing documentation of heritage items in the area.

An Aboriginal heritage assessment was completed by Everick Heritage Consultants Pty Ltd as part of the Moonimba Quarry EIS. The information provided in the Cultural Heritage Assessment (CHA) was used to provide the context and potential sensitive areas within the Moonimba Borrow Site.

A site visit by Navin Officer was also undertaken on 19 July 2017 to locate a known cave listed on the AHIMS register, refer to Appendix J.

Community consultation with the Local Aboriginal Land Council (LALC) has also been undertaken in accordance with the OEH guidelines Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010). Details of consultation undertaken for the Moonimba Borrow Site is included in Chapter 5.

4.7.3 EXISTING ENVIRONMENT

The CHA undertook a review of parish maps which found that the land which hosts the current Moonimba Quarry was Crown Land under lease for mining purposes as early as 1891. Aerial imagery of the site indicates that a majority of the vegetation cover surrounding the Moonimba Ridge has been extensively cleared for agricultural activities. Logging and potential extraction activities are evident within the Moonimba Borrow Site in the 1988 aerial photography and by 1998 several large extraction pits and access tracks are clearly visible. The CHA concludes that while clearing and extraction works have dramatically altered the appearance of lands used for quarrying, the lands immediately surrounding this area have not been extensively cleared of vegetation in the past, likely due to the difficult and often inaccessible terrain.

The CHA indicates that should aboriginal cultural heritage exist within the excavation area, it would have been impacted by the clearing and quarrying activities, while the surrounding lands have been subject to minimal disturbance and maintain potential for Aboriginal heritage to be located.

4.7.4 IMPACT ASSESSMENT

No places of intangible (non-physical) cultural heritage significance were identified within the excavation areas in the literature review or within the CHA. The CHA outlines that a mythological/ceremonial site, Ngimboug Cave (AHMS Site 13-1-0034) was identified on the AHIMS register as well as the Moonimba Forbidden Place (identified on the AHIMS register as restricted (AHIMS Site 13-1-0145)). Both sites were identified to be within 400 metres of the proposed quarry expansion being assessed at the time. The CHA also discusses the identification of a scar tree during a site inspection. The scar tree is located on the ridge crest to the south east of the eastern pit, refer to Figure 2-2. This was registered on the AHIMS register as Robinsons Quarry 1 (AHIMS Site 13-1-0199).

The CHA recommended that the scarred tree (AHIMS Site 13-1-0199) should be protected. As a result the tree and the area around it have been excluded from the excavation area (refer to section 4.5.5 for proposed management measures).

The CHA undertaken to support DA2015.0069 concluded that the activities proposed were unlikely to impact on Aboriginal heritage values with appropriate mitigation measures in place to protect the scarred tree. No further assessment was recommended within the CHA.

The more recent extensive AHIMS search undertaken in April 2017 identified three items / places including the Ngimboug Cave, the Forbidden Place and the Robinsons Quarry 1 Scar Tree discussed above.

A site inspection was undertaken in July 2017 to confirm the location of the Ngimboug Cave and determine if the proposed intensification of operations at the borrow site could have any potential impact on the structural stability of the cave, for example vibrations from blasting activities. The cave was unable to be located during the site inspection due to overgrown vegetation. Further background research revealed that the cave is a natural feature embedded in the rock face, located approximately four metres from the ground level, with a diameter of approximately two to three metres (refer to Appendix J).

As the Ngimboug Cave is located approximately 400 metres from the eastern pit and imbedded in the existing rock face, it is considered unlikely that the proposed modification would have any impacts on the cave. Given the proposed modification would impact the same footprint as DA2015.0069, it is unlikely that additional impacts to Aboriginal heritage values would be generated as a result of the proposed modification.

CONSISTENCY WITH THE APPROVED PROJECT

Three Aboriginal heritage items/places were identified within 400 metres of the excavation areas, with one scarred tree identified in the immediate vicinity of the Eastern Pit. Impacts to the scarred tree were assessed within the Moonimba Quarry EIS and subsequently granted consent within DA2015.0069. In order to prevent impacts to the scarred tree, management measures would be put in place to exclude the tree and its immediate surrounds from the Eastern Pit. The operation of the proposed modification would not result in further impacts to either the Ngimboug Cave, or the Moonimba Forbidden Place, given there are no proposed activities outside the areas shown in Figure 2-2 and the distance to these items. Provided the appropriate management measures are put in place to protect the scarred tree, there are no additional anticipated impacts to Aboriginal heritage items surrounding the proposed excavation areas. The impacts to Aboriginal heritage items are therefore considered consistent with the Approved Project.

4.7.5 MITIGATION / MANAGEMENT MEASURES

Management of Aboriginal heritage will be undertaken in accordance with the approved *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3-11) Construction Heritage Management Plan* (Appendix B5, CEMP) to address known and unexpected heritage sites and impacts associated with the Moonimba Borrow Site.

The following additional mitigations from the CHA will also be undertaken to ensure protection of the scar tree located near the eastern pit:

- A temporary high visibility fence to provide a buffer zone will be erected prior to commencing work in the immediate vicinity of the tree. It will be erected within a minimum of 30 m radius of the tree and remain in place until specialist advice is sought.
- The advice of a specialist, preferably an Aborist, will be sought to determine an appropriate buffer zones for the ongoing management and protection of the tree taking into account the topography of the landscape, the proposed extensive extractive works and the potential for long term damage.

4.8 NON-ABORIGINAL HERITAGE

4.8.1 INTRODUCTION

This section considers potential impacts to non-Aboriginal Heritage that may result from the borrow site. Non-Aboriginal heritage impacts were discussed in Chapter 13 ('Historical (non-Aboriginal) heritage') of the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (RMS, December 2012) and section 5.5 ('Cultural Heritage Assessment') of the Moonimba Quarry Expansion Bungawalbin NSW Environmental Impact Statement (Newman's Quarry & Landscape Supplies, 2014) (Moonimba Quarry EIS).

4.8.2 METHODOLOGY

A desktop assessment for non-Aboriginal heritage was undertaken in April 2017 which included a review of publicly available information including:

- Everick Heritage Consultants, 2014, Cultural Heritage Assessment for the Moonimba Quarry – Lot 193 DP75560 Bungawalbin, NSW. Prepared for Newmans Quarry and Landscaping PTY LTD.
- Richmond Valley Local Environment Plan (2012)

- NSW State Heritage Register
- Australian Heritage Database
- National Heritage List
- Commonwealth Heritage List
- Register of the National Estate
- World Heritage List

4.8.3 EXISTING ENVIRONMENT

The *Cultural Heritage Assessment for the Moonimba Quarry* (Everick Heritage Consultants, 2014) was undertaken as part of the Moonimba Quarry EIS to support DA2015.0069. The assessment reviewed parish maps and historic data and found that the parcel of land now known as Lot 193 DP755603 was Crown Land under lease for mining purposes as early as 1891. Aerial photos from 1988 show evidence of extractive and logging activities, whilst aerial photos from 1998 show clear excavation areas and an access track within the property.

A search and review of the relevant non-Aboriginal heritage registers and publicly available data (refer to section 4.6.2) did not identify non-Aboriginal heritage items within or adjacent to the borrow site. The borrow site is located approximately 550m west of an area identified as high conservation value Old Growth Forest. No areas identified as Old Growth Forest occur within either excavation areas.

4.8.4 IMPACT ASSESSMENT

No objects or places of non-Aboriginal significance were identified within the excavation areas or immediately surrounding the footprint of the site at the time of DA2015.0069 or within the desktop search undertaken in April 2017. No excavation would be undertaken outside the footprint of the site shown in Figure 2-2, reducing the risk of impact to the area of Old Growth Forest (approximately 550m east of the borrow site).

CONSISTENCY WITH THE APPROVED PROJECT

Given there are no previously identified Non-Aboriginal heritage items within or adjacent to the borrow site, the impacts to non-Aboriginal heritage are consistent with the Approved Project.

4.8.5 MITIGATION / MANAGEMENT MEASURES

The borrow site would be managed in accordance with the *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3-11) Construction Heritage Management Plan* (Appendix B5, CEMP) and no additional mitigation measures are proposed.

4.9 AIR QUALITY

4.9.1 INTRODUCTION

This section considers potential air quality impacts that may result from the borrow site. Air quality impacts were discussed in Chapter 18.2 of the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (RMS, December 2012) and Section 5.9 of the *Moonimba Quarry Expansion Bungawalbin NSW Environmental Impact Statement* (Newman's Quarry & Landscape Supplies, 2014) (Moonimba Quarry EIS).

4.9.2 METHODOLOGY

An air quality impact assessment (AQIA) was prepared to predict the level of impact to the surrounding environment from the operation of the Moonimba Borrow Site, refer to Appendix K. The AQIA was prepared in accordance with the NSW EPA document 'Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales' (NSW EPA, 2017), referred to as the 'Approved Methods'. The assessment involved the modelling of local meteorology and the dispersion of potential emissions from the project site to predict the level of impact that may be experienced in the surrounding environment.

- Specifically, the following requirements of the Approved Methods were addressed as part of the AQIA:
- Description of local topographic features and sensitive receptor locations
- Establishment of air quality assessment criteria
- Analysis of climate and dispersion meteorology for the region
- Description of existing air quality environment
- Compilation of a comprehensive emissions inventory for the existing and proposed activities
- Completion of atmospheric dispersion modelling and analysis of results.

The key pollutants from the operation of the borrow site are in the form of suspended particulate matter (PM) including total suspended particulate (TSP), PM₁₀ and PM_{2.5} as well as fugitive dust deposition. While emissions of pollutants associated with the combustion of diesel fuel, including nitrogen oxides (NO_x), sulphur dioxide (SO₂), carbon monoxide (CO) and Volatile Organic Compounds (VOCs), would be generated by the current and proposed operations at the borrow site, these emissions are unlikely to compromise air quality at the closest receivers, given the nature and scale of the operation.

4.9.3 EXISTING ENVIRONMENT

The borrow site is situated in a rural environment surrounded by farming properties and nature reserves. Sensitive receivers are the same as those identified in the 2014 Moonimba Quarry Expansion Air Quality Impact Assessment, prepared by ENVIRON Australia Pty Ltd, Appendix 9 of the Moonimba Quarry EIS, (Moonimba Quarry AQIA).

As part of this AQIA, the existing air quality was assessed in order to establish background levels for the key pollutants. The assessment consisted of a review of existing sources of air emissions in the region and a review of available air quality monitoring data.

Three industrial sources of dust emissions which may potentially cause direct cumulative impacts with emissions from the borrow site were identified within a 20 kilometre radius of the borrow site. These industrial sources were:

- Coraki Quarry, 18 Petersons Quarry Road, Coraki, NSW 2471
- Cape Byron Power Broadwater, 117 Pacific Highway, Broadwater, NSW 2472
- Broadwater Sugar Mill, 117 Pacific Highway, Broadwater, NSW 2472.

There is limited information on existing air quality in the region surrounding the borrow site. No publicly available air quality monitoring data is available for the region surrounding the borrow site and no air quality monitoring has been carried out at the borrow site.

In order to establish background levels for the key pollutants (i.e. deposited dust, TSP, PM₁₀ and PM_{2.5}), the following air quality monitoring data sets were utilised:

- Roads and Maritime monitored air quality at a site adjacent to the Pacific Highway at Korora between Korora Public School and the Korora Rural Fire Brigade, north of Coffs Harbour. This monitoring was undertaken as part of the Environmental Assessment for the Sapphire to Woolgoolga Pacific Highway Upgrade (RTA, 2007) and was conducted from October 2005 to January 2006.
- Pacific Highway Upgrade Project between Woolgoolga and Ballina. Dust deposition monitoring has been performed at several locations along this section of the Pacific Highway since July 2016. The dust deposition monitoring network for this section of the highway currently consists of seventeen dust deposition gauges, eight of which are located within a 20 kilometre radius of the borrow site.

The ambient air quality criteria adopted for the assessment are based on NSW EPA air quality goals as detailed in the Approved Methods (NSW EPA, 2017).

4.9.4 IMPACT ASSESSMENT

In order to assess the potential variation in emissions over the two years of extraction at the borrow site, two emission inventories were compiled (i.e. year 1 and year 2). Emissions from each scenario were estimated and dispersion modelling was carried out for year 2, which was found to be the year with the highest overall emissions.

- Sources of particulate emissions associated with the borrow site include:
- Topsoil and overburden removal
- Raw material extraction activities, including excavation, drilling and blasting
- Vehicle entrainment of particulate matter during the haulage of material along the sealed and unsealed roads
- Unloading of material to processing plants
- Crushing and screening of extracted material at screening plants
- Process plant operations including loading of product to stockpiles and stockpile management
- Loading of products to delivery trucks
- Unloading of imported fill to emplacement areas
- Wind erosion associated with material stockpiles, active pits and imported fill emplacement areas.

The dispersion modelling results found that the cumulative PM_{2.5}, PM₁₀ and TSP concentrations and dust deposition rates predicted at each surrounding sensitive receiver comply with their corresponding ambient air quality criteria. Specifically, the following conclusions were drawn for the proposed intensification of extraction at the Moonimba Borrow Site:

- The modelling of PM_{2.5} emissions from all identified sources associated with the operations at the borrow site showed that maximum predicted annual and 24-hour average cumulative PM_{2.5} concentrations at all nearby sensitive receivers would remain below the relevant ambient air quality criteria. The incremental impacts predicted by the modelling for PM_{2.5} emissions are negligible.
- The modelling of PM₁₀ emissions from all identified sources associated with the operations at the borrow site showed that maximum predicted annual and 24-hour average cumulative PM₁₀

concentrations at all nearby sensitive receivers would remain below the relevant ambient air quality criteria.

- The modelling of TSP emissions from identified sources associated with the operations at the borrow site showed that these emissions have no potential to give rise to ground level exceedances of ambient air quality criteria for annual average TSP concentrations and dust deposition rates.

No air quality constraints have been identified for the proposed intensification of extraction at the Moonimba Borrow Site as a result of the air quality impact assessment.

The source of particulate matter associated with the proposed Moonimba Borrow Site are considered to be similar to those that were identified in Section 5.9.5 of the Moonimba Quarry EIS. Despite the intensification of operations at the site, the proposal is unlikely to result in exceedances of the ambient air quality criteria, similarly to the outcome of the Moonimba Quarry AQIA.

CONSISTENCY WITH THE APPROVED PROJECT

The sources of particulate matter outlined in Section 4.7.4 are considered to be consistent with those that were identified and assessed for the Approved Project under the W2B EIS. A qualitative air quality impact assessment was undertaken under the W2B EIS. This assessment determined that air quality would not be a key issue for the project, and that even though fugitive dust emissions had the potential to impact on sensitive receivers, these could be avoided through appropriate mitigation. This quantitative assessment for the Moonimba Borrow Site determined that no air quality constraints are anticipated from the proposed intensification of extraction at the site, therefore no additional impacts are anticipated beyond those previously assessed.

4.9.5 MITIGATION / MANAGEMENT MEASURES

Dust emissions from the Moonimba Borrow Site would be managed in accordance with the *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3-11) Construction Air Quality Management Plan (CAQMP)*, Appendix B6 of the CEMP.

4.10 VISUAL AMENITY AND LANDSCAPE

4.10.1 EXISTING ENVIRONMENT

The Moonimba Ridge is a prominent landform in the area consisting of Kangaroo Creek Sandstone formed during the Cretaceous Period. The ridge is heavily vegetated and surrounded by predominantly cleared floodplain utilised for agricultural purposes.

The borrow site is located on a large property (Lot 193 DP 755603) that is situated on top of the Moonimba Ridge. A majority of the site comprises dry sclerophyll forest predominately consisting of Blackbutt, with secondary species of Pink Bloodwood, Red Mahogany, Scribbly Gum and occasional Tallowwood.

The surrounding floodplains to the east, north and north-west of the borrow site were cleared 100 to 130 years and support a range of commercial agricultural businesses. Cattle grazing is a common agricultural activity in the area as well as the farming of a number of crops including sugar cane, soy beans and melaleuca shrubs that produce ti-tree oil. The region surrounding the borrow site consists primarily of rural residential properties which are located on the lower slopes of the Moonimba Range. The closest residential receiver is about one kilometre from the excavation area.

4.10.2 IMPACT ASSESSMENT

The borrow site is located on the peak of the ridge in the centre of a large property (greater than 500 hectares) which is densely vegetated. The dense vegetation surrounding the borrow site acts as a natural visual shield for the borrow site and assists in reducing the visual signature of the borrow site. The expansion of the existing excavation area would not impact on the natural shielding provided by the vegetation. , however some light would be produced due to the need to use security lighting within the site compound and where required for works within the eastern and western pits. A temporary increase in visual amenity impacts would be anticipated for residents and road users along Woodburn-Coraki Road due to the increase in heavy vehicle movements associated with the proposed modification. It is noted however that the temporary visual amenity impacts associated with increased heavy vehicle traffic would be short term in nature and may vary according to the needs of the Approved Project.

An assessment of visual and landscape impacts was undertaken during the preparation of the Moonimba Quarry EIS. The assessment considered key areas of potential impact including the state of the current landscape, extent of the changes proposed, areas of visibility, duration of impact and the effectiveness of the mitigations proposed. Given the proposed modification would encompass the same parcel of land assessed within the Moonimba Quarry EIS, it is considered unlikely that activities under the proposed modification would generate a significant increase in visual amenity impacts, or impacts to the landscape form.

Key differences between the proposed modification and Development Application No. 2015.0069 regarding visual amenity and landscape impacts include:

- The provision of security lighting within the site compound as well as lighting towers within both the eastern and western pits
- Additional temporary visual amenity impacts for residents and road users along Woodburn – Coraki Road due to increase in heavy vehicle movements

CONSISTENCY WITH THE APPROVED PROJECT

The visual amenity and landscape impacts generated throughout the duration of site operation under the proposed modification would be consistent with those already generated by the borrow site operations identified in the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (RMS, December 2012). No additional visual amenity or landscape impacts are anticipated beyond those previously assessed.

4.10.3 MITIGATION / MANAGEMENT MEASURES

Mitigation / management measures for the Approved Project are relevant to the proposed modification. No additional mitigation measures are required.

4.11 PROPERTY AND LAND USE

4.11.1 INTRODUCTION

This section considers potential land use and property impacts that may result from the proposed modification. Impacts on planning and land use were discussed in Chapter 16 of the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (W2B EIS)* (RMS, December 2012) and *Working Paper Volume 8 – Traffic and Transport, Land use and property and Social and Economic*.

4.11.2 EXISTING ENVIRONMENT

Moonimbah Quarry currently operates as an approved sandstone quarry site which is wholly contained within Lot 193 DP755603. The borrow site is zoned as RU1 – Primary Production under the Richmond Valley LEP (2012), and the current land uses (extractive industry, and importation of fill) are permitted with consent under the RU1 zone. All proposed activities associated with operating the borrow site would be undertaken within the site as specified in Figure 2-2. No operational activities would be undertaken outside Lot 193 DP755603 aside from transporting materials to and from the borrow site. The access track which connects into Lot 193 DP755603 is a dedicated road maintained by Richmond Valley Council. Some of the surrounding land adjacent near Boggy Creek Road is Crown Land, however this land is not likely to be impacted during operation of the borrow site. All vehicles transporting materials to and from the site would use designated roads and would not enter private or Commonwealth property for any reason without permission from the landholder. A search of the Native Title Register revealed that there are no native title claims or determinations located within the borrow site.

4.11.3 IMPACT ASSESSMENT

Operations under the proposed modification would not alter current land uses within the site. No conservation lands would be impacted by the proposed modification, and there is no commercial forestry currently carried out within the site or proposed as a part of this modification.

No additional private properties would need to be acquired to facilitate the proposed modification. Impacts to the adjoining land uses are consistent with the land use impacts previously assessed within DA2015.0069.

Property and land use impacts associated with DA2015.0069 are discussed within section 5.1 ('Section 79C(1) of the EP&A Act') of the Moonimba Quarry EIS. The land use and property impacts are discussed in order to address the criteria listed within Section 79C(1) of the EP&A Act which details the matters for consideration for the assessment of a development application.

The Moonimba Quarry EIS states that the development associated with DA2015.0069 would not substantially alter the use of the land or lands within the surrounding area. Similarly, the proposed modification would operate within an existing quarry and therefore would not result in any proposed change in land use. There are no notable differences between the land uses proposed within the Moonimba Quarry EIS and the proposed modification.

CONSISTENCY WITH THE APPROVED PROJECT

The quarry was identified as Robinson's Pit and a source of material in the W2B EIS (refer Figure 6-44 in Chapter 6 of the EIS). While it was not assessed, the land uses are consistent with other borrow sites assessed by the EIS. As there are no proposed changes to land use, and the site would function in the same manner as all other borrow sites assessed within the W2B EIS, the planning and land use impacts of the proposed modification are considered consistent with the Approved Project.

4.11.4 MITIGATION / MANAGEMENT MEASURES

Mitigation / management measures for the Approved Project are relevant to the proposed modification. No additional mitigation measures are required.

4.12 SOCIAL AND ECONOMIC

4.12.1 INTRODUCTION

This section considers potential socio-economic impacts that may result from the proposed modification. Socio-economic impacts were discussed in Chapter 17 of the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (RMS, December 2012) and *Working Paper Volume 8 – Traffic and Transport, Land use and property and Social and Economic*. This assessment includes the same items that were addressed in the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (RMS, December 2012).

4.12.2 METHODOLOGY

A desktop review of existing information was undertaken to provide an overview of the demographic and social characteristics of the area. The review included the most recent Census data from Swan Bay and Woodburn region (2011), and the *Richmond Valley Economic and Demographic Profile Report* prepared for Richmond Valley Council by Lawrence Consulting in 2013.

4.12.3 EXISTING ENVIRONMENT

POPULATION

Bungawalbin was identified within the Swan Bay (Richmond Valley – NSW) Census (2011) region. As of the 2011 Census, the total population of Swan Bay was 286 people of these 51.0% were male and 49.0% were female (ABS, 2017). This represents 1.3% of the total number of people who resided in Richmond Valley (22,697) (Richmond Valley Council, 2017). The median age of people in Swan Bay (Richmond Valley - NSW) was 35 years. Children aged 0 - 14 years made up 26.4% of the population and people aged 65 years and over made up 10.6% of the population (ABS, 2017).

In the 2011 Census, there were 775 people in Woodburn (Richmond Valley - NSW) of these 54.1% were male and 45.9% were female. The median age of people in Woodburn (Richmond Valley - NSW) was 42 years. Children aged 0 - 14 years made up 20.1% of the population and people aged 65 years and over made up 18.7% of the population.

The region surrounding Bungawalbin primarily consists of sparsely populated regional villages, regional development (such as quarrying and other extractive industries) and agricultural lands. Given the lack of a regional centre in the area, it is considered unlikely that the township has experienced major population growth in the years following the 2011 Census, however it is noted that Richmond Valley Council has granted consent for the subdivision of several rural residential lots in the vicinity of the proposal which could result in additional rural residential developments.

EMPLOYMENT

Average weekly income in Swan Bay (Richmond Valley - NSW) was lower than the NSW average in 2011 with less people holding qualifications when compared to the state average. However, the Swan Bay (Richmond Valley-NSW) region hosted a higher rate of home ownership when compared to the state average. The unemployment rate was 4.7%, which is lower than the Northern Rivers average, the NSW average (5.9%) and the national average (5.6%).

The most commonly held occupations in Swan Bay (Richmond Valley - NSW) included Managers 19.5%, Technicians and Trades Workers 19.5%, Clerical and Administrative Workers 12.2%, Machinery Operators and Drivers 11.4%, and Professionals 10.6%. In comparison, the most common occupations in Woodburn (Richmond Valley - NSW) included Technicians and Trades Workers 17.1%, Labourers 16.1%, Community and Personal Service Workers 13.0%, Managers 12.1%, and Sales Workers 11.5%.

Woodburn (the nearest town) includes a number of restaurants, facilities and accommodation which service the wider region, including regional towns and villages such as Bungawalbin. Several businesses occur within Woodburn and hold direct access to the Pacific Highway, including a supermarket, service station, cafés, bakeries, takeaway shops and a motel. Local schools within the region include St Joseph's Primary school on Woodburn-Coraki Road and Woodburn Public school on Woodburn Street.

On the day of the 2011 Census, the majority of employed people in Swan Bay (Richmond Valley - NSW), travelled to work by car whether as the driver (69.4%) or as a passenger (2.5%). To a lesser extent, employed people in Swan Bay (Richmond Valley – NSW) walked to work (3.3%) or took a motorbike / scooter (2.5%). Similar figures were observed in Woodburn (Richmond Valley - NSW) with the majority of employed people travelling to work by car as a driver (65.9%) or as a passenger (6.6%). A larger proportion of people in this area walked to work (7.2%) whereas smaller portions of the population travelled by truck (1.6%) or motorbike/scooter (1.2%). Public transport is not provided in Woodburn and surrounding areas, however local bus providers provide a school bus service for local children. When combined, it is clear that the majority of traffic in peak times (i.e. before and after normal business hours) would be generated by a combination of motorists in addition to any truck movements generated by surrounding quarries and other extractive industries. Very few bus movements could be anticipated as the only service provided is exclusively for school children as opposed to public transportation.

4.12.4 IMPACT ASSESSMENT

The socio-economic impacts resulting from operations within the Moonimba Borrow Site are largely discussed within section 5.13 ('Economic and Social Impacts') of the Moonimba Quarry EIS prepared to support DA2015.0069. The impacts that were assessed included potential positive impacts to employment in the area and the local economy, and positive impacts to road users through the implementation of capital improvement upgrades (detailed DA2015.0069). Many of these impacts are hinged on the potential to help in the delivery of the Approved Project.

The Moonimba Borrow Site would be an important resource for the construction of the highway in the short term and to the local economy in the longer term when it resumes operation to supply local areas.

The proposed modification would not require additional property acquisition, or involve the expansion of the borrow site beyond the footprint presented in the Moonimba Quarry EIS. No impacts are anticipated to agricultural lands surrounding the Moonimba Borrow Site.

Operations under the modification would offer additional direct and indirect employment opportunities within the locality. Employment opportunities would include full-time and part-time roles within the Moonimba Borrow Site during operations, and opportunities for blasting contractors as well as transportation contractors. Operations under the modification would also provide direct and indirect benefits and jobs to local businesses in areas such as Woodburn and surrounding region through increased construction expenditure and workforce activity. This would include (but is not limited to) retail, accommodation, cafes and restaurants, and property and business services.

Temporary increases in heavy haulage trucks would be anticipated along local roads (Woodburn-Coraki Road) resulting in some amenity impacts to local residents. It is not anticipated that these increases would impact on the Pacific Highway due to existing traffic levels on the highway as described in the Traffic, Transportation and Access chapter (Section 4.2.4). In addition there would be potential impacts on road

safety resulting from the increased construction traffic on haulage routes during construction and operation of the borrow site (refer to Section 4.2).

The borrow site would also generate additional noise and dust as described in Sections 4.3 and 4.7. Furthermore, additional noise and dust impacts associated with the haulage of materials and equipment during operation is anticipated (refer to Sections 4.3 and 4.7).

The social and economic impacts under the proposed modification would be similar to those described within section 5.13 of the Moonimba Quarry EIS. The increase in activity within the Moonimba Borrow Site would result in positive employment impacts, with up to three part time and up to five full time jobs created during the duration of site work. Further employment opportunities would be generated as an indirect outcome of the proposal including machinery and equipment operators, transportation contractors, and blasting contractors. Local businesses such as cafes and restaurants would also experience potential increases in business due to the increase of activity in the area. Road users would also benefit in the long-term through the capital improvement upgrades. However there are some key areas where impacts under the proposed modification would be greater than those discussed within DA2015.0069. Key differences to the proposed modification and DA2015.0069 regarding social and economic impacts include:

- Modest increase in available full time and part time employment positions during operations
- Undertaking repairs to local roads caused by hauling operations in lieu of making payments to Council for road maintenance
- Potential for short-term delays on local roads due to increase in heavy vehicle movements in the area
- Potential for short-term amenity impacts (such as noise and dust generation) due to the increase of heavy vehicle movements in the area

CONSISTENCY WITH THE APPROVED PROJECT

The anticipated social and economic impacts generated during site operation under the proposed modification would be consistent with those already generated by the borrow site operations identified in Chapter 6 ('Description of the Project – Construction') and the social and economic impacts identified in Chapter 17 ('Social and Economic') of the Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (RMS, December 2012). Chapter 6 details the types of activities which could be anticipated during the construction phase of the project which includes (but is not limited to) the use of borrow sites to supply material to the project and the haulage of that material to the construction corridor. Chapter 17 details the potential social and economic impacts of the Approved Project which includes (but is not limited to) potential for impacts from construction traffic, noise and dust, increased travel times for local and long distance road users near road works.

The impact assessment undertaken for the Approved Project assessed potential impacts to Woodburn and its immediate surrounds, but did not include social and economic impacts for towns outside the immediate vicinity of the works (such as Bungawalbin). Given the nature of the proposed modification, similar impacts to amenity and local road use would be anticipated for Bungawalbin during the operations under the proposed modification through the increase in heavy vehicles hauling material from the Moonimba Borrow Site to the Approved Project. The additional impacts to local traffic, noise and air quality are discussed in sections 4.1.4, 4.2.4 and 4.7.4 respectively. It is anticipated that the proposed modification may result in additional social amenity impacts to Bungawalbin and road users in the region due to the temporary increase in heavy vehicle movements along Woodburn-Coraki Road.

4.12.5 MITIGATION / MANAGEMENT MEASURES

Management of social amenity such as increased traffic, noise and dust are discussed in sections 4.1.5, 4.2.5, and 4.7.5 respectively. The community in the vicinity of the proposed modification would be notified and consulted with in accordance with the approved *Woolgoolga to Ballina Stakeholder Engagement Strategy*. No additional mitigation measures are proposed.

4.13 WASTE AND RESOURCE MANAGEMENT

4.13.1 INTRODUCTION

This section considers potential waste and resource impacts that may result from the borrow site. Waste and resource impacts were discussed in Chapter 18.3 of the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (RMS, December 2012) and section 5.10 of the *Moonimba Quarry Expansion Bungawalbin NSW Environmental Impact Statement* (Newman's Quarry & Landscape Supplies, 2014) (Moonimba Quarry EIS).

4.13.2 EXISTING ENVIRONMENT

Conditions of consent associated with Development Application No. 127/95, do not include provisions for the importation of fill material. Hazardous materials are permitted to be stored in a manner which prevents environmental damage from spills or leaks. Where oils and lubricants are kept on site, they are required to be stored in an impermeable bunded and roofed area with holding capacity of 110% of the capacity of the largest container. All necessary licenses have been obtained from the Environment Protection Authority for the operation of the quarry and discharge of polluted wastewater from the site.

Under the consent conditions associated with Development Application No. 2015/069 and as detailed in the Operational Plan of Management (presented within Appendix 10 of the Moonimba Quarry EIS), operations permitted under do not include a permanent fuel storage within the site. All machinery would be refuelled by mobile vehicles (utilities with fuel tanks attached) which would travel to the site with fuel as a payload. Oils and lubricants would be stored in utility vehicles and brought to site by the operators as needed. Minor maintenance (such as the initial setup of machines) would be carried out on site, however major repairs and services would be carried out at the relevant depot for each machine. No servicing would be undertaken on site for any reason. No waste fuels or oils would be disposed of on site and all containers would be disposed of by individual machine operators or contractors. No unsightly materials would be held in areas which are visible to residences or public places, no rubbish would remain on site at any time and no waste storage would be provided. Fill imported to the site under the consent conditions associated with Development Application No. 2015/069 is required to be certified Virgin Extracted Natural Material (VENM). Certification would be provided to the quarry manager for all VENM imported to the site. Imported fill would be stored in designated areas only and would not be stored outside the initial area where received or designated rehabilitation areas.

No wastewater disposal facilities are currently provided on the site. Drinking water is currently supplied through sourcing of bottled water. Non-potable water is supplied by pumping sedimentation ponds using small on-site pumps. The water is currently used for dust suppression and watering of landscaped areas.

No public utilities are currently available within the site, however, an access track exists to the transmission towers in Lot 50 DP755609 and suitable access is maintained to allow continual access to the towers.

4.13.3 IMPACT ASSESSMENT

The principal wastes likely to be generated by the borrow site may include (but are not limited to):

- Classified liquid and non-liquid wastes (e.g. waste oil, hydrocarbons and containers and oil/water emulsions)
- Sewage and general waste from construction compounds
- General waste from office and compounds.(e.g. food scraps, packaging and consumables)
- Green waste.

Due to the nature of the quarrying operations, negligible waste from extraction activities is anticipated. There would not be any tailings or refuse material as all of the extracted material would be needed and thus exported from the borrow site. Should any material excavated at the site be unsuitable for the project, then it would be stockpiled at the site in accordance with the stockpiling requirements in the W2B CEMP.

Topsoil would be scraped up and stockpiled on site separately for use in rehabilitation of the site once operations are completed.

The modification would include the temporary use of a bulk fuel storage within the site. Up to 10,000L of diesel would be stored within an above-ground, self-bunded storage vessel. Mobile fuel carts would also be used to reach less mobile plant and equipment within the site. Other chemicals associated with the modification would be stored within the site including small quantities of unleaded fuel (up to 100L) and small quantities of oils and lubricants (up to 200L). Other chemicals associated with blasting (including emulsion chemicals) would also be stored within the site.

Minor maintenance would also continue to be performed on equipment and machinery within the site, however major repairs and all servicing would continue to be undertaken at a depot.

Fill imported to the site would comprise a mixture of Virgin Excavated Natural Material (VENM), and Excavated Natural Material (ENM). Imported fill would be stored within the designated areas shown in Figure 2-2.

No wastewater disposal facilities would be provided within the site, and non-potable water would be supplied to the site through de-watering of sediment basins for use in dust suppression on haulage roads and during crushing/screening operations. Sediment basins have the potential to generate large quantities of fine silt laden material, which, if not managed appropriately, has the potential of causing water pollution. Drinking water would be supplied through procurement of potable water. Ablution blocks or equivalent would be installed and maintained throughout the duration of site use. Power would likely be supplied to the site office through use of generators for the duration of site use. Access to the transmission towers in Lot 50 DP755609 would be maintained at all times.

The waste generated and resources used by operations under the proposed modification would be similar to those listed within the section 5.10.2 of the Moonimba Quarry EIS and the Operational Plan of Management presented in Appendix 10 of the Moonimba Quarry EIS.

Key differences between the proposed modification and Development Application No. 2015/069 regarding waste and resource management include:

- Importation of certified ENM in addition to VENM,
- Storage of up to 10,000L of bulk fuel on site and designated,
- Designated refuelling areas for mobile plant,
- Storage of small amounts of chemicals (including but not limited to unleaded fuel, oils, lubricants, and chemicals used for blasting such as emulsion chemicals), and

- Small amounts of waste oil and rubbish would also be stored within the site.

Management of these impacts is addressed in section 4.11.4.

CONSISTENCY WITH THE APPROVED PROJECT

The waste generated and resources used throughout the duration of site operation under the proposed modification would be consistent with those already generated by the borrow site operations identified in the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (RMS, December 2012). No additional impacts to waste and resource management are anticipated beyond those previously assessed.

4.13.4 MITIGATION / MANAGEMENT MEASURES

Waste material generated on-site would be managed in accordance with the Protection of the Environment Operations Act 1997, Waste Classification Guidelines Part 1: Classifying Waste (DECCW, 2009), and approved *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11) Construction Waste, Resource and Energy Management Plan* (CWREMP)(Appendix B7,CEMP).

All fill imported to the site would be recorded and managed in accordance with Excavated Natural Material Order 2014 and the Excavated Natural Material Exemption 2014, and would be stockpiled and stored in accordance with the approved *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11) Construction Soil and Water Management Plan* (including the Stockpile Management Protocol).

If contaminated soil is encountered, it would be managed and disposed of in accordance with the approved *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11) Construction Waste, Resource and Energy Management Plan* (CWREMP) (Appendix B7,CEMP) and the approved *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11) Construction Contaminated Land Management Plan* (CCLMP)(Appendix B8, CEMP). Both plans contain protocols for the handling, stockpiling and disposal of contaminated soils and require disposal at an appropriately licensed waste facility.

Where suitable, the sediment removed from basins would be used within the borrow site for landscaping or rehabilitation purposes. Water collected in the sediment basins would be extracted and used as a dust suppressant on haul roads and during crushing/screening. The rate of application would be such as not to cause runoff to surrounding waters. It is anticipated that the water reuse would be limited to the excavation area above the sediment ponds so that any excess water would run off back into the basins.

All fuel and chemical stores, and refuelling areas would be managed in accordance with the approved *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11) Construction Soil and Water Management Plan* (Appendix B4, CEMP). No additional mitigation measures would be implemented on the site beyond those outlined within the approved *Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11) Construction Environmental Management Plan* and associated sub-plans.

4.14 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Under the environmental assessment provisions of the Environment Protection and Biodiversity Conservation Act 1999, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered for the proposed modification.

Table 4-5 shows the Matters of National Environmental Significance and the level of impact the proposed modification is anticipated to generate.

Table 4-5 Matters of National Environmental Significance

FACTOR	IMPACT
Any impact on a World Heritage property?	No World Heritage properties would be impacted by the proposal.
Any impact on a National Heritage place?	No impact on a National Heritage Place.
Any impact on a wetland of international importance?	No wetlands of international importance would be impacted by the proposal.
Any impact on a listed threatened species or community?	No threatened species or communities listed under the EPBC Act would be impacted by the proposal.
Any impact on a listed migratory species?	No migratory species would be impacted by the proposal.
Any impact on a Commonwealth marine area?	The borrow site is not located within a Commonwealth marine area.
Does the proposal involve a nuclear action (including uranium mining)?	The proposal does not involve a nuclear action.
Additionally, any impact (direct or indirect) on Commonwealth land?	The borrow site is located on privately owned land.

5 CONSULTATION

5.1 CONSULTATION FOR THE APPROVED PROJECT

Consultation has been undertaken throughout the evolution of the Approved Project. Activities undertaken prior to project approval are detailed in Chapter 12 of the W2B EIS and Appendix D of the W2B SPIR.

Government agencies have been regularly consulted with during monthly Environment Review Group (ERG) meetings. Relevant government agency stakeholders include:

- Environment Protection Authority (EPA)
- Department of Primary Industries – Fisheries (DPI Fisheries)
- Office of Environment and Heritage (OEH)
- Forestry Corporation of NSW (FCNSW)
- Department of Planning and Environment NSW (DP&E)
- Department of Environment (DoE)
- Roads and Maritime Services (RMS)

Community consultation for the Approved Project has occurred regularly in accordance with the approved Woolgoolga to Ballina Communications and Stakeholder Engagement Strategy which has been delivered in accordance with MCoA C1. Flood focus group meetings would be undertaken to discuss hydrological impacts in accordance with MCoA B33.

In accordance with mitigation measure AH10 in Chapter 5 of the SPIR (November 2013), ongoing Aboriginal Focus Group (AFG) meetings have occurred regularly in each of the four portions of the project. The consultation with RAPs has been undertaken in accordance with the Aboriginal Cultural Heritage Requirements for Proponents (DECCW 2010) and the Roads and Maritime 'Procedure for Aboriginal Cultural Heritage Consultation and Investigation' (PACHCI).

5.2 CONSULTATION FOR DEVELOPMENT APPLICATION NO. 2015.0069

Consultation was undertaken to support DA2015.0069 in early 2014 and was summarised in the Community Consultation Regarding the Proposed Expansion of Newmans Quarry (Caroline Desmond, July 2014) presented as Appendix 10 of the Moonimba Quarry EIS. Consultation was undertaken with immediate neighbours, all residents on the proposed truck route (Boggy Creek Road and Reardons Lane from the Boggy Creek Road intersection to the T-intersection at Woodburn-Coraki Road) and residents within a one kilometre radius of the site. Consultation consisted of phone calls, emails, letters in the post, and/or personal visits. The residents were supplied with a summary of the proposal at the time of consultation and were asked whether they had any issues or concerns with current operations within the quarry, and whether they had any concerns regarding the proposed quarry expansion. In total, 42 residents were contacted during the community consultation period of which the following issues were raised:

- No concerns (17)
- Trucks – including noise, dust, bus route, safety (11)
- Hours of operation (6)
- Noise from quarry operations (5)
- Property value (4)
- Other issues (14)

5.3 CONSULTATION FOR THE PROPOSED MODIFICATION

5.3.1 AGENCY CONSULTATION

The relevant government agencies were briefed about the proposed modification during the July 2017 Environment Review Group (ERG) meeting prior to the exhibition of the Modification Report. Agencies would be notified once the Modification has been placed on public display. Any feedback received would be addressed in a submission report prepared after the public display of the modification report.

5.3.2 COMMUNITY CONSULTATION

An initial notification letter was distributed in August 2017 to potentially affected receivers and stakeholders that contained information regarding the background and scope of the proposal, traffic management, work hours and an outline of the modification approval process. See copy in Appendix L. Issues raised by the community from this information was a request for outcomes of any updated studies and specifically issues regarding traffic and noise management. These issues have been addressed in this modification report which will be made available to the community during the exhibition period.

A drop-in session is scheduled during the exhibition period at the Woodburn Visitor Information Centre. Doorknocks and one-on-one meetings will be scheduled as required.

5.3.3 REGISTERED ABORIGINAL PARTIES

The proposed modification falls within the Bogal Local Aboriginal Land Council (LALC) area. A consultation letter has been sent to Bogal LALC providing a brief description of the proposal, and information regarding the intended exhibition timeframes for the modification. Bogal LALC were also invited to provide feedback prior to exhibition of the proposed modification.

6 ADDITIONAL MANAGEMENT MEASURES

A range of environmental requirements and control measures have been previously prescribed for the Approved Project including mitigation measures listed within in the Submission / Preferred Infrastructure Report (November 2013)(S/PIR), the Conditions of Approval, relevant Roads and Maritime documents and the approved *Woolgoolga to Ballina (sections 3-11) Construction Environment Management Plan (W2B CEMP)* and associated sub-plans. The proposed modification would be established, operated and maintained in accordance with the requirements included in the W2B CEMP and associated sub-plans.

As outlined in Section 4.2.3 of the approved W2B CEMP, the contractor operating the Moonimba Borrow Site would be required to develop project specific environmental management documentation to address the operational control requirements outlined in the W2B CEMP. This includes the development of a Contractor's Construction Environmental Management Plan (CCEMP) that would be reviewed by Pacific Complete to ensure its compliance with the relevant requirements of the W2B CEMP. Additionally, an Environmental Work Method Statement (EWMS) would be developed by the contractor for the Moonimba Borrow Site. Management measures identified within this modification report would be incorporated into site or activity specific Environmental Work Method Statements (EWMS) prepared by the contractor.

The mitigation measures presented in Table 6-1 are discussed in Chapter 4 of this modification report and are in addition to mitigation measures presented in the W2B CEMP and associated sub-plans.

Table 6-1 Additional mitigation measures for the Moonimba Borrow Site

	MEASURE/REQUIREMENT	RESPONSIBILITY	TIMING/ FREQUENCY
Traffic transport and access			
MM 1	Road upgrades specified in approved DA2015.0069 would be completed prior to the commencement of increased haulage of extracted material from the borrow site.	Landowner / Pacific Complete	Preconstruction
MM 2	Right-turn treatment on the Pacific Highway, for vehicles to safely and efficiently access Woodburn-Coraki Road with the appropriate treatment being a channelised right turn bay on the Pacific Highway, southbound will be installed to provide a right-turn treatment on the Pacific Highway for vehicles to safely and efficiently access Woodburn-Coraki Road. This treatment requires the reconfiguration of the intersection's layout and realignment of the existing line marking.	Pacific Complete / Contractor	Preconstruction
MM 3	A traffic management plan (TMP) will be prepared in accordance with the W2B CTAMP (Appendix B1 of the CEMP). This will include traffic controllers, variable message signs and adequate tapering, which will be provided to manage this intersection during peaks in construction haulage activities.	Pacific Complete / Contractor	Preconstruction

	MEASURE/REQUIREMENT	RESPONSIBILITY	TIMING/ FREQUENCY
MM 4	The implementation of GPS tracking of haulage vehicles will be investigated to monitor the location of haulage trucks during the morning and afternoon school peak traffic times so as to ensure impacts of school bus operations are minimised.	Pacific Complete / Contractor	Preconstruction Construction
Noise and vibration			
MM 5	A blast management plan will be prepared by the contractor prior to any blasts occurring at the site to ensure compliance with overpressure and vibration limits outlined in the Approved Project's Conditions of Approval, specifically MCoA B22 and B23.	Pacific Complete / Contractor	Preconstruction Construction
MM 6	A program for regular noise monitoring will be established. As a minimum, noise monitoring will be undertaken for the following: <ul style="list-style-type: none"> The first time any new or altered operations occur at the facility to meet the increased extraction rate (with the exception of Site Establishment works) Any time equipment changes are made Any time operations are commenced concurrently for the first time Where operations move to a new location within the approved work area As a result of a valid complaint from a surrounding noise sensitive receiver. 	Pacific Complete / Contractor	Construction
MM 7	Where any exceedances of the criteria are measured, the operator of the facility is to implement all reasonable and feasible measures to reduce noise levels towards the criteria. Measures may include: <ul style="list-style-type: none"> Erecting noise barriers, screening or forming bunds around activities which are found to cause exceedances of the criteria. Depending on the surrounding topography, localised screening around equipment may reduce noise emissions by up to 10-15 dB(A). Performing all noise intensive activity such as crushing and/or screening at deep excavation areas in existing pits, irrespective of extraction location. Managing activities that are undertaken concurrently in order to meet noise criteria. This may change dependent on the location on site due to topographical screening and distance to the surrounding receivers. In certain areas more work may be permissible concurrently than when the same work is undertaken on a different part of the site. Where reversing alarm noise is identified to be a source of disturbance, the alarm noise level will be checked against the appropriate regulatory and health and safety requirements and the necessary mitigating action taken to achieve an acceptable noise reduction without compromising safety standards. In line with the CEMP, alternative methods to traditional beeper alarms may be used. 	Pacific Complete / Contractor	Construction

	MEASURE/REQUIREMENT	RESPONSIBILITY	TIMING/ FREQUENCY
	<ul style="list-style-type: none"> In the event that rumble grid noise is considered to be a source of disturbance, mitigation applied in the form of lower posted speeds at the grids or localised screening to be installed if appropriate. 		
MM 8	In order to manage the haulage route noise impacts, the measures detailed in the CNVMP will be followed and implemented where feasible and reasonable.	Pacific Complete / Contractor	Construction
MM 9	An inspection of the noise wall outlined in DA2015.0069 to be constructed at the affected receiver on Reardons Lane will be undertaken and noise monitoring carried out to ensure sufficient noise reductions are being provided for this receiver.	Pacific Complete / Contractor	Construction
Biodiversity			
MM 10	<p>A Habitat Offset arrangement of a minimum of 68 hectares with a legally binding mechanism for the protection in perpetuity of the habitat offset will be implemented in accordance with the requirements outlined in DA2015.0069. Prior to approval of the offset a suitably qualified person will be engaged to:</p> <ul style="list-style-type: none"> Undertake detailed assessment of the 90 hectare area to determine the location of the final 68 hectare area. The area shall provide habitat on a like for like basis proportional to the impacted vegetation communities. The offset shall comprise a single contiguous area incorporating logical management and/or landscape boundaries that are easily identifiable and designed to minimise edge effects. Investigate opportunities for securing the Habitat Offset. Preference shall be given to use of the BioBanking Scheme or alternatively a Conservation Agreement pursuant to the National Parks and Wildlife Act 1974. Submit for approval of Richmond Valley Council details of the investigations referred to. Undertake any such recommendations or requirements in association with the approved method of securing the Habitat Offset. <p>The offset shall remain in force in perpetuity and the final offset area and mechanism for securing the habitat offset shall be approved by Richmond Valley Council.</p>	Landowner / Pacific Complete	Preconstruction
MM 11	Revegetation areas required under DA2015.0069 will be further examined to ensure compliance with conditions of approval and ensure DA operation is possible in a timely manner.	Landowner / Pacific Complete	Preconstruction
MM 12	During pre-clearing surveys targeted surveys for the Powerful and Masked Owl will be undertaken to determine whether nesting is occurring within or near the proposed clearing footprint. In the event that a nest tree or roost tree is located and an active breeding pair are utilising the hollow, it must be clearly marked and a buffer of a	Pacific Complete / Contractor	Construction

	MEASURE/REQUIREMENT	RESPONSIBILITY	TIMING/ FREQUENCY
	minimum 50 metre radius must be applied and clearly delineated. Clearing of identified roosting tree would be removed outside breeding season (March – September) and when individuals have vacated the nest.		
MM 13	To reduce the potential for injury to resident fauna (especially macropods), speed limits along access roads and tracks will be limited to 40-50 kilometres per hour to reduce likelihood of road collision and road mortality. Warning signs along regularly used roads will be erected to warn road users of potential wildlife within the vicinity along road verges.	Pacific Complete / Contractor	Construction
Hydrology, water quality and soil management			
MM 14	An erosion and sediment control plan (ESCP) will be prepared by the contractor to detail how the site will be managed. This will be prepared in accordance with the Woolgoolga to Ballina Construction Soil and Water Management Plan (CSWMP, Appendix B4 of the W2BCEMP) and the Blue Book.	Pacific Complete / Contractor	Preconstruction
MM 15	A surface water monitoring program will be established prior to the operation of the site in order to establish baseline levels of the drainage lines near the borrow site and continue through the operation of the site. Water quality monitoring will be undertaken in accordance with the approved Woolgoolga to Ballina (sections 3 to 11) Water Quality Monitoring Program.	Pacific Complete / Contractor	Preconstruction Construction
MM 16	In the unlikely event that the Moonimba Borrow Site does encounter a permanent water table in the bedrock, and penetrates this water table, to a depth in excess of 5 metres, a review of management measures shall be undertaken which will include re-evaluation of the groundwater impact and return of captured water (inflows) to local drainages after treatment in an appropriate sedimentation pond (to capture suspended solids).	Pacific Complete / Contractor	Construction
MM 17	During the decommissioning of the site, the exposed areas will be stabilised prior to the site being handed back to the landowner.	Pacific Complete / Contractor	Post construction
Heritage			
MM 18	A temporary high visibility fence, with a minimum 30 metre radius, will be established around the scar tree, located to the south of the eastern pit prior to the commencement of works. The advice of a specialist preferably an Arborist, will be sought to determine appropriate buffer zones for the ongoing management and protection of the tree taking into account the topography of the landscape, the proposed extensive extractive works and the potential for long term damage.	Landowner/ Pacific Complete / Contractor	Preconstruction

7 CONCLUSION

A modification of the Woolgoolga to Ballina Pacific Highway Upgrade (the Project Approval) is being sought for the use and temporary intensification of operation at the Moonimba Borrow Site (previously known as the Moonimba Quarry), for the supply of material for the construction of the Approved Project.

The proposed modification would allow for the extraction and supply of one million tonnes of material per annum (equivalent to 400,000m³) for a period of two years or until the material demand for the project ceases. This would provide two million tonnes of material in total which would meet the deficit of material in demand for the delivery of the Approved Project.

This modification report identifies and assesses the potential environmental impacts from the proposed modification. Section 4 of the report provides a detailed assessment of each potential environmental impact. The key potential environmental impacts identified include:

- An increase in haulage vehicles using the local road network to delivery material to the Approved Project
- Noise impacts to surrounding sensitive receivers from the operations of the borrow site
- Noise impacts to sensitive receivers located along the haulage route that would be utilised by haulage vehicles delivery material to the Approved Project
- The removal of 9.5 hectares of native vegetation and potential fauna habitat (previously approved under DA2015.0069).

As outlined in Section 6, the Moonimba Borrow Site would be established, operated and maintained in accordance with the requirements included in the *Woolgoolga to Ballina (sections 3-11) Construction Environment Management Plan (W2B CEMP)* and associated sub-plans. Additional mitigations applicable to the Moonimba Borrow Site are outlined in Section 6.

8 REFERENCES

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- Australian Bureau of Statistics (ABS), 2017, *2011 Census Richmond Valley (A) (LGA)*, Australian Government, Canberra, Australia, Accessed online at http://stat.abs.gov.au/itt/r.jsp?RegionSummary®ion=16610&dataset=ABS_REGIONAL_LGA&geoconcept=REGION&maplayerid=LGA2014&measure=MEASURE&datasetASGS=ABS_REGIONAL_ASGS&datasetLGA=ABS_REGIONAL_LGA®ionLGA=REGION®ionASGS=REGION
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- Roads and Maritime Services 2013, *Woolgoolga to Ballina Pacific Highway Upgrade Submissions / Preferred Infrastructure Report*, Roads and Maritime Services, Sydney Australia.

APPENDIX A DEVELOPMENT APPLICATION
2015.0069 CONSENT CONDITIONS



**NOTICE TO APPLICANT OF DETERMINATION OF A
DEVELOPMENT APPLICATION**

Environmental Planning and Assessment Act, 1979 (As Amended)

Cherie Smith - Development Assessment Officer
Telephone: (02) 6660 0300

To: Mr N J & Mrs KA Newman
Newmans Quarry & Landscaping Supplies Pty Ltd
235 Reardons Lane
CORAKI NSW 2471

Being the applicant in respect of: **Development Application No. DA2015.0069**

Extractive Industry to 90,000m³ per annum and Importation of Fill to 30,000m³ per annum

Pursuant to Section 80(1) of the Environmental Planning and Assessment Act, notice is hereby given of the determination by the Council, as Consent Authority, of the Development Application lodged **12 February 2015** relating to the land described as follows:

Lot 193 DP 755603 – Bungawalbin Whiporie Road, Bungawalbin

The Development Application has been determined by:

GRANTING OF CONSENT subject to the conditions specified in the notice.

This consent operates from **20 May 2015**

Lapses on **20 May 2020**

IMPORTANT NOTICE

**THIS IS A LEGAL DOCUMENT. ENSURE THAT YOU READ THE DOCUMENT CAREFULLY,
AND PARTICULARLY NOTE ALL ATTENDANT INSTRUCTIONS AND CONDITIONS**

DETAILS OF CONDITIONS

The conditions of consent are set out as follows:

1. In granting this development consent, Council requires:
 - All proposed works be carried out in accordance with any amendment or modification outlined in these conditions
 - Any proposed use the land be in accordance with any amendment or modification outlined in these conditions

and be substantially in accordance with the stamped approved plans, Plan of Management Cell Layout 01/03 Rev. 2 dated 29 August 2014, Plan of Management Importation Fill Cell Layout 02/03 Rev 2 dated 7 July 2014, Plan of Management Final Rehabilitation 03/03 Rev2 dated 7 July 2014, Environmental Impact Statement, and/or supporting documents (including additional information requested by Council) submitted with the application.

In the event of any inconsistency between conditions of this development consent and the approved plans and supporting documents, the condition of this development consent prevail.

A copy/copies of the approved plan is/are attached to this consent.

Reason: *To correctly describe what has been approved. (EPA Act Sec 79C)*

SURRENDER OF EXISTING CONSENT AND COMMENCEMENT OF THIS CONSENT

2. Operations under this consent shall not commence until the following conditions (a) - (d) are satisfied;
 - (a) The proponent surrenders Development Consent Notice DA 127/95 dated 19 February 1997 in accordance with Section 80A of the EP&A Act 1979 and in the manner prescribed by clause 97 of the EP&A Regulation 2000.
 - (b) The notice of surrender of consent shall be accompanied by;
 - i) a survey indicating the extent and surface levels of the extraction areas immediately prior to the date of surrender,
 - ii) an assessment of the total volume of material extracted under the consent
 - iii) an assessment of outstanding contributions payable under consent DA127/95, including sufficient documentation to establish the amount of material removed,
 - iv) a statutory declaration stating the information is a true and accurate record of extraction,
 - v) payment of the assessed amount, and
 - vi) details confirming rehabilitation works for all disturbed areas outside the extraction areas or roadways approved by this consent, is complete, and
 - (c) The proponent shall notify Council in writing of the proposed commencement date of operations under this consent
 - (d) The proponent shall provide to Council written certification from suitably qualified persons demonstrating that all consent conditions required to be satisfied prior to commencement of operations have been so satisfied.

Council will confirm upon review of the documentation related to condition 3(d) the date of commencement of the annual return period. The "annual return period" referred to in this consent means the 12 month period commencing at that date.

Reason: *To ensure only relevant Consents are valid for the subject land and protect the environment.*

APPROVAL LIMITS

3. The total amount of material extracted and transported in any annual return period shall not exceed 90,000m³. The total amount of imported material transported to the site in any annual return period shall not exceed 30,000m³.

Truck movements, inclusive of all incoming and outgoing trucks, in any one day period shall not exceed seventy six (76) truck movements (Monday - Friday) and twenty two (22) truck movements Saturdays.

This consent does not permit the combining of extractive volumes approved under DA127/95 with this consent. That is for any twelve month period the maximum extraction from the site shall not exceed 90,000m³.

Reason: *To correctly describe what has been approved. (EPA Act Sec 79C)*

HOURS OF OPERATION

4. Hours of operation shall be limited to the hours set out in the table to this condition subject to the following exception;
- i) No truck movements shall occur on any school day, during the period that a school bus travels along the haulage route sections located on Boggy Creek Road and Reardons Lane.

The proponent shall consult with the bus company and Richmond Valley Council to determine the safe operational periods that the trucks may operate on Boggy Creek Road and Reardons Lane.

Quarry operations and Transportation	Monday to Friday Saturday	7am - 6pm 8am - 12pm
Blasting	Monday to Friday	9am - 3pm
No operations or transportation	Sundays or Public Holidays	

Reason: *To correctly describe what has been approved and protect the amenity of the area.*

TERM OF CONSENT

5. The period during which the extractive industry and transport activities may be carried out is limited to 25 years from the date of commencement notified under condition No. 3. This condition does not prevent the undertaking of rehabilitation works after the expiration of 25 years.

Reason: *To correctly describe what has been approved. (EPA Act Sec 79C)*

HAULAGE ROUTE

6. The haulage route shall be the sections of Roads as follows, excepting in the instance outlined in (a) and (b) below only;
- Boggy Creek Road from the site access road to Reardons Lane intersection
 - Reardons Lane from Boggy Creek Road to Woodburn Coraki Road intersection
 - Woodburn-Coraki Road from Reardons Lane to the Pacific Highway intersection at Woodburn.
- (a) Vehicles turning left on Woodburn-Coraki Road shall be permitted only where quantities of material turning left at Woodburn-Coraki Road are limited to a maximum of 30,000m³ or 65,000 tonnes per annual return period.
- (b) The 30,000m³ referred to in (a) above is not in addition to the 90,000m³ approved by this consent.
- (c) Accurate details must be kept and provided if requested to demonstrate compliance with this condition.

Reason: To correctly describe what has been approved, traffic safety and protect the amenity of the area. (EPA Act Sec 79C)

IMPORTATION OF FILL AND SITE REHABILITATION

7. Any fill imported to the site shall comprise of Virgin Excavated Natural Material (VENM) only and shall be sourced only from the NSW Roads and Maritime Services. The total amount of imported fill to the site in any annual return period shall not exceed 30,000m³ and is subject to the following;
- (a) Prior to importation of any fill an assessment including a calculation of the total quantity of fill required to complete rehabilitation works for the life of the quarry shall be submitted to Richmond Valley Council.
- (b) The maximum quantity of imported fill permitted over the life of consent under condition shall be 110% of the quantity determined under (a).
- (c) The quantity determined under (a) may be modified by Richmond Valley Council at any time, subject to evidence provided within the Performance and Environmental Management Report demonstrating the calculation of fill required for rehabilitation of the site requires amending.

Accurate details confirming the source, quantity and certification details for the fill shall be kept and provided as requested by Richmond Valley Council.

The imported fill shall be used only for rehabilitation works in association with this consent. The fill shall be either applied directly or stockpiled for use in future rehabilitation in accordance with this consent and the Operational Plan of Management.

Reason: To correctly what has been approved and protect the environment.

8. The proponent shall rehabilitate the site to the satisfaction of Richmond Valley Council. Rehabilitation shall be undertaken progressively, that is, as soon as reasonably practicable and generally as indicated in the Environmental Impact Statement and Operational Plan of Management.

All disturbed areas not falling within the areas identified as Pit B or Pit C or the roadways approved under this consent, shall be rehabilitated prior to commencement of works.

At the expiration of the consent under condition 5, the developer shall remove all equipment and facilities associated with the development from the land and provide a report to Richmond Valley Council detailing the completion of rehabilitation works for the site.

Reason: *To ensure the site is rehabilitated and protect the environment.*

MEANS TO WEIGH MATERIAL

9. The developer shall provide a suitable means to weigh all material hauled from the site. Details are to be submitted and approved by Richmond Valley Council prior to commencement of haulage. This consent does not authorise the construction of any weighbridge, if required further consent must be obtained.

Reason: *To ensure quantities of extracted materials can be determined and managed.*

PROVISION OF AMENITIES

10. Provision of adequate toilet facilities shall be established onsite by means of a temporary chemical closet or an approved on site effluent disposal system

Reason: *To provide necessary facilities to service the development.*

ECOLOGICAL MANAGEMENT

11. There shall be no vegetation removal until a Habitat Offset being a minimum of 68 hectares in area and a legally binding mechanism for the protection in perpetuity of the Habitat Offset is approved to the satisfaction of Richmond Valley Council. The Offset shall comprise vegetation representative of the impacted communities and be located generally within the 90 hectare area identified in Figure 3.1 Vegetation Plan submitted 4 March 2015.

Prior to approval of the Offset area the proponent shall engage a suitably qualified person to;

- (a) Undertake detailed assessment of the 90 hectare area to determine the location of the final 68 hectare area. The area shall provide habitat on a like for like basis proportional to the impacted vegetation communities.
- (b) The offset shall comprise a single contiguous area incorporating logical management and/or landscape boundaries that are easily identifiable and designed to minimise edge effects.
- (c) Investigate opportunities for securing the Habitat Offset. Preference shall be given to use of the BioBanking Scheme or alternatively a Conservation Agreement pursuant to the National Parks and Wildlife Act 1974.
- (d) Submit for approval of Richmond Valley Council details of the investigations referred to in (a) - (c)
- (e) Undertake any such recommendations or requirements in association with the approved method of securing the Habitat Offset

The offset shall remain in force in perpetuity and the final offset area and mechanism for securing the Habitat Offset shall be approved by Richmond Valley Council.

Reason: *To compensate for loss of habitat and biodiversity resulting from the development.*

12. Where quarry operations are proposed to commence prior to the provision of the Habitat Offset required under condition 11, the proponent shall:
- (a) Install a protective barrier between existing vegetation and all quarry operations, including a buffer sufficient to protect existing vegetation. The barrier shall be sufficient to prevent accidental incursions beyond the existing extent of quarry operations.
 - (b) Submit to Council a plan identifying the location of any barrier.
 - (c) Be responsible for ensuring all persons on the site are made aware of the boundary markers and that no works extend beyond the markers

Reason: *To protect the environment and provide visual identification of the limits prior to finalising the Habitat Offset.*

13. Subject to amendment by the conditions of this consent the proponent shall ensure all works and operation of the quarry is undertaken in accordance with Sections 5.6 Mitigation and 5.7 Rehabilitation of the Flora and Fauna Assessment prepared by Australian Wetlands Consulting Pty Ltd Revision B dated 19.09.2014.

Reason: *To protect the environment.*

IDENTIFICATION OF APPROVED QUARRY AREAS

14. The boundaries of the approved quarry footprint, as identified in the approved quarry plan shall be clearly marked on site **prior to commencement**. The developer shall ensure;
- (a) The location of boundaries is confirmed by survey and submitted to Richmond Valley Council prior to commencement
 - (b) The markers are easily identifiable and sufficiently durable,
 - (c) The markers remain in place for the life of the consent,
 - (d) All contractors and employees on the site are made aware of the quarry boundary and that no works extend beyond the markers.

Reason: *To provide visual identification of the approved development area.*

TRAFFIC MANAGEMENT

15. The proponent shall prepare and enforce a Truck Management Plan and Code of Conduct for drivers. The documents shall be submitted to and approved by Richmond Valley Council **prior to commencement of transport operations**.

The Management Plan must include but may not necessarily be limited to:

- A driver training and induction procedure. This shall include a requirement for drivers / contractors to sign a Code of Conduct acknowledgement that they agree to complying with the requirements and ongoing education about requirements.
- Complaint investigation procedure and procedure for dealing with non-compliant drivers.
- Method of monitoring truck speeds by the operator.
- Record keeping including any proposal to keep log books of truck journeys, complaints, monitoring carried out by quarry operator, and outcomes of investigations of any breaches and providing copies of such records to Council.
- Identification markings on trucks contracted to haul / work for the quarry.

- A Driver Code of Conduct that details the approved haulage route, operation hours for travel to and from the site, speeds, measures to reduce traffic noise, safe distances between trucks, traffic safety and courteousness, locations of sensitive receivers, identification and enforcement.

The proponent is responsible for managing speed limits of quarry trucks to ensure compliance with this condition. The proponent shall ensure all drivers adhere to the Code of Conduct, promptly address any complaints or community issues and shall take or implement any reasonable mitigation measures as required.

Reason: *To protect the amenity of the area, traffic safety, ensure management of truck speed limits and noise impacts from transport operations*

COMMUNITY RELATIONS

16. **Prior to commencement of operations** the proponent shall;

- (a) submit to Richmond Valley Council and include within the Operational Plan of Management the following, the name and contact details for a person with the responsibility and authority to respond to Council and/or members of the public in regard to complaints, compliance with this consent and any Plan or report associated with the development. This person must respond to community complaints promptly and effectively.
- (b) erect a sign at the entrance of the quarry with the phone number and permanent site contact details so that complaints concerning the operation of the quarry can be received and addressed in a timely manner. The sign must remain in place and contain accurate details at all times.

The proponent shall ensure the contact details provided above remain current at all times and are updated if any changes occur.

Reason: *To ensure the development responds to community concerns.*

CULTURAL HERITAGE

17. The proponent shall implement and ensure the development operates at all times in accordance with the Cultural Heritage Assessment prepared by Everick Heritage Consultants Pty Ltd dated September 2014 including the recommendations of Section 9.

If Aboriginal objects are identified during the proposed works and they cannot be avoided, all mitigation measures undertaken to manage impact will require an Aboriginal Heritage Impact Permit (AHIP). Any potential AHIP application will require evidence of consultation with the registered Aboriginal parties. Ongoing consultation for the life to the development is encouraged.

Reason: *To protect Cultural Heritage.*

PERFORMANCE REPORTING AND OPERATIONAL PLAN OF MANAGEMENT

18. (a) **Prior to commencement of operations** the Operational Plan of Management shall be amended where applicable to be consistent with this consent and any report, approval or plan associated with this consent and shall include any other additional matters as determined by Richmond Valley Council.

- (b) Within one month of the end of every annual reporting period, or other timing as may be agreed with Council, the proponent shall submit to Richmond Valley Council a Performance and Environmental Management Report. The Report must review the environmental performance of the development including:
- i) A description of the development that was carried out in the previous year, and the development that is proposed to be carried out over the next year including quarry production and transport data, details of proposed working cells, cells to be opened and or closed and rehabilitation works.
 - ii) A review of the Operational Plan of Management and a description of any proposed amendments to the current Operational Plan of Management.
 - iii) An assessment of rehabilitation works completed during the year against the Operational Plan of Management and review of the importation of fill. A fill balance calculation shall be undertaken to ensure sufficient soil is available for ongoing rehabilitation works over the life of the quarry.
 - iv) A comprehensive review of the monitoring results and complaints records of the development over the previous year, which includes a comparison of these results against the:
 - a) the relevant statutory requirements, limits or performance measures/criteria;
 - b) requirements of any plan or program required under this consent, including the Transport Management Plan and Code of Conduct
 - c) the monitoring results of previous years;
 - d) the relevant predictions in the EIS; and
 - e) a copy of the annual return submitted to the Environmental Protection Authority for the current year
 - v) A statement of compliance with each of the relevant conditions of this consent including identification of any non-compliance over the last year, and description what actions were taken and will continue be taken to ensure compliance. Identified actions shall be included in an amending Operational Plan of Management.
 - vi) Identification of any trends in the monitoring data over the life of the development.
 - vii) Identification of any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies.
 - viii) A description of measures that will be implemented over the next year to improve the environmental performance of the development.
 - ix) Monitoring and environmental reporting is to be completed by an independent and appropriately qualified person
- (c) Following submission of the Performance and Environmental Management Report and subject to approval by Richmond Valley Council, the Operational Plan of Management may be replaced with an amending Plan.

An Operational Plan of Management remains current until such time as an amending plan is approved by Richmond Valley Council.

Reason: *To monitor performance of the development and provide flexibility in the progressive working of cells over the life of the development.*

INFRASTRUCTURE

19. Any damage caused to public infrastructure (roads, footpaths, kerb and gutter, stormwater, water and sewer mains, power and telephone services etc) during construction of the development shall be repaired to the satisfaction of the Executive Manager Infrastructure and Environment (and delegated staff). The repairs shall be carried out **prior to the commencement of operations of the quarry under this consent**.

Council shall be notified in writing, **prior to commencement of works**, of any existing damage to roads, stormwater drainage, kerb and gutter or footpaths.

Absence of notification signifies that no damage exists, and the applicant is therefore liable for the cost of reinstatement of any damage found at the completion of the works.

***Reason:** To protect the existing and future amenity of the locality and to formally record any pre-existing damage to existing assets.*

20. Utilities, services and other infrastructure potentially affected by construction and operation shall be identified prior to construction to determine requirements for access to, diversion, protection, and/or support. Existing services/infrastructure that require reconstruction or adjusting to suit a development (water, sewerage, stormwater, road works, footpath, kerb and gutter, footpaths, etc.) is to be carried out at the developer's expense. Construction is to be in accordance with Council's standards, or the affected asset owners standards, and shall be completed **prior to the commencement of operations of the quarry under this consent**.

***Reason:** To protect existing services.*

21. Works within any part of the road reserve which will impact on pedestrians or traffic flow (including temporary site fencing which restricts pedestrian access, temporary disruption to traffic, etc.) requires the preparation of a **Traffic Control Plan**. The Plan shall comply with the provisions of the Roads and Maritime Services (formerly RTA) document "**Traffic Control at Work Sites**" manual and shall be prepared by a person who is qualified, authorised and has passed an Roads and Maritime Services (formerly RTA) approved training course. The TCP designer's certification number is to appear on the Traffic Control Plans.

The Plan shall be submitted to and verified by Richmond Valley Council **prior to the commencement of works in the road reserve**.

***Reason:** To ensure works carried out in the road reserve are carried out in a safe environment.*

22. Application (under Section 138 of the Roads Act) for approval to carry out any work within the road reserve shall be made to Council by any contractor proposing to carry out any such works prior to any such works commencing. This includes driveway crossings and aprons, water, sewerage, stormwater, road works, kerb and gutter, footpaths, etc. (Completion of Council's Application for Construction of Vehicular Accessway form and payment of the cost/bond satisfies the Section 138 requirement for crossings and aprons. Bond amounts are the rates applicable at the time of payment.)

The owner or contractor shall not undertake any work within the public road reserve without giving Council's Infrastructure and Environment Department **five (5) working days notice of proposed commencement**.

All contractors working on such areas are to have Public Liability Cover to a minimum value of \$10,000,000. A certificate of currency is to be forwarded to Council prior to the commencement of works.

Reason: To comply with Section 138 of the Roads Act 1993.

23. In accordance with Richmond Valley Council's Rural Road Numbering System, the developer shall place rural road number identification on a post at the Boggy Creek Road vehicular entry point to the quarry access road. **prior to the commencement of operations of the quarry under this consent.**

Reason: To provide visual identification of the access location for emergency services.

24. A defects liability bond (in cash or Bank Guarantee) shall be lodged with Council. The date of Practical Completion shall be the date upon which all engineering works are completed and the defects liability bond has been paid. The bond shall be based on 10% of the value of the works which will become Council's assets (Council's adopted Revenue Policy (Fees and Charges)), and will be held by Council for a period of 12 months from the date of Practical Completion. The defects liability bond will be refunded at the satisfactory completion of the maintenance period (12 months). The bond shall only be released by advice from Richmond Valley Council that both the defects liability period has been completed, and that the works have been completed and are satisfactory at the end of the defects liability period.

The bond shall be paid to Council **prior to the commencement of operations of the quarry under this consent.**

Reason: To provide adequate funds for the rectification of non-compliances, or failure to carry out maintenance during the maintenance period.

25. A Civil Engineering assessment fee shall be paid to Council, **prior to the issue of a Construction Certificate** for the civil works (roadworks, intersection etc) associated with this consent, for the assessment of plans, issue of a Construction Certificate, and inspection of civil works which will impact on or become Council's assets. Rates are as detailed in Council's Revenue Policy (Fees and Charges), with quantities assessed from approved plans detailing such civil works.

Reason: To ensure engineering works are designed and constructed to Council standards.

26. All building and construction work by private contractors in NSW, costing \$25,000 or more, is liable for the payment of the **Long Service Levy** to the Long Service Levy Payments Corporation. This is a State Government Levy and is subject to change. Construction work includes civil construction such as roads and bridges, pipelines, fuel gas and water storage and distribution infrastructure, sewerage drainage and treatment systems, retaining walls, electrical distribution infrastructure, etc. Confirmation of the

payment to the Corporation (Council is an agent) is to be submitted to Council **prior to the issue of the Construction Certificate**. (Payments through Council are to be made payable to Richmond Valley Council. Cheques payable to the Corporation cannot be accepted by Richmond Valley Council.)

Reason: To ensure the long service levy on private contractor constructed works is paid in accordance with State Government legislation.

27. A contribution under Section 94 (1)(b) of the Environmental Planning and Assessment Act 1979, amounting to \$1.10 per tonne (rate as @ 18/4/2015) of material transported to and from the site is to be paid to Richmond Valley Council. Contributions under this Plan shall be levied annually and based upon lodgement of annual returns itemising extraction/importation tonnages for the previous financial year. Rates provided are correct at the time of this consent and shall be payable at the rates applicable in Council's adopted Revenue Policy (Fees and Charges) at the date of payment. (The Section 94 Heavy Haulage Contributions will be allocated to the haul route roads of Boggy Creek Road, Reardons Lane and Woodburn Coraki Road.)

Reason: To provide funds for the road maintenance in accordance with Richmond Valley Council's Section 94 Heavy Haulage Contributions Plan 2013.

28. Plans showing all civil engineering works which will become Council's assets, eg roads, kerb and gutter, stormwater drainage, water, sewer, footpaths, etc., shall be submitted to Richmond Valley Council. Council approval of the plans is required **prior to the issue of the Construction Certificate** for the civil works (roadworks, intersection etc) associated with this consent. Such works shall be designed and documented in accordance with Council's Standards.

Reason: To Provide adequate services for the development.

29. Measures shall be put in place to control stormwater runoff for the road and intersection construction works. These control measures shall be in place **prior to the commencement of construction works** and shall prevent soil erosion and transport of sediments from the development site into either:

- adjoining land
- natural drainage courses
- constructed drainage systems, and
- waterways

The methods to be used shall be designed in accordance with the book '*Managing Urban Stormwater: Soils & Construction*' also known as '*the Blue Book*' published by NSW Landcom.

All control measures are to be maintained in an operational condition at all times during construction and until vegetation or permanent structures can satisfactorily control stormwater runoff. Control measures shall be regularly cleared of sediment and debris build-up, to ensure continued operation.

During construction works all motor fuels, oils and other chemicals are to be stored and used on site in a manner which ensures no contamination of stormwater. No incidents of visible pollution leaving the construction site. No litter placed in a position where it may be blown or washed off site.

***Reason:** To minimise erosion and sediment and associated impacts in accordance with the Protection of the Environment Operations Act, and to protect the capacity of downstream drainage networks (both constructed and natural)*

30. The developer shall construct the following road works in accordance with Council's Northern Rivers Development and Design Manual and the Northern Rivers Local Government Construction Manual and the Austroads Guide to Road Design Part 4A. All designs shall accommodate the swept paths of two opposing haulage trucks.

The developer shall be responsible for any costs, including maintenance, for a period of twelve months from the date of approval of completion of the work.

Design plans are to be submitted to and approved by Richmond Valley Council **prior to the issue of the Construction Certificate** for the civil works (roadworks, intersection etc) associated with this consent. (The approved design plans form the basis of the calculation of the Civil Assessment Fee.) Road works shall be completed to the satisfaction of Richmond Valley Council **prior to the commencement of operations of the quarry under this consent.**

1. Boggy Creek Road is to be constructed to a 6 metre two coat bitumen seal with 1 metre gravel shoulders from the quarry entrance road to Reardons Lane (i.e. between the sections of AC/open graded hotmix).
2. The Boggy Creek Road / quarry entrance road intersection is to be widened to accommodate entering and departing heavy vehicles (typically in accordance with Figure 13 of the Report) and shall be to the Austroads Guide to Road Design Part 4A Figure 8.2 Rural basic left turn treatment (BAL) standard as a minimum.
3. The Reardons Lane / Boggy Creek Road intersection shall be designed and constructed (typically in accordance with Figure 18 of the Report) to the Austroads Guide to Road Design Part 4A Figure 7.5 Rural Basic Right turn (BAR) standard. Additional widening on the left turn out of Boggy Creek Road will require construction in accordance with Austroads Guide to Road Design Part 4A Figure 8.2 Rural Basic Left turn treatment (BAL) standard.
4. The Boggy Creek Road / quarry entrance road intersection shall be sealed with AC/hotmix for heavy vehicle tyre drag control.
5. The Boggy Creek Road / quarry entrance road intersection shall have a median island painted in the quarry entrance road to delineate the entry and departing lanes.
6. Boggy Creek Road shall be sealed with AC/open graded hotmix for a length of 350 metres west from the centreline of Reardons Lane.
7. Subject to the approval by Richmond Valley Council of a submitted formal design, double barrier line marking BB shall be installed on Boggy Creek Road from the quarry entrance road to 100 metres east of the western boundary of Lot 4 DP 703004 (i.e. from the quarry entrance over the crest and through the S bends).
8. Subject to the approval by Richmond Valley Council of a submitted formal design, double barrier line marking shall be installed on Boggy Creek Road from the western boundary of Lot 2 DP 703004 to Reardons Lane (i.e. along the frontages of the 2 residences on Boggy Creek Road).

9. Subject to the approval by Richmond Valley Council of a submitted formal design, a dividing (separation) line S1 shall be line marked on Boggy Creek Road between the double barrier lines (i.e. from the S bends to the residences near Reardons Lane).
10. The Reardons Lane / Boggy Creek Road intersection shall be sealed with AC/hotmix for heavy vehicle tyre drag control.
11. Subject to the approval by Richmond Valley Council of a submitted formal design, advisory speed signs (ending in a "5") shall be placed on the Boggy Creek Road S bends.
12. Subject to the approval by Richmond Valley Council of a submitted formal design, hinged truck warning signs shall be placed at the Boggy Creek Road / quarry entrance road, and the Reardons Lane / Boggy Creek Road intersections. Such signs shall be displayed during haulage operations, and closed when no haulage is being undertaken.
13. Boggy Creek road culverts shall be extended to provide the full 8 metre wide pavement construction (6m seal plus 1m shoulders). Such extensions shall be completed prior to the construction of the road works over the culverts. (Roads and Maritime Services advises that the use of R9-233 "Narrow Lanes" is not appropriate.)
14. Subject to the approval by Richmond Valley Council of a submitted formal design, double barrier line marking BB shall be installed on Reardons Lane from Boggy Creek Road to Casuarina Drive - including the northern part of the Casuarina Drive intersection.
15. Subject to formal design approval by Richmond Valley Council, double barrier line marking BB shall be installed on Reardons Lane at the Woodburn Coraki Road intersection.
16. Subject to the approval by Richmond Valley Council of a submitted formal design, a dividing (separation) line S1 shall be line marked in Reardons Lane from the double barrier lines at the Casuarina Drive intersection to the double barrier lines at the Woodburn Coraki Road intersection.
17. Subject to the approval by Richmond Valley Council of a submitted formal design, a westbound deceleration lane shall be constructed on Woodburn Coraki Road for heavy vehicle turns into Reardons Lane.

Reason: *To ensure an adequate road network in accordance with adopted standards.*

31. Upon completion of works to be vested in Council, **Work as Executed** drawings and plans in digital format shall be submitted to and approved by Richmond Valley Council **prior to the commencement of operations of the quarry under this consent.**

Reason: *To provide adequate records of services for the development.*

32. Inspection and Testing Plans covering all the necessary inspections and testing of the civil engineering works which will become Council's assets shall be submitted to and approved by Richmond Valley Council. The Inspection and Testing Plans shall be in accordance with the Northern Rivers Local Government Development and Design Manual and the Northern Rivers Local Government Construction Manual. Council approval of the Inspection and Testing Plan is required **prior to the commencement of any works that will become Council's assets.**

Reason: *To ensure engineering works are constructed to council standards.*

ENVIRONMENTAL HEALTH

33. The speed limit of quarry trucks hauling material from and returning to Moonimba quarry must be limited to that recommended in Section 9.2 of the report titled "Noise Impact Assessment Extension of Moonimba Quarry Bungawalbin" Report No. 06193_NIA_Rev D, published by Greg Alderson and Associates dated 12 February 2015.

Reason: To protect the amenity of sensitive land uses near trucking routes

34. An acoustic wall must be constructed along the northern boundary of Lot 1 DP703004 to Boggy Creek road to ensure road traffic noise is mitigated to an acceptable level. Design details and specifications of the wall must be submitted to and approved by Richmond Valley Council **prior to release of Construction Certificate**. The wall must be constructed in accordance with Councils approval prior to commencement of operation of the quarry. The design of the wall submitted to Council must include details of materials proposed to be used in its construction and the method / specifications of construction as well as ongoing management and maintenance of the wall to ensure it effectively mitigates noise. Road safety issues such as the clear zone must also be detailed.

Reason: To ensure noise from quarry trucks is mitigated to acceptable levels and that the design meets Council requirements.

INTEGRATED DEVELOPMENT GENERAL TERMS OF APPROVAL

General terms of approval for NSW Environment Protection Authority under Protection of the Environment Operations Act 1997

Administrative conditions

Note: Mandatory conditions for all general terms of approval

A1. Information supplied to the EPA

A1.1 Except as expressly provided by these general terms of approval, works and activities must be carried out in accordance with the proposal contained in:

Development Application No.2015.069 submitted to Council on 30 September 2014 and attachments;

The environmental impact statement, Moonimba Quarry Expansion Bungawalbin NSW by John Thomas Newman.

A2. Fit and Proper Person

A2.1 The applicant must, in the opinion of the EPA, be a fit and proper person to hold a licence under the Protection of the Environment Operations Act 1997, having regard to the matters in s.83 of that Act.

Discharges to Air and Water and Applications to Land

P1. Location of monitoring/discharge points and areas

P1.1 The following utilisation areas referred to in the table below are identified in the EPA's general terms of approval, or a licence under the Protection of the Environment Operations Act 1997, for the purposes of the monitoring and/or setting of limits for any application of solids or liquids to the utilisation area.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
Sediment Basin Discharge	Water	Water	Overflow point of stormwater from quarry floor.

Limit conditions

L1. Pollution of waters

Note: Mandatory condition

L.1.1 Except as may be expressly provided by a licence under the Protection of the Environment Operations Act 1997 in relation of the development, section 120 of the Protection of the Environment Operations Act 1997 must be complied with in and in connection with the carrying out of the development.

L2. Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table/s (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 Where a pH quality limit is specified in the Table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table/s.

L2.4 Water and/or Land Concentration Limits

DISCHARGE POINT 1 (Sediment Basin Discharge)

Pollutant	Units of measure	100 % concentration
Total Suspended Solids	mg/L	50.
pH	pH units	6.5 - 8.5
Oil and grease	mg/L	Nil

L2.5 The concentration limits in the above table do not apply to any discharge from the sediment basin (at Point 1) solely arising from rainfall measured at the premises exceeding 45.2 mm in total falling over any consecutive five day period.

L2.6 If the applicant uses turbidity (NTU) in place of total suspended solids (TSS) to determine compliance with the EPA's general terms of approval, or a licence issued under the Protection of the Environment Operations Act 1997, the applicant must develop a statistical correlation which identifies the relationship between NTU and TSS for water quality in the sediment basin/s in order to determine the NTU equivalent of 50 mg/L TSS prior to its use.

L2.7 If the applicant uses turbidity (NTU) in place of total suspended solids (TSS) to determine compliance with the EPA's general terms of approval, or a licence issued under the Protection of the Environment Operations Act 1997, the applicant must provide the EPA with a copy of the statistical correlation assessment methodology and results before using NTU in place of TSS.

L2.8 If the applicant uses turbidity (NTU) in place of total suspended solids (TSS) to determine compliance with the EPA's general terms of approval, or a licence issued under the Protection of the Environment Operations Act 1997, the applicant must develop and implement a method to enable the ongoing verification of the relationship between NTU and TSS.

L2.9 If the applicant uses turbidity (NTU) in place of total suspended solids (TSS) to determine compliance with the EPA's general terms of approval, or a licence issued under the Protection of the Environment Operations Act 1997, the applicant must provide the EPA with any amendments the applicant makes to the statistical correlation as a result of the ongoing verification required by Condition L2.8 before using the revised statistical correlation.

L3. Waste

L3.1 The applicant must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997.

L3.2 This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if it requires an environment protection licence under the Protection of the Environment Operations Act 1997.

L4. Noise limits

L4.1 Noise from the premises must not exceed an LAeq (15 minute) noise emission criterion of 35 dB(A) for receivers 1, 4, 5 and 13 as identified in Noise Impact Assessment by Greg Alderson & Associate (Report No. 06193_NIA_Rev B), except as expressly provided by these general terms of approval.

L4.2 Noise from the premises is to be measured at residential receivers 1, 4, 5, 13 as identified in the Noise Impact Assessment by Greg Alderson & Associate (Report No. 06193_NIA_Rev B). This condition does not apply if written permission from the property owners for an exceedance of condition L4.1 has been provided to the EPA.

L4.3 The noise limits set out in condition L4.1 apply under all meteorological conditions except for the following:

- Wind Speeds greater than 3 metres/second at 10 metres above ground level; or
- Temperature inversion conditions up to 3° C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- Temperature inversion conditions greater than 3°C/100m.

L5. Blasting

L5.1 Blasting operations at the premises may only take place between 09:00 to 15:00 Monday to Friday. (Where compelling safety reasons exist, the Authority may permit a blast to occur outside the above mentioned hours. Prior written (or facsimile) notification of any such blast must be made to the Authority).

L5.2 The airblast overpressure level from blasting operations in or on the premises must not exceed:

- a) 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period; and
- b) 120 dB (Lin Peak) at any time,

at any point within 1 metre of any affected residential boundary or other noise sensitive location unless the location is owned by the licensee or is subject to a private written agreement between the owner of the residence or noise sensitive location as to an alternative overpressure level.

L5.3 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed:

- a) 5mm/s for more than 5% of the total number of blasts carried out on the premises during each reporting period; and
- b) 10 mm/s at any time,

at any point within 1 metre of any affected residential boundary or other noise sensitive location unless the location is owned by the licensee or is subject to a private written agreement between the owner of the residence or noise sensitive location as to an alternative ground peak velocity level.

L5.4 All sensitive receivers are to be given at least 24 hours notice when blasting is to be undertaken.

L6. Hours of operation

L6.1 Activities covered by the EPA's general terms of approval, or a licence under the Protection of the Environment Operations Act 1997, must only be carried out between the hours of 7:00 am and 6:00 pm Monday to Friday, and 8:00 am and 12:00 pm Saturday, and at no time on Sundays and Public Holidays.

L6.2 This condition does not apply to the delivery of material outside the hours of operation permitted by condition L6.1 if that delivery is required by police or other authorities for safety reasons; and/or the operation or personnel or equipment are endangered. In such circumstances, prior notification must be provided to the EPA and affected residents as soon as possible, or within a reasonable period in the case of emergency.

Operating conditions

O1. Dust

O1.1 Activities occurring in or on the premises must be carried out in a manner that will minimise the generation, or emission from the premises, of wind-blown or traffic generated dust.

O2. Processes and management

O2.1 Sediment basins shall be treated, if required, to reduce the Total Suspended Solids level to the concentration limit of 50 mg/L provided by the EPA's general terms of approval, or a licence under the Protection of the Environment Operations Act 1997, before being released to the environment. Treatment can be with gypsum or any other material that has been approved by the EPA.

O2.2 The applicant must maximise the diversion of run-on waters from lands upslope and around the site whilst land disturbance activities are being undertaken.

O2.3 The applicant must maximise the diversion of stormwater runoff containing suspended solids to sediment basins installed on the premises.

O2.4 Where sediment basins are necessary, all sediment basins and associated drainage must be installed and commissioned prior to the commencement of any clearing or grubbing works within the catchment area of the sediment basin that may cause sediment to leave the site.

O2.5 The applicant must ensure the design storage capacity of the sediment basins installed on the premises is reinstated within 5 days of the cessation of a rainfall event that causes runoff to occur on or from the premises.

O2.6 The applicant must ensure that sampling point(s) for water discharged from the sediment basin(s) are provided and maintained in an appropriate condition to permit:

- a) the clear identification of each sediment basin and discharge point;
- b) the collection of representative samples of the water discharged from the sediment basin(s);
and
- c) access to sampling point(s) at all times by an authorised officer of the EPA.

O2.7 The applicant must endeavour to maximise the reuse of captured stormwater on the premises.

O2.8 Each sedimentation basin must have a marker (the "sediment basin marker") that identifies the upper level of the sediment storage zone.

O2.9 Whenever the level of liquid and other material in any sedimentation basin exceeds the level indicated by the sedimentation basin marker, the licensee must take all practical measures as soon as possible to reduce the level of liquid and other material in the sedimentation basin.

O2.10 The sediment basins must meet the design and operational standards of *Managing Urban Stormwater Soils and Construction: Volume 1 and Volume 2 E. Mines and quarries*. This document requires that at a minimum 85 percentile five-day rainfall event be used to determine basin sizing for quarries.

O2.11 All liquid chemicals, fuels and oils must be stored in tanks or containers inside suitable bund(s). Bund(s) are to be designed, constructed and maintained in accordance with AS1940-2004 Storage and Handling of Flammable and Combustible Liquids.

Monitoring and recording conditions

M1. Monitoring records

M1.1 The results of any monitoring required to be conducted by the EPA's general terms of approval, or a licence under the Protection of the Environment Operations Act 1997, in relation to the development or in order to comply with the load calculation protocol must be recorded and retained as set out in conditions M1.2 and M1.3.

M1.2 All records required to be kept by the EPA's general terms of approval, or a licence under the Protection of the Environment Operations Act 1997, must be:

- a) in a legible form, or in a form that can readily be reduced to a legible form;
- b) kept for at least 4 years after the monitoring or event to which they relate took place; and
- c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected:

- a) the date(s) on which the sample was taken;
- b) the time(s) at which the sample was collected;
- c) the point at which the sample was taken; and
- d) the name of the person who collected the sample.

M2. Requirement to monitor concentration of pollutants discharged

M2.1 .The applicant must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The applicant must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

POINT 1 Water and Land

Discharge point 1

Pollutant	Units of measure	Frequency
Total Suspended Solids	mg/L	Special Frequency 1.
pH	pH units	Special Frequency 1
Oil and grease	mg/L	Special Frequency 1

< *Special Frequency 1* > means sampling any discharge, whether controlled or otherwise, which has not occurred from rainfall exceeding 45.2 mm over any consecutive five day period.

M3. Testing methods - concentration limits.

M3.1 Subject to any express provision to the contrary of the EPA's general terms of approval, or a licence under the Protection of the Environment Operations Act 1997, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4. Environmental monitoring

M4.1 The applicant is required to install and maintain a rainfall depth measuring device.

M4.2 Rainfall at the premises must be measured and recorded in millimetres per 24 hour period, at the same time each day.

Note: The rainfall monitoring data collected in compliance with Condition M4.2 can be used to determine compliance with L2.4.

M6. Other monitoring and recording condition

M6.1 For the purposes of monitoring for compliance with the noise limit conditions of the EPA's general terms of approval, or a licence under the Protection of the Environment Operations Act 1997, (condition L4) noise emitted from the premises must be measured or computed at 30 metres from the nearest residential dwelling/s over a period of 15 minutes using the "FAST" response on the sound level meter. A modifying factor correction must be applied for tonal, impulsive, or intermittent noise in accordance with the document NSW Industrial Noise Policy (NSW EPA, January 2000).

M7. Blast Monitoring

M7.1 The time of blasting, the air-blast overpressure level from blasting operations and the ground vibration peak particle velocity from blasting operations must be measured at the nearest sensitive receiver for each blast.

Reporting conditions

Note: Mandatory condition to be used on all general terms of approvals

R1.1 The applicant must provide an annual return to the EPA in relation to the development as required by any licence under the Protection of the Environment Operations Act 1997 in relation to the development. In the return the applicant must report on the annual monitoring undertaken (where the activity results in pollutant discharges), provide a summary of complaints relating to the development, report on compliance with licence conditions and provide a calculation of licence fees (administrative fees and, where relevant, load based fees) that are payable. If load based fees apply to the activity the applicant will be required to submit load-based fee calculation worksheets with the return.

Attachment B – Mandatory Conditions for all EPA licences

Administrative conditions

Other activities

(To be used on licences with ancillary activities)

This licence applies to all other activities carried on at the premises, including:

Extractive
Activities;
and
Crushing

Operating conditions

Activities must be carried out in a competent manner

Licensed activities must be carried out in a competent manner.

This includes:

- a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
- b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

Maintenance of plant and equipment

All plant and equipment installed at the premises or used in connection with the licensed activity:

- a) must be maintained in a proper and efficient condition; and
- b) must be operated in a proper and efficient manner.

Monitoring and recording conditions

Recording of pollution complaints

The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

The record must include details of
the following: the date and time of
the complaint;

the method by which the complaint was made;

any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;

the nature of the complaint;

the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and

if no action was taken by the licensee, the reasons why no action was taken.

The record of a complaint must be kept for at least 4 years after the complaint was made. The record must be produced to any authorised officer of the EPA who asks to see them.

Telephone complaints line

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

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

This condition does not apply until 3 months after this condition takes effect.

Reporting conditions

Annual Return documents

What documents must an Annual Return contain?

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

- c) a Statement of Compliance; and
- d) a Monitoring and Complaints Summary.

A copy of the form in which the Annual Return must be supplied to the EPA accompanies this licence. Before the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

Period covered by Annual Return

An Annual Return must be prepared in respect of each reporting, except as provided below Where this licence is transferred from the licensee to a new licensee,

- a) the transferring licensee must prepare an annual return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
- b) the new licensee must prepare an annual return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

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

Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an annual return in respect of the period commencing on the first day of the reporting period and ending on:

- a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
- b) in relation to the revocation of the licence – the date from which notice revoking the licence operates.

Deadline for Annual Return

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

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

Licensee must retain copy of Annual Return

The licensee must retain a copy of the annual return supplied to the EPA for a period of at least 4 years after the annual return was due to be supplied to the EPA.

Certifying of Statement of Compliance and Signing of Monitoring and Complaints Summary

Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:

- (a) the licence holder; or
- (b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

A person who has been given written approval to certify a Statement of Compliance under a licence issued under the Pollution Control Act 1970 is taken to be approved for the purpose of this condition until the date of first review this licence.

Notification of environmental harm

Note: The licensee or its employees must notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act

Notifications must be made by telephoning the EPA's Pollution Line service on 131 555. The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Written report

Where an authorised officer of the EPA suspects on reasonable grounds that:

- (a) where this licence applies to premises, an event has occurred at the premises; or
- (b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence, and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

The request may require a report which includes any or all of the following information:

- a) the cause, time and duration of the event;
- b) the type, volume and concentration of every pollutant discharged as a result of the event;
- c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event; and

- d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
- e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
- f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event;
- g) any other relevant matters.

The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

General conditions

Copy of licence kept at the premises or on the vehicle or mobile plant

A copy of this licence must be kept at the premises or on the vehicle or mobile plant to which the licence applies.

The licence must be produced to any authorised officer of the EPA who asks to see it.

The licence must be available for inspection by any employee or agent of the licensee working at the premises or operating the vehicle or mobile plant.

INTEGRATED DEVELOPMENT GENERAL TERMS OF APPROVAL

**General terms of approval for Department of Primary Industries Office of Water
under s91 of the Water Management Act 2000**

Number	Condition
Plans, standards and guidelines	
1	<p>These General Terms of Approval (GTA) only apply to the controlled activities described in the plans and associated documentation relating to DA2015.069 and provided by Council.</p> <p>Any amendments or modifications to the proposed controlled activities may render these GTA invalid. If the proposed controlled activities are amended or modified the NSW Office of Water must be notified to determine if any variations to these GTA will be required.</p>
2	<p>Prior to the commencement of any controlled activity (works) on waterfront land, the consent holder must obtain a Controlled Activity Approval (CAA) under the Water Management Act from the NSW Office of Water. Waterfront land for the purposes of this DA is land and material in or within 40 metres of the top of the bank or shore of the river identified.</p>
3	<p>The consent holder must prepare or commission the preparation of:</p> <p>(i) Vegetation Management Plan</p>

Number	Condition
	(ii) Works Schedule (iii) Soil and Water Management Plan
4	All plans must be prepared by a suitably qualified person and submitted to the NSW Office of Water for approval prior to any controlled activity commencing. The plans must be prepared in accordance with the NSW Office of Water's guidelines located at www.water.nsw.gov.au/Water-Licensing/Approvals/default.aspx (i) Vegetation Management Plans (ii) Riparian Corridors (iii) Outlet structures
5	The consent holder must (i) carry out any controlled activity in accordance with approved plans and (ii) construct and/or implement any controlled activity by or under the direct supervision of a suitably qualified professional and (iii) when required, provide a certificate of completion to the NSW Office of Water.
Rehabilitation and maintenance	
6	The consent holder must carry out a maintenance period of two (2) years after practical completion of all controlled activities, rehabilitation and vegetation management in accordance with a plan approved by the NSW Office of Water.
7	The consent holder must reinstate waterfront land affected by the carrying out of any controlled activity in accordance with a plan or design approved by the NSW Office of Water.
Reporting requirements	
8	The consent holder must use a suitably qualified person to monitor the progress, completion, performance of works, rehabilitation and maintenance and report to the NSW Office of Water as required.
Security deposits	
9	N/A
Access-ways	
10	N/A
11	N/A
Bridge, causeway, culverts, and crossing	
12	N/A
13	N/A
Disposal	
14	The consent holder must ensure that no materials or cleared vegetation that may (i) obstruct flow, (ii) wash into the water body, or (iii) cause damage to river banks; are left on waterfront land other than in accordance with a plan approved by the NSW Office of Water.
Drainage and Stormwater	
15	The consent holder is to ensure that all drainage works (i) capture and convey runoffs, discharges and flood flows to low flow water level in accordance with a plan

Number	Condition
	approved by the NSW Office of Water; and (ii) do not obstruct the flow of water other than in accordance with a plan approved by the NSW Office of Water.
16	The consent holder must stabilise drain discharge points to prevent erosion in accordance with a plan approved by the NSW Office of Water.
Erosion control	
17	The consent holder must establish all erosion and sediment control works and water diversion structures in accordance with a plan approved by the NSW Office of Water. These works and structures must be inspected and maintained throughout the working period and must not be removed until the site has been fully stabilised.
Excavation	
18	The consent holder must ensure that no excavation is undertaken on waterfront land other than in accordance with a plan approved by the NSW Office of Water.
19	N/A
Maintaining river	
20	The consent holder must ensure that (i) river diversion, realignment or alteration does not result from any controlled activity work and (ii) bank control or protection works maintain the existing river hydraulic and geomorphic functions, and (iii) bed control structures do not result in river degradation other than in accordance with a plan approved by the NSW Office of Water.
21	N/A
River bed and bank protection	
22	N/A
23	The consent holder must establish a riparian corridor along unnamed watercourse in accordance with a plan approved by the NSW Office of Water.
Plans, standards and guidelines	
24	N/A
25	N/A
26	N/A
27	N/A
END OF CONDITIONS	

**General terms of approval for Department of Primary Industries Office of Water
under Part 3 of the Water Management Act 2000**

Conditions

Standard

1. The general terms of approval (GTA) relate to the above development within the proposed development site.
2. The GTA do not constitute an approval under the *Water Management Act 2000 (WMA)*.
3. If the consent authority determines to grant consent, the GTA are to form part of the development consent.
4. Any amendments to the development application may void these GTA.
5. The approval holder must submit, to the NSW Office of Water (NOW) a completed application form for a water supply work approval under the *WMA* prior to the commencement of any development / works.
6. The approval application is required to accord with the GTA.

Works

7. The approval holder must not take water using any work specified on this approval unless in compliance with the conditions of the access licence under which water is being taken.
8. The approval holder must install, maintain and operate any device(s) for measuring the volume of water extracted by the approved works in accordance with any manufacturer's specifications or, where given, in accordance with any written direction from NOW.
9. The approval holder must provide a certificate issued by the manufacturer or other such competent, qualified person certifying the accuracy of device or devices used for measuring the volume of water extracted by the approved works, in accordance with any written direction from NOW.
10. The approval holder must within two (2) months of completing construction of any work permitted by this approval and in a form approved by NOW, provide the department with the following:
 - the location of the authorised work on the lot and deposited plan preferably using GPS references, and
 - details of the work (including the size, dimensions and capacity of the work).
11. The approval holder must provide NOW with a report detailing the quantity of water taken through the approved work and recorded by the approved measuring device.
12. The approval holder must inform NOW within seven (7) days if the device(s) used for measuring the volume of water taken from the approved work ceases to record water usage accurately. In such cases, the approval holder must notify the department of:
 - the duration of the failure of the measuring device, and;
 - the total hours that the work was operated while the measuring device was not functioning.
13. The approval holder must not take water using works on this approval under a:
 - domestic and stock access licence;

Conditions

- local water utility access licence, or;
 - major utility access licence,
- unless it is in accordance with a water supply order approved by State Water not less than 2 days prior to when the water is to be taken.

INFORMATION TO APPLICANTS

ADVISORY NOTES

NOTE 1: Prior to commencing any construction works, the following provisions of the Environmental Planning and Assessment Act, 1979 are to be complied with:

- (i) A Construction Certificate is to be obtained from the Consent Authority or an Accredited Certifier in accordance with Section 81A(2)(a) of the Act.
- (ii) A Principal Certifying Authority is to be appointed and Council is to be notified of the appointment in accordance With Section 81A(2)(b) of the Act.
- (iii) Council is to be given at least two (2) days notice of the persons intention to commence building works, in accordance with Section 81A(2)(c) of the Act.

NOTE 2: The applicant may apply to the Council or an Accredited Certifier for the issuing of a Construction Certificate and to be the Principal Certifying Authority to monitor compliance with the approval and issue of any relevant documentary evidence or certificates.

NOTE 3: In accordance with Clause 98(1) of the Environmental Planning and Assessment Regulation, it is a condition of Development Consent for development that involves any building work, that the work must be carried out in accordance with the requirements of the Building Code of Australia.

NOTE 4: If the provision of services or the construction of any infrastructure or any other thing required by this consent occurs, and a GST is payable by Council, the applicant will pay to the Council the GST (as defined below) which is payable by the Council in respect of this consent.

NB: GST means any tax levy charge or impost under the authority of any GST law (as defined by the GST Act) and includes GST within the meaning of the GST Act.

The GST Act means a New Tax System (Goods and Services Tax) Act 1999 or any amending or succeeding legislation.

NOTE 5: This development approval does not guarantee compliance with the Disability Discrimination Act and the developer should therefore investigate their liability under the Act. Council can assist developers by directing them to Parts 2, 3 and 4 of the Australian Standard 1428 – Design for Access and Mobility (Part 1 is mandatory in the BCA).

NOTE 6: The granting of the development consent does not negate the owner/applicant's obligations under Part 6 of the *National Parks and Wildlife Act 1974*, where it is declared an offence to harm, or desecrate, an Aboriginal object or declared Aboriginal Place. The Office of Environment and Heritage's *Due Diligence Code of Practice* should be used to determine

whether harm is likely, and whether consent in the form of an Aboriginal Heritage Impact Permit (AHIP) is required.

NOTE 7: Underground assets may exist in the area that is subject to your application. In the interests of health and safety and in order to protect damage to third party assets please contact Dial before you dig at www.1100.com.au or telephone on 1100 before excavating or erecting structures (This is the law in NSW). If alterations are required to the configuration, size, form or design of the development upon contacting the Dial before You Dig service, an amendment to the development consent (or a new development application) may be necessary. Individuals owe asset owners a duty of care that must be observed when working in the vicinity of plant or assets. It is the individual's responsibility to anticipate and request the nominal location of plant or assets on the relevant property via contacting the Dial before you dig service in advance of any construction or planning activities.

NOTE 8: Telstra (and its authorised contractors) are the only companies that are permitted to conduct works on Telstra's network and assets. Any person interfering with a facility or installation owned by Telstra is committing an offence under the Criminal Code Act 1995 (Cth) and is liable for prosecution.

Furthermore, damage to Telstra's infrastructure may result in interruption to the provision of essential services and significant costs. If you are aware of any works or proposed works which may affect or impact on Telstra's assets in any way, you are required to contact : Telstra's Network Integrity Team on Phone Number 1800 810 443.

PRESCRIBED CONDITIONS OF DEVELOPMENT CONSENT

Under the provisions of Clause 98 of the Environmental Planning and Assessment Regulation for the purposes of Section 80A(11) of the Environmental Planning and Assessment Act the following conditions are Prescribed Conditions:

1. All building work must be carried out in accordance with the provisions of the Building Code of Australia.

Reason: *Required by Clause 98 of the Regulation.*

2. Any Development that requires building work, subdivision work or demolition work a sign must be erected on the development site in a prominent position before the commencement of any work showing:

- a) Name, address and telephone number of the Principal certifying Authority for the work.
- b) Name of the Principal Contractor (if any) for any building work and a telephone number on which that person may be contacted outside working hours.
- c) Stating that unauthorised entry to the work site is prohibited.

NOTE: The sign must be of rigid and durable material and maintained on the site until work has been completed. The sign must be easily read by anyone in any public road or public place adjacent to the site.

Reason: *To ensure compliance with Section 80A(11) of the Environmental Planning and Assessment Act, 1979 and Clauses 98A and 227A of the Accompanying Regulation.*

3. If the development involves an excavation that extends below the level of the base of the footings of a building, structure or work (including any structure or work within a road or rail corridor) on adjoining land, the person having the benefit of the development consent must, at the person's own expense:

- (a) protect and support the building, structure or work from possible damage from the excavation, and
- (b) where necessary, underpin the building, structure or work to prevent any such damage.

The above requirements do not apply if the person having the benefit of the development consent owns the adjoining land or the owner of the adjoining land has given consent in writing to that condition not applying.

Reason: *To ensure compliance with Section 80A(11) of the Environmental Planning and Assessment Act, 1979 and Clauses 98E of the Accompanying Regulation.*

DATE FROM WHICH CONSENT OPERATES

Section 83 of the Environmental Planning and Assessment Act provides that the consent shall become effective and operate from the date endorsed upon the notice, **except** in the case of designated development to which objections have been lodged, when the consent shall become effective 28 days after the consent is issued.

Where an appeal is lodged, either by the applicant or an objector in respect of designated development, the consent shall remain in deferment and not become effective until the appeal has been determined. The consent shall be void if, on appeal, the development is refused.

COMPLIANCE

The development shall be carried out in accordance with the application, and "approved plans" as may be attached to this consent, and as amended by the foregoing conditions. **All conditions** shall be complied with prior to occupation of the development and, where appropriate, during the operating life of the development.

REVIEW OF DETERMINATION

Under the provisions of Section 82A of the Environmental Planning and Assessment Act 1979, an applicant may request the Council to review a determination of the application. The request for a review must be made within six (6) months after the date of the determination.

RIGHT OF APPEAL

If you are dissatisfied with this decision, Section 97 of the Environmental Planning and Assessment Act 1979 gives you the right of appeal to the Land and Environment Court within six (6) months after the date on which you receive this notice.

Where an appeal is made in the case of a designated development, each person who objected is required to be given notice of the appeal, and will have the right to be heard at that hearing.

Except in the case of designated development, there is no provision within the Act for a third party (objector) to appeal against the consent issued by the Council.

LAPSING OF CONSENT

Section 95 of the Environmental Planning and Assessment Act provides that a development consent lapses five years after the date from which it operates. Therefore, this consent lapses five years from the date of operation of this consent UNLESS:

- building, engineering, or construction work relating to this development is commenced on the land within the period of operation of the consent, or

- if no such works are required, the use of the premises commences within the period of operation of the consent.

MODIFICATION OF CONSENTS

Under the provisions of Section 96 of the Environmental Planning and Assessment Act an applicant may apply to Council for modification of the consent.

NOTICE TO COMPLETE

Where development has been commenced, but the work not completed, Section 121B provides that the Council may issue an order requiring completion of the work within a specified time, being not less than twelve months.

For and on behalf of Richmond Valley Council.



Paul Radnidge
Manager Assessment, Environment and Regulation

per: Cherie Smith

Encl.

Cc: Mrs K A Newman, Mr N J Newman
PO Box 22
WOODBURN NSW 2472

**APPENDIX B DETERMINATION OF
DEVELOPMENT APPLICATION 127/95**

RICHMOND RIVER SHIRE COUNCIL

TELEPHONE (066) 622066 - FAX (066) 621342

All communication to be
addressed to

THE GENERAL MANAGER
P.O. BOX 378
CASINO NSW 2470

SHIRE OFFICE
68 WALKER STREET
CASINO NSW 2470

Council Ref: 127/95
(V.01684)

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

(Form 3)

NOTICE TO APPLICANT OF DETERMINATION OF A DEVELOPMENT APPLICATION

TO: Hosie Haggerty & Associates
149 Barker Street
CASINO NSW 2470

being the applicant in respect of development application No. 127/95 on behalf of F.J. Robinson.

Pursuant to section 92 of the Act notice is hereby given of the determination by the Council of the development application No. 127/95 for the proposal to operate a gravel, sand and sandstone extractive industry at Lot 193, DP 755603, Bungawalbin-Whiporie Road, Bungawalbin, Parish of Bungawalbin.

The development application has been determined by granting of consent subject to the following conditions:-

CONDITIONS

DEVELOPMENT OF THE QUARRY

1. All works carried out, and the use of land, subject to any amendment or modification called for in the following conditions be generally in accordance with the details contained in the work site layout plans numbered figure 1 and figure 4 and the management plans numbered figure 13 and figure 15 and supporting documents (Statement of Environmental Effects, supporting and additional information) submitted with the application.
2. This consent is only in respect of the location of the two (2) proposed quarry sites as depicted on the attached plans.
3. All topsoil shall be progressively stripped from areas to be excavated and stockpiled separately. Stockpiles are to be located away from the general operation of the quarry and be preserved for the future rehabilitation of the quarry. Topsoil that is stripped is to be stockpiled in a suitable location that has been designed with appropriate sedimentation management practices. As soon as possible after stripping and stockpiling the stockpiles are to be sown with suitable grass to stabilise them. This topsoil is to be used to rehabilitate exhausted/worked out areas immediately upon extraction ceasing, in accordance with the plan of management as contained within the report submitted with the application.
4. All hazardous materials are to be appropriately stored so as to prevent environmental damage in case of spillage or contaminated lands. Oils and lubricants shall be stored in a impermeable bunded and roofed area with holding capacity of 110% of the capacity of the largest container.
5. No material for quarry infilling shall be imported to the site without the prior consent of Council.

6. Operational plant (dozers, front end loaders and excavators), that may be utilised on the site shall comply with and meet relevant criteria and standards as specified by the Environment Protection Authority. Where relevant, the operator must be able to provide any necessary licenses or approvals from the EPA for inspection by Council regulatory Officers. All necessary EPA approvals must be obtained before the operating plant or machinery.
7. No topsoil shall be sold or otherwise removed from the site without prior consent of Council.

AMENITY AND NOISE CONTROL

8. The use shall not interfere with the amenity of the locality by reason of the emission of noise, vibration, smell, fumes, smoke, vapour, steam, soot, ash, dust, waste water, waste products or grit, oil or otherwise.
9. The development shall meet noise emission criteria, vibration levels and standards relating to airborne pollutants and discharge of solid wastes to natural water courses as specified by the Environmental Protection Authority.
10. The activities required by the operation of the quarry should not create, generate or emit offensive noise so as to be heard at the nearest affected residence.

Offensive noise means noise that by reason of its level, nature, character or quality or the time at which it is made or any other circumstances is likely:

- a) to be harmful to,
 - b) to be offensive to, or
 - c) to interfere unreasonably with the comfort or repose of a person.
11. The hours of operation for the proposed quarry shall be limited to between 7.00am and 6.00pm Mondays to Fridays and 8.00am to 12 noon Saturdays, with no work on Sundays or Public holidays. Operation outside of these hours only with the prior written approval of the Divisional Manager of Environmental Development Services.

ROADS AND TRANSPORT

12. All loading and unloading to take place within the curtilage of the quarry site.
13. Vehicles using off-street loading/unloading and parking area must enter and leave the site in a forward direction. All driveways and turning areas shall be kept clear of all obstructions that would prevent compliance with this condition.

MONITORING AND OTHER APPROVALS

14. If the area of the resource, including the roads and stock piles will be greater than two (2) hectares then the premises may be scheduled under the Noise Control Act, 1975 and an approval from the Environment Protection Authority may be required.
15. All necessary Pollution Control Licenses are to be obtained from the Environment Protection Authority for the operation of the quarry and discharge of polluted wastewater from the site. Written evidence that these licenses have been obtained is to be submitted to Council prior to operation within the new extraction area.
16. All discharges from the sedimentation ponds/basins shall meet the requirements of the Clean Waters Act and relevant criteria of the Environment Protection Authority. Design details together with discharge water quality shall be submitted for Council's assessment and are to be in accordance with any available EPA or Department of Housing Guidelines for storm - water control. Final design details to engineering standard must be provided to Council for its approval 2 months from the date of endorsement of this consent.

7. Any discharges from the site should contain less than 50mg/L of non-filterable residue (NFR), no visible oil or grease, less than 10mg/L oil and grease and a pH in the range 6.5 to 8.5. Compliance with the NFR standard may require the use of a coagulant injection system.

WATER & SOILS

18. Any sediment control basin/pond is to be designed and maintained to at least the standards in accordance with the Department of Housing's guidelines (1993) "Soil and Water Management for Urban Development" or relevant Environmental Protection Authority Design Guidelines for stormwater management.
19. Sediment control measures shall be put into place within six (6) months of the date of endorsement of this consent and be properly maintained to prevent soil erosion and the transport of sediment off the development site or into natural or made drainage lines or watercourses during rainfall and runoff. All topsoil, subsoil stockpiles, and landscaping mounds shall be stabilised and be revegetated by turfing or an approved seeding method within 14 days of completion of earthworks in each part of the development. It is a requirement that the topsoil be preserved for use with the site rehabilitation.
20. Capacity and surface area shall be based on total area of water entering these proposed structures, including run-off from undisturbed clean areas which cannot be diverted.

Further Conditions:

21. A fauna and flora impact statement be conducted and submitted to Council prior to the lateral expansion of either of the quarry sites.
22. A tree planting program be implemented immediately to the south west of Quarry Site B. This program is to include native species of a density and height sufficient to reduce the visual impact of the quarry from the middle distance.
23. The following works are to be undertaken within twelve months of the date of this consent to the satisfaction of Council's Divisional Manager - Engineering Services, at no cost to Council. These works are also to be maintained to the satisfaction of Council's Divisional Manager - Engineering Services for a period of twelve (12) months from the date of approval of the completed works, at no cost to Council
 - a) The applicant shall be required to survey and dedicate a road reserve to give access to Lot 193 DP 755603, generally based on the existing formed track, with allowance for appropriate road widening as directed by the Divisional Manager - Engineering Services to allow for corners to be straightened for safety reasons, and this road reserve be created from where the existing formed track leaves the Crown road reserve.

The applicant shall be responsible for the payment of all costs associated with the survey and dedication of the road reserve.
 - b) The applicant will be required to dedicate the Crown road reserve from Boggy Creek Road to where the Crown road reserve joins the newly proposed access road, at no cost to Council.
 - c) The applicant shall be responsible for the construction of the road to a minimum gravel standard consisting of an 8m formation width, 6.0m of gravel, 150mm thick.
 - d) Council will not be responsible for the maintenance of this road reserve in the future and this condition shall be noted on the Council's property information system.
 - e) The applicant is required to undertake appropriate runoff and erosion control measures along the road in accordance with Soil Conservation Service guidelines.
 - f) The provision of hinged 'truck entering' warning signs be permanently erected and be displayed during operations on Boggy Creek Road either side of the intersection with the new dedicated road of access.

- g) Contribution of 50% of the cost of the upgrading of Reardons Lane by heavy patching the pavement to existing widths for a length of 700 metres from Boggy Creek Road to M.R.145.
- h) The provision of a 6 metre wide bitumen sealed pavement on a 7 metre wide gravelled formation for the new dedicated access road for a minimum length of 300 metres in from Boggy Creek Road.
- i) The provision of a dust suppressant be applied to the gravelled road pavement for a minimum length of 200 metres past the new house within Lot 193, DP755603.
- j) Upgrade the intersections of M.R.145 with Reardons Lane and M.R.145 with Whiporie Road to the AUSTROADS Type A -figure 5.16 Minimum Treatment standard including 3.0 metre bitumen sealed shoulders and a 0.5 metre gravel shoulder.
- k) Upgrading of Whiporie Road, by contributing 50% of the cost, of heavy patching to existing pavement widths, sections 2.4 to 2.9kms from M.R. 145.
24. All quarry operation traffic are to access the quarry site only from Boggy Creek Road and the new dedicated road reserve and via Reardons Lane. The quarry sites are not to be accessed via tracks from the west of the sites.
25. Full design plans of proposed engineering works to satisfy condition 23 be submitted, for approval by the Divisional Manager - Engineering Services prior to commencement of construction of any drainage or roadworks.
26. Council is to be paid 3.5 cents per tonne per kilometre road improvement and maintenance levy for an average haulage distance of 20kms. This levy is to be calculated annually and payable in advance based on the quarry operator's assessment of the market and shall be reviewed annually based on current sales.
27. This approval permits a maximum extraction of 30,000m³ per year.

The abovementioned conditions have been imposed to protect the existing and future amenity of the locality and attain the objectives set out in Richmond River Local Environmental Plan, 1992 and of the Environmental Planning & Assessment Act, 1979.

Endorsement of date of consent 19th February, 1997.

NOTES:

1. To ascertain the date upon which the consent becomes effective refer to section 93 of the Act.
2. To ascertain the extent to which the consent is liable to lapse refer to section 99 of the Act.
3. Section 97 of the Act confers on an applicant who is dissatisfied with the determination of a consent authority a right of appeal to the Land and Environment Court exercisable within 12 months after receipt of this notice.



(P.T. Muldoon)
GENERAL MANAGER

APPENDIX C TRAFFIC IMPACT ASSESSMENT



WOOLGOOLGA TO BALLINA UPGRADE

MOONIMBA BORROW SITE TRAFFIC IMPACT ASSESSMENT

W2B-PC0-0

REV	DATE	DESCRIPTION	ORIGINATOR	REVIEWER	APPROVER
01		DRAFT	G. AOUAD	R. MILLER	
02		DRAFT	G. AOUAD	A. ZAMBOLT	
A	02/06/2017	FINAL	G. AOUAD	R. MILLER	
B	22/08/2017	FINAL	G. AOUAD	A. ZAMBOLT	

This document is a controlled document prepared in accordance with AS /NZS ISO 9001:2008 Quality Management Systems Requirements, and is regularly reviewed and updated. Audits confirming the effective implementation of the procedures / activities described herein provide verifiable evidence that Pacific Complete conforms to specified requirements.

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ABBREVIATIONS

AADT	Average Annual Daily Traffic
EIS	Environmental Impact Statement
GAA	Greg Aldersons & Associates
PC	Pacific Complete
RMS	Roads and Maritime Services
RSA	Road Safety Audit
TTIA	Transport & Traffic Impact Assessment
VPD	Vehicles Per Day
VPH	Vehicles Per Hour
W2B	Woolgoolga to Ballina

EXECUTIVE SUMMARY

Pacific Complete on behalf of Roads and Maritime Services (RMS) is preparing a Modification Report for the Woolgoolga to Ballina Pacific Highway Upgrade for the use of the Moonimba Quarry, known to the project as Moonimba Borrow Site, situated in Bungawalbin, NSW. This Traffic Impact Assessment (TIA) will form part of this Modification Report.

The site is currently operating under a council development application (DA 2015/97) with an approved extraction limit of 30,000m³ per annum. Consent to extract 90,000m³ of material and import 30,000 m³ fill was approved in 2015 by Richmond Valley Council (DA 2015/069).

Pacific Complete is proposing to intensify the extraction rate at the site to one million tonnes (1,000,000 tonnes), which is equivalent to 400,000m³ of material per annum to provide sufficient materials to complete the W2B project. Approval for this increased extraction rate is being sought through the Department of Planning and Environment via a modification to the W2B project approval.

A Transport and Traffic Impact Assessment (TTIA) report was produced by **Greg Alderson & Associates** in 2014 as part of an Environmental Impact Statement (Moonimba EIS) that was submitted with the DA2015/069. The TTIA report was used to support the objectives of this TTIA.

Assumptions have been introduced in **Section 2.4.1**, based on available information to ensure a sufficient analysis of the existing and future conditions of the proposed haulage routes.

Following the analysis of the combined traffic volumes within the Woodburn region, i.e. haulage, private, school and land use; it was ascertained that the local network (i.e. Boggy Creek Road, Reardons Lane and Woodburn-Coraki Road) will be adequate in servicing future traffic activities, under the provision that the road upgrades stipulated within DA 2015/069 are completed, prior to the activation of increased extractive operations.

Despite the adequate operational capacity of the local network, the cumulative impacts generated by the surrounding quarries in conjunction with the Moonimba Borrow site, will warrant temporary traffic management at the Woodburn-Coraki Road - Pacific Highway intersection, for the duration of the W2B construction works. Mitigation measures such as; Traffic Management Plans (TMPs), intersection reconfiguration and delineation amendments have been recommended as temporary solutions.

1. INTRODUCTION

Pacific Complete on behalf of Roads and Maritime Services (RMS) is preparing a modification report for the Woolgoolga to Ballina Pacific Highway Upgrade for the use of the Moonimba Quarry, known to the project as Moonimba Borrow Site, situated in Bungawalbin, NSW. This Traffic Impact Assessment (TIA) will form part of this modification report.

The Moonimba Borrow Site is currently operating under a council development application (DA 2015/97) with an approved extraction limit of 30,000m³ per annum. Consent to extract 90,000m³ of material and import 30,000m³ fill was approved in 2015 by Richmond Valley Council (DA 2015/069). The DA 2015/069 has not currently been activated. Pacific Complete is proposing to intensify the extraction rate at the site to one million tonnes (1,000,000 tonnes) per annum, which is equivalent to 400,000m³ of aggregate per annum to provide sufficient material to complete the W2B project. The purpose of this traffic impact assessment, is to explore the implications of increasing haulage and heavy vehicle activity; specifically relating to road performance, general traffic operation, school bus routes and land usages both current and future.

The Moonimba Borrow Site is situated approximately 16km south-west of Woodburn, NSW. It resides to the west of Portion C's W2B construction zone and is bounded by Devil's Pulpit and Broadwater Township. Split between two pits, the site will operate with a confirmed total excavation area of 21 hectares. This is consistent with the excavation area given consent under a DA 2015/069 for an expansion of the existing quarry.

The Environmental Impact Statement issued in 2012 for W2B (Roads and Maritime Service + Aurecon + SKM, 2012) projected 1.23 million tonnes of road base, 0.79 million tonnes of sand and approximately 1.4 million tonnes of aggregate for the construction of drainage structures, pavements, spray sealing works, production of concrete and asphalt. Sections 7, 8 and 9 which encapsulate Portion C, were forecasted to require the following material quantities:

Table 1.1 W2B EIS Indicative Construction Material Quantities (Source: W2B EIS)

Project section	Earthworks (general fill) (m ³)	Earthworks (select fill) (m ³)	Aggregate (t)	Road base (m ³)	Sand (t)	Asphalt (t)	Cement (t)	Fly ash (t)	Precast concrete (t)	Steel (t)
7	481,000	128,000	159,000	20,000	93,000	10,000	30,000	15,000	800	30
8	811,000	117,000	68,000	70,000	25,000	60,000	6000	3000	2000	850
9	792,000	87,000	72,000	40,000	36,000	25,000	11,000	5000	800	100

Moonimba Borrow Site was initially identified as Robinsons Quarry within the W2B EIS (Roads and Maritime Service + Aurecon + SKM, 2012) as a supply location to contribute to these volumes. Several other quarries situated within Portion C (i.e. Coraki, Swan Bay, Broadwater and Evans Head) were considered as potential supply sites, for W2B.

Figure 1-1 Portion C Construction Boundaries

1.1 Project Overview

Under this modification to the proposal, the Borrow Site is anticipated to operate within the following parameters:

- A new proposed haulage capacity until the completion of the W2B Project, marking the anticipated completion of the Woolgoolga to Ballina Pacific Highway Upgrade.
- The haulage vehicle demands of the Borrow Site will be dependent upon road construction requirements of Portion C (Devils Pulpit to Broadwater). The number of haulage vehicles will fluctuate with the construction requirements and demands of the Portion C road works. There will be circumstances during the project's progression, where additional haulage vehicles will be required to meet construction expectations.
- Haulage operation of surrounding sites will be assessed in conjunction with the additional vehicles generated for the Moonimba borrow site. This is to ensure a conservative and holistic analysis of the study area.

1.2 Study Area

1.2.1 Site Access

Split between two pits, identified as East and West pits, the Moonimba Borrow Site presently operates at 30,000m³ per annum. Additional approval was granted in 2015 to increase the extraction rate at the site to 90,000m³ per annum. This DA has not been activated, at the time this assessment was prepared. **Figures 1-2** and **1-6** depict the proximity and size of the two pits within the Moonimba Borrow Site.

Site access is provided by Boggy Creek Road which joins with Reardons Lane, 3 km east of the site and adjacent to a residential property (Lot 2 DP 805371). The previous TTIA (Greg Alderson & Associates, 2014) report confirmed that the first 300 metres of the access road has been sealed, to minimise dust and noise disruption to the residents.

The majority of land used within the Bungawalbin region is for agriculture, grazing and cropping purposes. The TTIA (Greg Alderson & Associates, 2014) report forecasted an additional 84 residential lots to be developed/released by 2024. These future developments affect peak hour traffic generation and operational capacity of the road network.

The existing haulage route (refer to **Figure 1-7**) passes through eight intersections, on the approach to the Pacific Highway in Woodburn. The major intersections that will be explored within this study are:

- Pacific Highway (River Street) and Woodburn-Coraki Road
- Reardons Lane and Woodburn-Coraki Road
- Site Access Road and Boggy Creek Road

Once on the Pacific Highway, haulage vehicles are anticipated to access the construction corridor via a number of local roads including: Watsons Lane and Alfred Street (that lead into Wagner Street and then onto Woodburn-Evans Head Road). These roads were identified in Section 6.6.1 of the W2B EIS (Roads and Maritime Service + Aurecon + SKM, 2012) as local roads that could potentially be used for construction access or haulage routes. The impacts to these local roads have not been considered within this assessment, as they have already been addressed under the W2B EIS, for the delivery of material.

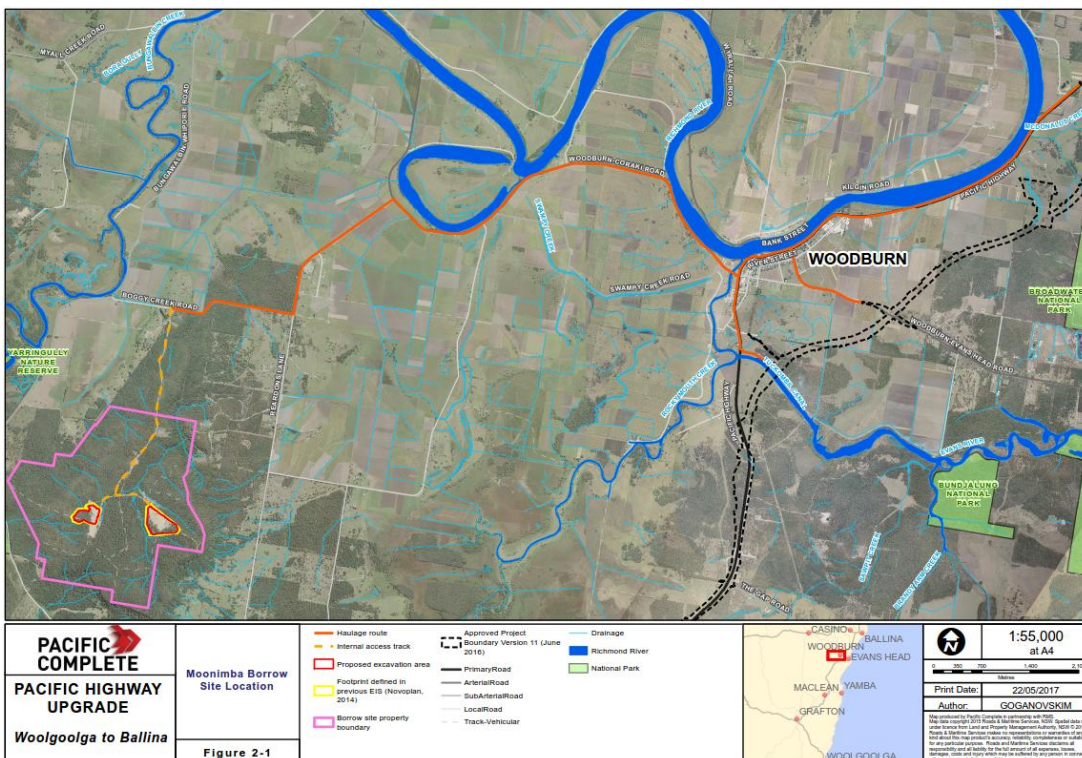


Figure 1-2 Moonimba Borrow Site Locality (Source: Google Earth)

1.2.2 Surrounding Quarries

In conjunction with the Moonimba site operation, Coraki quarry and Champions quarry are in operation within the study area.

Presently Coraki quarry operates between 7:00AM to 6:00PM, with a dispatch rate of 21 vehicles per hour. Furthermore, there is an additional 'private' quarry within the Coraki complex, generating traffic. Due to the overlapping segments between the Moonimba borrow site haulage corridor and Coraki quarry (i.e. Woodburn-Coraki Road), volumes contributed by this site have been considered as a cumulative impact for this study.

Champions quarry, which is situated in Tuckarimba, north-west of Woodburn, contributes 11 to 30 trucks per day, with restrictions to operate between 7:00AM to 5:30PM. The identified haulage route for this site, is via the Bruxner Highway, with the preferred access to the Pacific Highway via Wyrallah Road. The indicative traffic impacts of haulage operations from Champions quarry, are wholly restricted to Wyrallah Road and the Pacific Highway. Therefore, the Moonimba borrow site haulage route does not incur any cumulative impacts from Champions quarry.

1.2.3 Schools

The list below summarises the schools situated within the Woodburn - Coraki - Broadwater study area:

- St Joseph's Woodburn Primary School
- St Joseph's Coraki Primary School
- Woodburn Public School
- Evans River K-12 School
- Coraki Public School
- Broadwater Public School.

School bus routes and frequencies will be explored within this report, to ascertain any conflicts with haulage and backfilling operations.

NOTE - Bus routes are susceptible to change from year to year, depending on student enrolments and the proximity of to the school to residents.

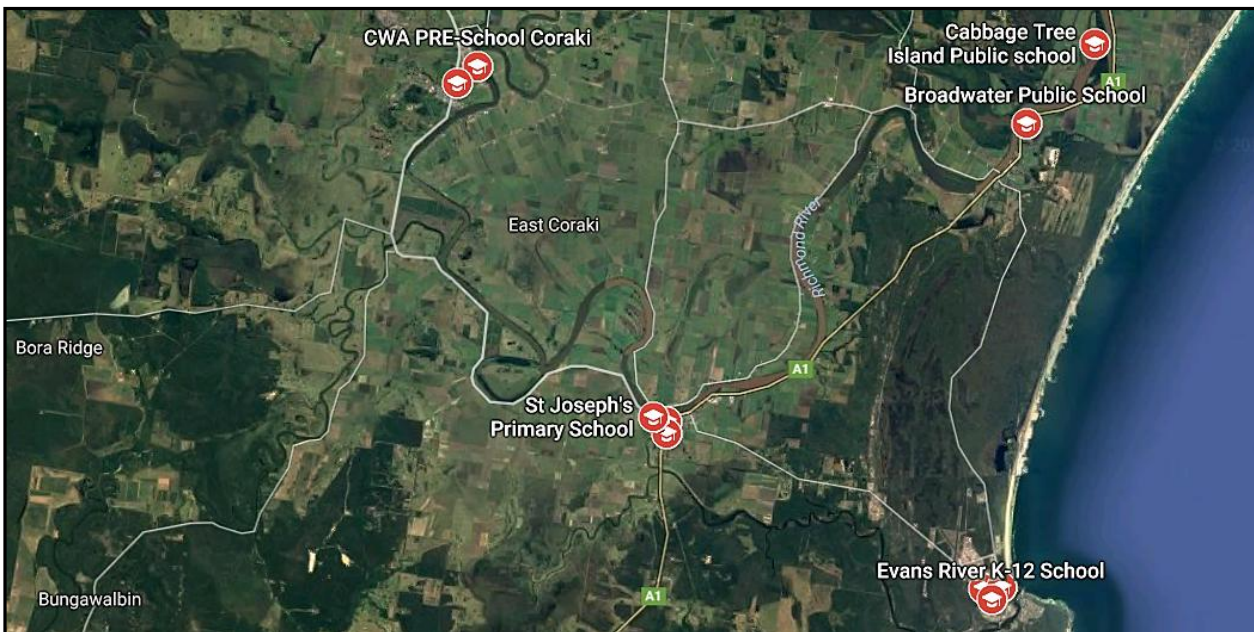


Figure 1-3 Schools within Portion C Jurisdiction (Source: Google Maps)

1.2.4 Residences

The current haulage route overlaps with most of Woodburn's residential access along the Pacific Highway. The Woodburn-Coraki Road and Pacific Highway intersection is the focal point within the study area, servicing schools, businesses and residents.

There are three major unloading points across Portion C: Woodburn-Evans Head Road, Southern Woodburn and Southern Broadwater. Due to their locations and access, many of the conflicts with residential vehicles will be along the Pacific Highway.



Figure 1-4 Surrounding Schools and Residential Catchments near Critical Intersections

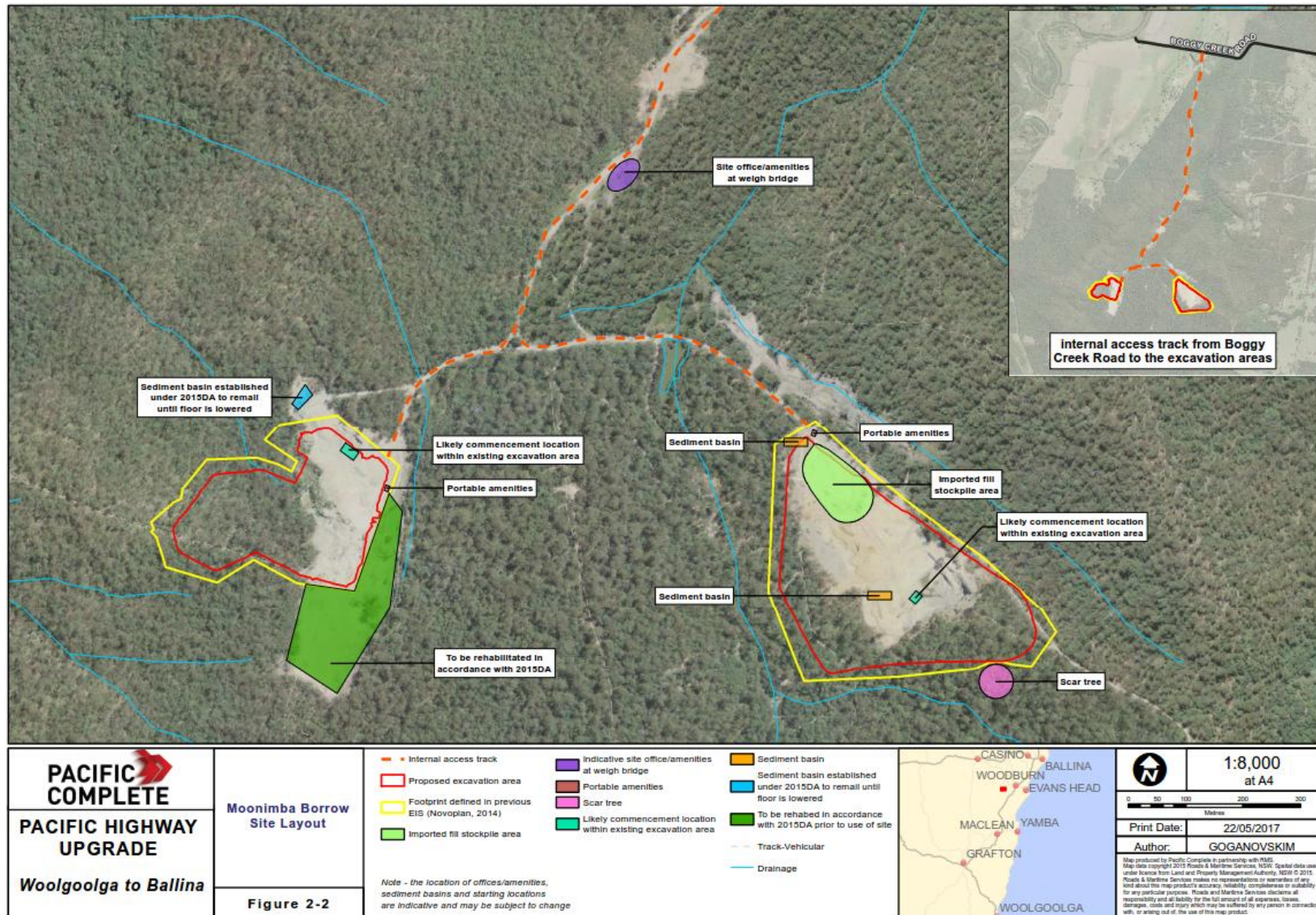


Figure 1-5 Moonimba Borrow Site (Source: Pacific Complete)

1.3 Traffic and Transport Impact Assessment – Greg Alderson & Associates (GAA 2014)

The TTIA (Greg Aldersons & Associates, 2014) formed part of the EIS, which accompanied the DA 2015/069 to expand the quarry. A lot of their major findings are still applicable to this analysis, with the exception of changes to released land, traffic volumes, school routes and construction activities.

The study was conducted in accordance with the Guide to Traffic Generating Development Version 2.2 of 2002 as well as AUSTROADS standards where appropriate. The safety of all road users was assessed including passenger cars, school buses and passengers, pedestrians and cyclists and children. The key objective of the TTIA was to evaluate the potential for impacts of the proposed extension of the existing quarry and the importation of fill, and identify mitigation measures where appropriate.

The methodology of the TTIA included:

- Assessment of traffic generation by the proposed development.
- Assessment of the capacity and efficiency of the road network, having regard to other likely development in the vicinity.
- Evaluation of road conditions, drainage and maintenance issues along the haul route.
- Completion of a Road Safety Audit on the haul route including intersection sight distances curves in Boggy Creek Road and other safety issues.
- Assessment of traffic impacts or the importation of fill.
- Identification of mitigation measures where appropriate.

The assessment of traffic generation by the sandstone extraction operation in the TTIA was based on the maximum proposed annual output of 193,000 tonnes averaged over the working days in a year. This was calculated as 40 truck movements per day. Based on traffic surveys at the quarry and rules of thumb, the report confirmed that 6 truck movements per hour is reasonable in the long term.

The TTIA also proposed an annual fill importation limit of 30,000 m³. This was calculated to generate an average of 14 truck movements per day when fill importation is taking place. It was concluded that the resulting additional traffic will not cause the traffic loads to exceed the traffic volume limits for the roads in the haul route. The community consultation for the proposed development highlighted concerns about safety issues including truck speed, driver behaviour, pedestrian safety and school bus safety.

In response, the TTIA recommended a speed limit of 60 km/hour be placed on Boggy Creek Road between Reardons Lane and the quarry access road, and that a double continuity centreline to be marked along the proposed sealed section of Boggy Creek Road and the haulage component of Reardons Lane to discourage road users crossing over into the opposing traffic lane.

The report concluded that the average peak truck volume, including importation of fill, is estimated to be 54 truck movements per day. It concludes that: ***“The existing road network is generally adequate for the proposed quarry operations” and “approval of the development from a traffic engineering point of view”*** is recommended.

The DA 2015/069 approval of the TTIA stipulates that Boggy Creek Road is to be sealed between the quarry access road and Reardons Lane to achieve seal of 6 metres width with 1 metre wide gravel shoulders, if the extractive rate of 90,000m³ p.a. is activated.

In respect of the Coraki-Woodburn Road intersection with Reardons Lane, the TTIA states: ***“Council has requested that the potential be investigated for creating a left turn deceleration lane on Coraki Woodburn Road at this intersection.”*** The investigation is required to establish if this lane can be constructed without requiring significant earthworks or drainage upgrade works.

1.4 Objectives

The proposed increase to haulage operations is anticipated to affect local network performance within Woodburn and Bungawalbin. The objectives of this report are to address the following criteria:

- 2016 and 2020 traffic volume impacts.
- Released Land/Land use changes.
- Proposed haulage frequency.
- Bus routes.
- Comparison against the W2B EIS Traffic and Transport Working Paper.

Currently the haulage route operates via Boggy Creek Road, Reardons Lane, Woodburn-Coraki Road and The Pacific Highway. This path is depicted in orange in **Figure 1-6** below.

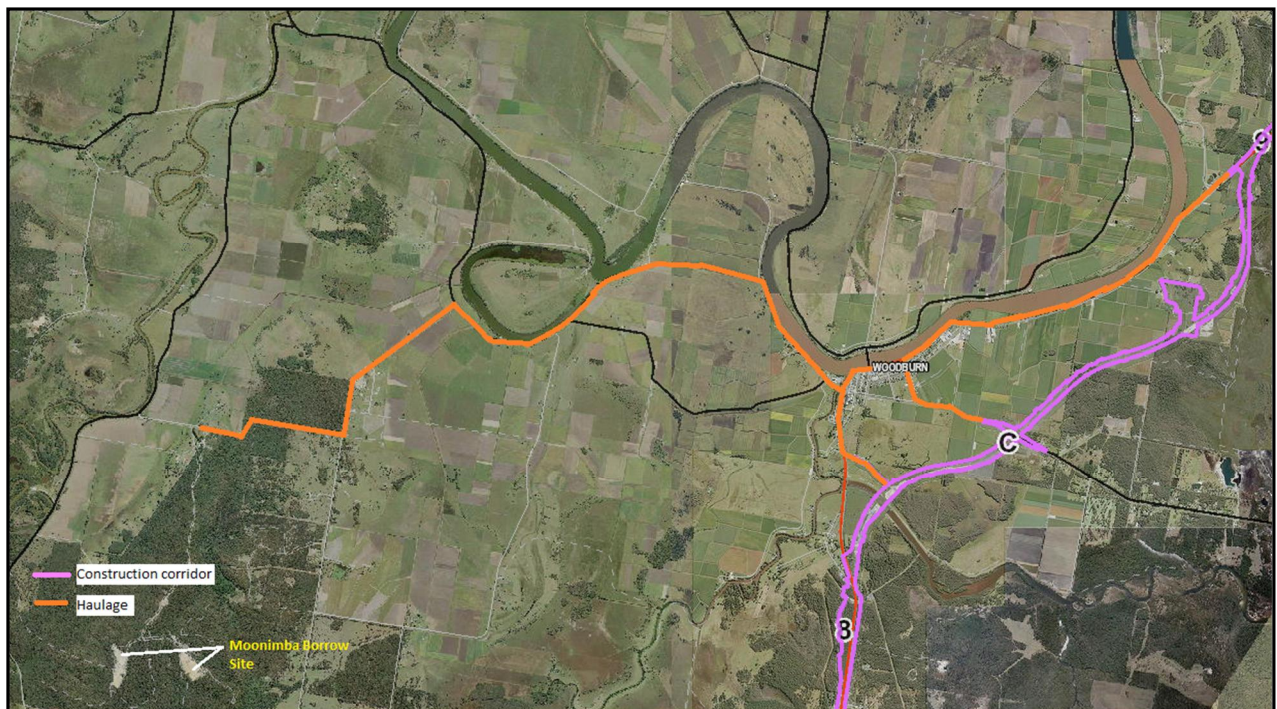


Figure 1-6 Proposed Haulage Routes (Source: Google Earth)

2. EXISTING CONDITIONS

2.1 Road Network

From the TTIA (Greg Aldersons & Associates, 2014), the following table indicates the present road capacities for the haulage route:

Table 2.1 Road Quality – Proposed Haulage Route

Road Name	Boggy Creek Road	Reardons Lane	Coraki-Woodburn Road
Pavement Types and Widths	7 metre width – Gravel	6 metre width – bitumen seal +1 metre gravel shoulders	7.5 metre seal + 0.5 metre sealed shoulders
Operational Vehicle Capacity	150 vpd	500 vpd	>1000 vpd

Source: Greg Alderson and Associates

Clause 30 of DA 2015/069 stipulates the ongoing upgrades to Boggy Creek Road and the ongoing maintenance of the haulage route. Prior to Pacific Complete occupation of the borrow sites, the following roadworks are to be completed by the land owner in accordance with Richmond Valley Council's criteria:

Table 2.2 Road Quality – Pending Upgrades and Maintenance

Location	Boggy Creek Road	Borrow Site Access Road	Reardons Lane Boggy Creek Road	Woodburn-Coraki Road Reardons Lane
Upgrade Description	6 metre width – bitumen seal +1 metre gravel shoulders	Widened entrance	→ Left turn widening out of Boggy Creek Road. → BAR ¹ and BAL ² turning treatments.	→ Subject to approval by Richmond Valley Council, a westbound deceleration lane shall be constructed on Woodburn-Coraki Road for heavy vehicles turning into Reardons Lane.
Operational Vehicle Capacity	500 vpd			

Source: Richmond Valley Council – DA 2015/069

¹ The basic right-turn treatment (BAR) is the minimum treatment for right-turn movements from a through road to side roads and local access points. This treatment provides sufficient trafficable width for the design through vehicle to pass on the left of a stationary turning vehicle.

² Rural Basic Left-turn Treatment (BAL) shows a minimum treatment for use in a rural situation (i.e. high-speed environment) which provides tapers leading into and out of the left-turn treatment to cater for the swept path of a large design vehicle.

Prior to any further changes to the extractive procedures, it has been clearly identified within DA 2015/069 that increased quarrying can only take place, provided the above upgrades have been completed and the ongoing maintenance of the corridor can be assured.

Council have acknowledged that infrastructural damages implicated by adverse weather are their responsibility to rectify. However, the development and improvements to the haulage corridor is to be undertaken by the land owner, to ensure continued haulage operations.

2.2 Traffic Counts

A preliminary traffic count was performed for the TTIA (Greg Aldersons & Associates, 2014) for the study area. These traffic volumes were used for the traffic impact assessment developed for the haulage route in Figure 1-6.



Figure 2-1 Traffic Counter Locations (Source: Greg Alderson & Associates, 2014)

Table 2.3 depicts the averaged AM, PM and daily traffic volumes from the TTIA (Greg Aldersons & Associates, 2014) assessment:

Table 2.3 2014 Averaged Traffic Volumes

Location	Daily Traffic (Vehicles per day - vpd)	Peak Hourly Volumes (Vehicles per hour - vph)
Reardons Lane	220	25
Woodburn-Coraki Road	1,397	133
Bogy Creek Road	132	<10
Site Access Road	30	

Source: Greg Alderson & Associates

A secondary traffic count was performed in 2016 for the Pacific Highway corridor, focusing on major local roads, exit/entry ramps and the mainline itself. These counts were used in the development of the traffic model. Furthermore, future traffic volumes had been forecasted, to account for new demand, road upgrades and background growth. These volumes will be used for this TTIA, to ensure consistency in the applied assumptions and methodology.

Table 2.4 2016 Traffic Volumes

2016 Counts	Northbound annual average daily traffic (AADT)	%HV	Southbound annual average daily traffic (AADT)	%HV
Pacific Highway - Woodburn	4,548	26%	4,754	29%
Wyrallah Road	1,121	16%	1,023	16%

Source: Pacific Complete Traffic Model

2.3 Haulage Operations and Site Access

The existing entrance for the Borrow Site (Lot 193 DP755603, Bungawalbin) is located on Boggy Creek Road approximately 2km west of the intersection with Reardons Lane. This access road heads south toward the excavation pits. The first 300 metres of the access road, measured from Boggy Creek Road, has been sealed to minimise dust and noise impacts on the nearby residents on Lot DP 805371.

The TTIA (Greg Aldersons & Associates, 2014) report indicated that the site access road incurs 30 truckloads per day. Following the DA 2015/069 for 90,000m³, it was forecasted that 40 truck movements per day, plus an additional 14 back-fill trucks per day would meet the yearly demand, thus resulting in 54 movements per day.

In conjunction with the Moonimba site operation, the Coraki Quarry, depicted in **Figure 2-2** currently has approval to dispatch 21 trucks per hour, between: 7:00AM to 6:00PM.

Note - Coraki quarry recently applied for approval to dispatch 31 truckloads per hour. Furthermore, there is an additional 'private' quarry within the Coraki complex, generating traffic movements. For this assessment, these volumes have been considered as a cumulative impact with the Moonimba borrow site.

The overlapping segments along this corridor and total volumes will be examined at the relevant intersections within the study area.

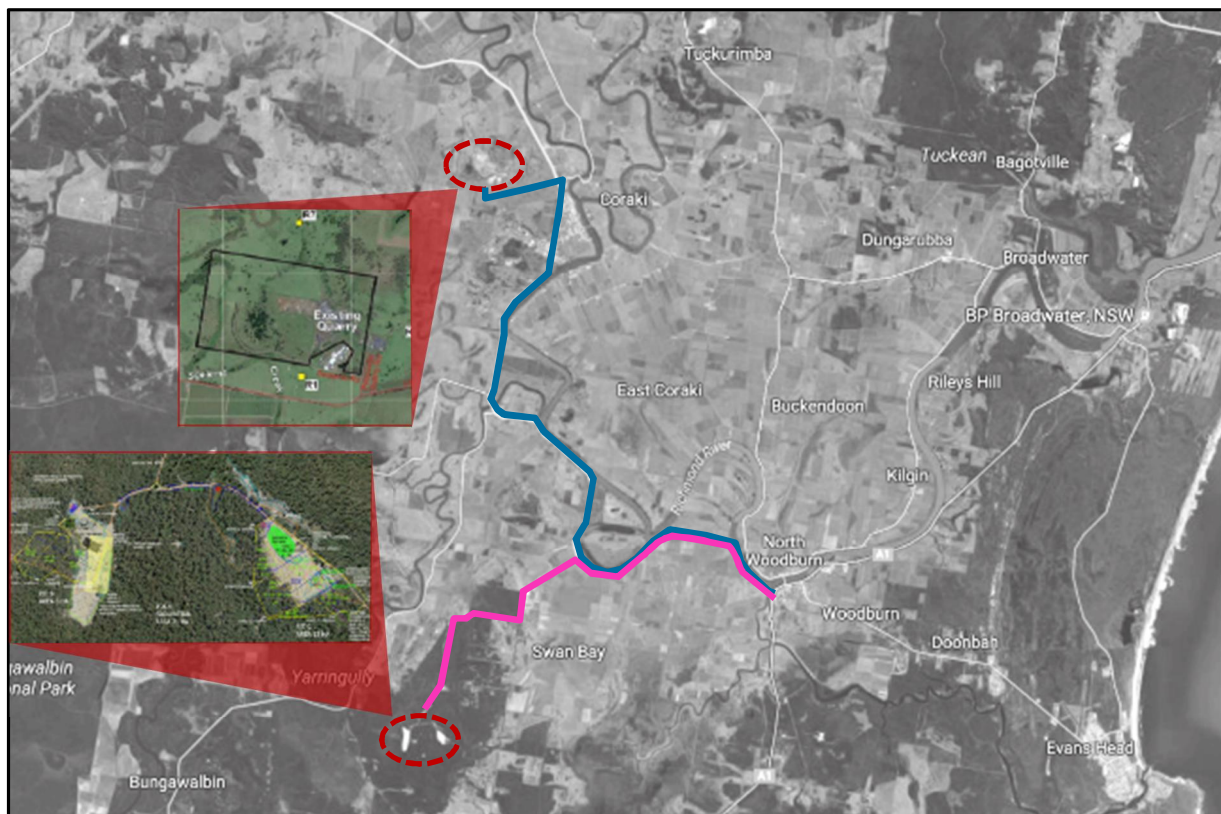


Figure 2-2 Quarry Sites Haulage Routes – Coraki Quarry (Blue), Moonimba Quarry (Pink) (Source: Google Maps)

2.4 School Bus Operation Hours

Year to year, bus routes are susceptible to change, depending on student enrolments and the proximity of to the school to residents. Due to these changes, there are no definitive bus routes or graphical representations of the bus corridors. However, accessed streets and stoppage times are publicly available. [Table 2.5](#) summarises the number of buses operating along the haulage corridor, during the morning and afternoon school peaks. The morning peak operates between 7:00AM and 9:00AM and the afternoon peak takes place between 2:55PM and 5:00PM.

Table 2.5 Overlapping Haulage and Bus Routes

Bus Routes	Suburb	Street	Number of Buses (AM)	Number of Buses (PM)
Locality	Bungawalbin	Boggy Creek Road	8	7
		Reardons Lane	10	7
	Woodburn	Woodburn-Coraki Road	7	7
		Pacific Highway	20	20

A high-level assessment of the bus routes and the roads accessed, provides the following bus routes within the area:

- Local Roads: Boggy Creek Road, Reardons Lane and Woodburn-Coraki Road incur approximately **4-5 buses per hour** during the AM and PM school peaks
- The Pacific Highway services buses delivering students to schools north and south of the study area. The approximated bus frequency is **10 buses per hour**, during the AM and PM school peaks.

Despite the clause stipulated within development application (DA 2015/069) to limit the movement of heavy vehicles during school hours, the elected peak between 11:00AM and 1:00PM holds precedence in this study, as the impacted study area incurs the greatest traffic volumes during this time.

2.4.1 Assumptions

This report will explore impacts generated by increased traffic volumes within the study area. Without future road maintenance data, road geometry and backfill requirements, the following assumptions will be considered and applied for this study:

1. Traffic volumes calculated within the TTIA (Greg Aldersons & Associates, 2014) will be utilised and conservatively grown at 2% p.a., to account for future volumes within Woodburn. Despite the anticipated drop in vehicles using the Pacific Highway following the completion of W2B, this growth will ensure a worst-case scenario analysis.
2. The Pacific Highway is capable of servicing increases in heavy vehicle proportionality.
3. As stipulated within Richmond Valley Council's DA 2015/069, upgrades and maintenance of the haulage route are to be carried out by the owner prior to Pacific Complete occupation of the borrow site.
4. Without a follow-up traffic survey of the study area, increased traffic volumes will be split throughout the network; based on land usage, points of interest and dominant directions of traffic flow.
5. The results and future impacts from the TTIA (Greg Aldersons & Associates, 2014) will be used as the precedent for further mitigation measures and strategies.
6. A Road Safety Audit will not be performed for the study area. The results from the RSA undertaken for the TTIA (Greg Aldersons & Associates, 2014) will remain applicable to the haulage route.
7. Potential upgrades to the haulage route have been considered by Richmond Valley Council. It has been acknowledged that the severe storm events within the region warrant adequate maintenance and upgrade of the haulage route, particularly Woodburn-Coraki Road.
8. As a high-level assessment, this report will focus on the impacts generated by traffic alone. Studies into road design, traffic management plans and safety will need to be pursued by Pacific Complete and/or the contractor. This report will provide potential mitigation measures to the affected roads and intersections.

3. PROPOSED MODIFICATION

3.1 Present Haulage Rate

The following procedure depicts the haulage rates based on the approved extraction rate, calculated by **Greg Alderson & Associates**:

$$\frac{193,000 \text{ tonnes}}{300 \text{ days}} = 645 \text{ tonnes per day} \dots (1)$$

Assuming that a typical truck and dog can transport 32 tonnes per load:

$$\therefore \text{Average loaded trucks} = 20 \text{ truckloads per day} \dots (2)$$

Or

$$\text{Movements per day} = 40 \text{ truck movements per day} \dots (3)$$

Or

$$\text{Movements per week} = 220 \text{ truck movements per week} \dots (4)$$

3.2 Proposed Haulage Rate

It has been proposed to increase the maximum annual extraction rate of the Moonimba Borrow Site to 1,000,000 tonnes per annum. The Borrow Site is proposed to run six (6) days a week (7am-6pm Weekdays and 8am-5pm Saturdays) during greater demand periods for the Pacific Highway upgrade. By maintaining the same haulage calculations and methodology performed by **Greg Alderson & Associates**, the following outputs are indicative of the new haulage operations:

$$\frac{1,000,000 \text{ tonnes}}{300 \text{ days}} = 3,333 \text{ tonnes per day} \dots (9)$$

$$\therefore \text{Average Loaded Trucks: } \frac{3,333}{32} = 104 \text{ truckloads per day} \dots (10)$$

Or

$$\text{Movements per day: } = 208 \text{ truck movements per day} \dots (11)$$

Or

$$\text{Movements per week: } = 1,144 \text{ truck movements per week} \dots (12)$$

The average hourly traffic generation can be calculated as:

$$208 \text{ movements per day} / 11 \text{ hours per day} = 19 \text{ movements per hour}$$

$$208 \text{ movements per day} / 9 \text{ effective hours per day} = 23 \text{ movements per hour.}$$

The effective hourly rate will be applied and examined across the impacted intersections and utilised haulage routes. Despite the proposed operational hours of 7:00am to 6:00pm (11 hours), effective haulage time of 9 hours has been applied to account for school buses accessing the corridor.

Number of vehicles to satisfy 30,000m³ backfill is ~14 truck movements per day. (Greg Aldersons & Associates, 2014).

Haulage + Backfilling = Total Number of Vehicles

12 truckloads per hour + 1 truckloads per hour = 13 truckloads per hour (One way)

23 movements per hour + 3 movements per hour = 26 movements per hour (Two way)

Approximately; **234 movements per day.**

Note – With an average of **234 movements per day**, an operational threshold of **300 truck movements a day or 33 movements per hour (two-way) or 16 vehicles per hour (one way)**, has been considered to account for influxes in construction demands. This extractive industry will be used as the upper limit for assessing traffic impacts.

4. FUTURE CONDITIONS

4.1 Traffic Generation

Table 4.1 depicts the average hourly vehicle volumes, forecasted for the Pacific Highway in 2020. These volumes have been estimated from existing (2016) hourly proportions, reflecting the greatest traffic peak (11AM – 1PM). The 2016 volumes were extracted from the online **Roads and Maritime Traffic Volume Viewer**.

Table 4.1 2020 Pacific Highway Volumes (Without Additional Haulage Vehicles)

	2020 Volumes	Northbound AADT	AVG vph	%HV	Southbound AADT	AVG vph	%HV
Road Location	Pacific Highway Woodburn	4,051	243	31%	4,205	294	32%

Source: Pacific Complete Traffic Model

Table 4-2 presents future traffic volumes, following the completion of W2B. A 2% traffic volume annual growth rate has been applied, to ensure a conservative assessment of the network's performance.

Table 4.2 2020 Project Completion Volumes (Without Additional Haulage Vehicles)

Location	Daily Traffic	Peak Hourly Volume
Reardons Lane	250 vpd	24 vph
Woodburn-Coraki Road	1,600 vpd	140 vph
Boggy Creek Road	150 vpd	12 vph

Following the preliminary calculations of Land Rezoning and Future Land Releases, by **Greg Alderson & Associates**, the following Land Released Generated Traffic was calculated for the Bungawalbin and Swan Bay area:

Table 4.3 Land Released Generated Traffic

Number of Lots	Daily Traffic Generation	Peak Hour Traffic Generation
84	907 vpd	109 vph

For the duration of the W2B road works, it is assumed that the anticipated 84 lots will not be completed *and* occupied, to generate the daily traffic stipulated within **Table 4.3**.

40% of the hourly traffic generated by future land use (34 developed lots before the end of 2018) has been applied within this impact assessment.

5. IMPACTS

5.1 Summary of Preliminary Impacts



The TTIA (Greg Aldersons & Associates, 2014) only accounted for roads that Richmond Valley Council preside over. With ongoing construction and developments of W2B, additional traffic has been introduced within the Woodburn Township. This has inherently affected the access and operation of Woodburn-Coraki Road, with vehicles entering it via the Pacific Highway. Therefore, the future performance and management of Woodburn-Coraki Road and the Pacific Highway intersection has been examined within this report. The table below summarises the impacts observed within the TTIA (Greg Aldersons & Associates, 2014) and this assessment.

Table 5.1 Impact Summary

Transport and Traffic Impact Assessment (Greg Aldersons & Associates, 2014)

Location	Impact Description	Outcomes
Moonimba Borrow Site	→ Average peak daily traffic generated by the proposed quarry was 54 truck movements per day.	→ It was ascertained that the road condition and network can service these volumes.
Boggy Creek Road	→ If the proposed annual extraction rate exceeds the current approval of 30,000m ³ per annum (as assessed by Council), Boggy Creek is to be sealed/hotmixed and a BAR intersection treatment is to be implemented before this exceedance occurs.	→ Boggy Creek Road sealed between the quarry access road and Reardons Lane to achieve seal of 6 metres width with 1 metre wide gravel shoulders. → Double continuity lines be marked on centrelines of proposed sealed section of Boggy Creek Road and haulage section of Reardons Lane.

Moonimba Borrow Site Traffic Impact Assessment (Pacific Complete, 2017)

Woodburn - Coraki Road / Pacific Highway	→ It is anticipated that the number of vehicles accessing Woodburn-Coraki Road and the Pacific Highway intersection will increase. Particularly left turning vehicles from Woodburn-Coraki Road and right turning vehicles from the North approach of the Pacific Highway → The anticipated proportion of hauling vehicles splitting at this intersection is depicted in Table 5-2 .	
Moonimba Borrow Site	→ Increase in haulage operations from the quarry obligates the land owner to satisfy Clause 30 of DA 2015/069 and the widen site access.	
Boggy Creek Road, Reardons Lane	→ Design capacity of Boggy Creek Road and Reardons Lane will be adequate in servicing the proposed haulage rate of 400,000m ³ , under the provision that their upgrades referenced in the DA 2015/069 have already been completed.	→ Left turn widening out of Boggy Creek Road. → BAR and BAL turning treatments.

5.2 Turning Volumes and Traffic Impacts

The following table and figure present the haulage vehicle split at the Woodburn-Coraki Road and Pacific Highway intersection, as identified by the Portion C contractor:

Table 5.2 Proportional Split of Material Delivery Locations

Material Delivery Locations	Proportional Split of Heavy Vehicles
South to Tabbimoble	20%
North to Woodburn – Evans Head	10%
North Along Pacific Highway	70%



Figure 5-1 Haulage Split at Woodburn-Coraki Road and Pacific Highway Intersection

Intersections within the study area were assessed against **AUSTROADS Guide to Road Design Part A: Unsignalised and Signalised Intersections** criteria, for potential channelisation.

Channelisation is the provision of traffic islands to separate through movement and turning vehicles. These treatments are installed to improve safety and turning manoeuvres, for vehicles crossing the opposing carriageway. Warrant for channelisation will be measured by combining the forecasted heavy vehicle volumes and traffic count data and plotting these volumes against **Figure 4.9 within the AUSTROADS Guide to Road Design Part 4A**.

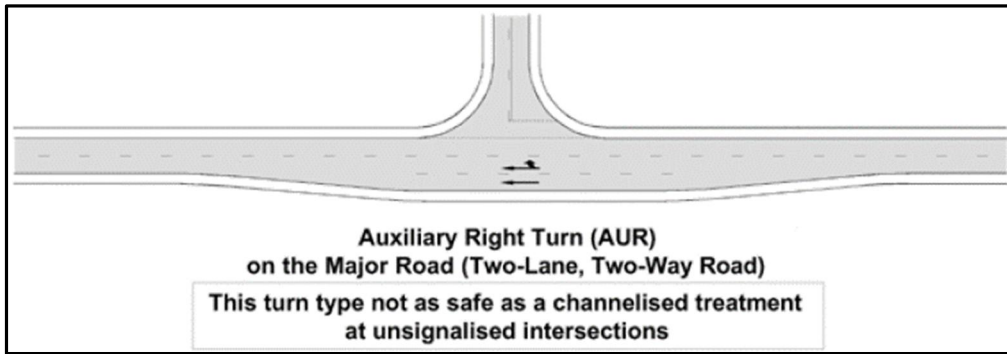


Figure 5-2 Existing Woodburn-Coraki Road and Pacific Highway Treatment (Source: AUSTRROADS)

Without dedicated traffic surveys or turning counts, the following treatment assessments assume volumes 20% greater than the calculated daily average. This accounts for peak directional behaviours and land uses (i.e. residential, schools and businesses).

Figure 5-3 presents the template for measuring two-way through movements, left and right turning vehicles, to measure turning treatment eligibility.

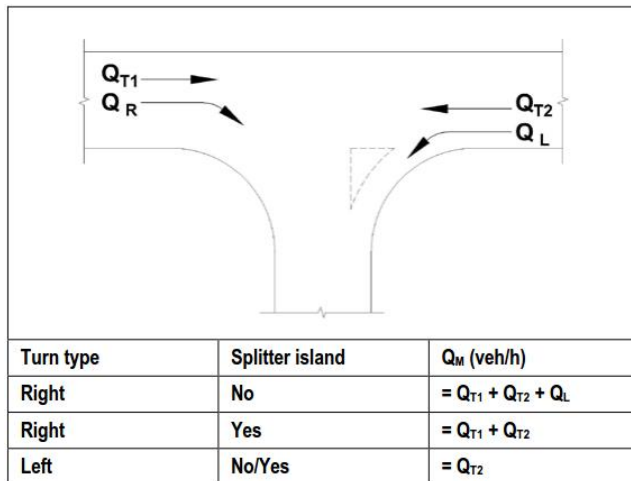


Figure 5-3 Calculation of the major road traffic volume parameter Q_m (Source: AUSTRROADS)

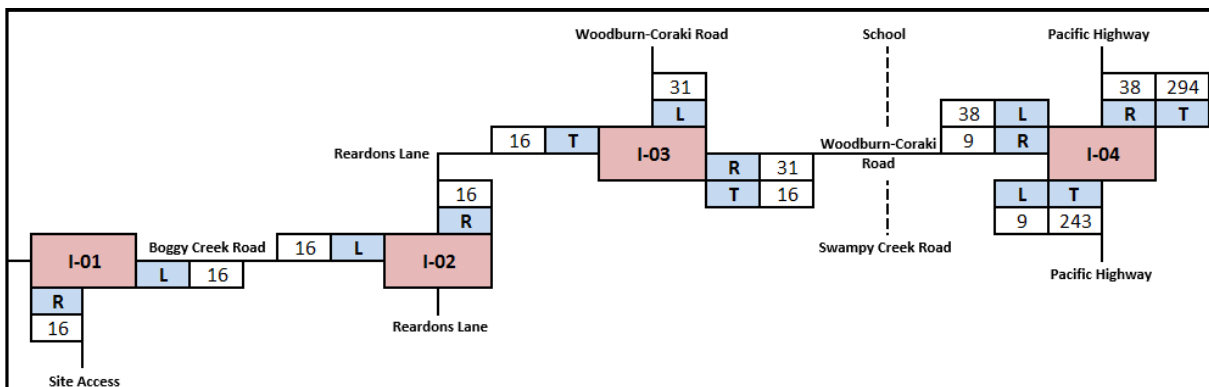


Figure 5-4 Stick Diagram (Exclusively Upper Limit Heavy Vehicle Movements)

Figure 5-4 presents the upper limit of heavy vehicle movements. This has been provided to compare the extent of impact, when buses and private vehicles volumes are introduced. Table 4-2 presents the forecasted two way, daily and hourly traffic volumes. Woodburn-Coraki Road incurs 140 vehicles per hour. This implicates a further 70 vehicles turning from Woodburn-Coraki Road onto the Pacific Highway. Applying a 50-50 split (turning left and right), the following volumes have been calculated:

Table 5.3 Future Intersection Volumes - Proposed Haulage Operation

INTERSECTION	ID	Q _{T1} (vph)	Q _{T2} (vph)	Q _L (vph)	Q _R (vph)	Q _M (vph)
Woodburn Coraki Road - Pacific Highway (AVG HV Only)	A	294	243	7	27	544
Woodburn Coraki Road - Pacific Highway (Max HV Only)	B	294	243	9	38	546
Woodburn Coraki Road - Pacific Highway (LV + HV)	C	294	243	>60	>80	581

Utilising **Figure 5-5**, major road traffic is plotted against turning volumes. For this study and the impacted intersections, chart (b) will be used, as it presents the treatment warrants for design speeds below 100km/h.

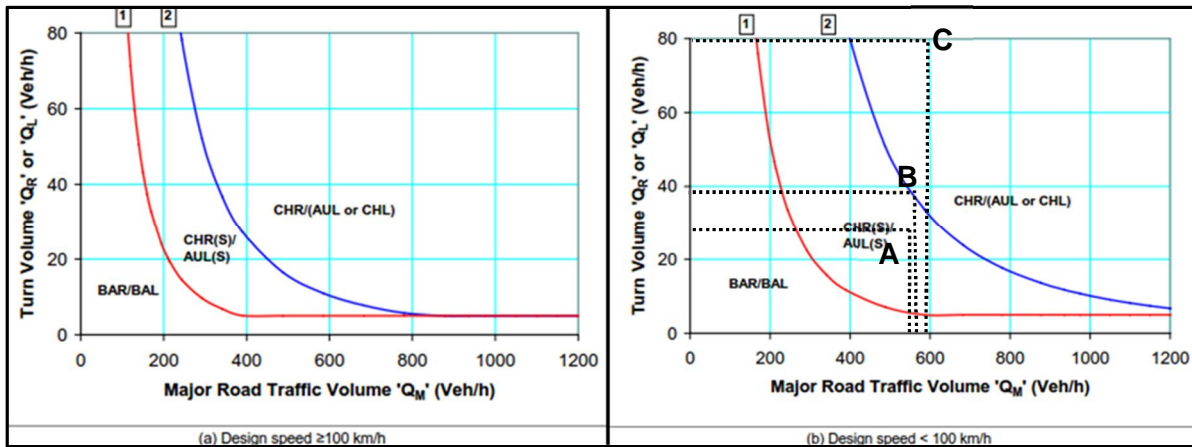


Figure 5-5 AUSTRROADS Figure 4.9 - Warrants for Turn Treatments

5.3 Discussion

From the forecasted through volumes (Q_m) along the Pacific Highway and the number of right turning vehicles (Q_R) intending to access Woodburn-Coraki Road, **Figure 5-5** depicts the warrant for channelisation of this intersection. The volumes generated by the increased extractive operations implicate right-turn treatment on the Pacific Highway, for vehicles to safely and efficiently access Woodburn-Coraki Road. The appropriate treatment is a channelised right-turn bay (CHR) on the Pacific Highway, southbound.

Due to the locality of St Joseph’s Primary School, the AM and PM peaks incur greater bus and light vehicle volumes accessing Woodburn-Coraki Road. The introduction of a channelised lane would improve the safety and manoeuvrability of construction and local vehicles.

Depicted in **Figure 5-2**, it is stipulated that an Auxiliary Right Turn (AUR) is not as safe as a CHR, at unsignalised intersections. The TTIA developed by **Greg Aldersons & Associates** did not account for the Woodburn-Coraki Road and Pacific Highway intersection. Observing the 2014 traffic volumes, this intersection would have been flagged within that report. However, it has continued operation despite the changes to the quarry’s extractive rates.

6. MANAGEMENT METHODS

The Woolgoolga to Ballina Pacific Highway upgrade is anticipated to be completed by 2020, therefore it is a priority to consider temporary mitigation measures, to accommodate for the interim construction activities.

Under the provision that the road upgrades prefaced within the DA 2015/069 have been completed by the land owner; Boggy Creek Road, Reardons Lane and the quarry site access road will provide adequate capacity, to service the 400,000m³ haulage activities.

With the present information and immediate impacts, the following recommendations have been ascertained for the Woodburn-Coraki Road – Pacific Highway intersection.

Upon forecasting the magnitude of turning vehicles accessing Woodburn-Coraki Road and Pacific Highway, it warrants a dedicated right turn bay. This outcome will require reconfiguration of the intersection's layout. The following measures have been suggested, to address this impact:

6.1 Delineation and Line Marking Variation

Observing the present configuration of the Woodburn-Coraki Road and Pacific Highway intersection, the shared through-right turning lane will create the greatest safety concerns. Particularly for adequate ingress and egress of construction and private vehicles.

A proposed mitigation measure is to convert the intersection into a channelised right turn, through the reconfiguration and re-alignment of the existing line marking. There is little benefit in converting the layout into a signalised intersection, particularly for temporary haulage operations such as this.

The AUSTRROADS guidelines stipulate that the following layout is the most common form of channelisation for rural roads:

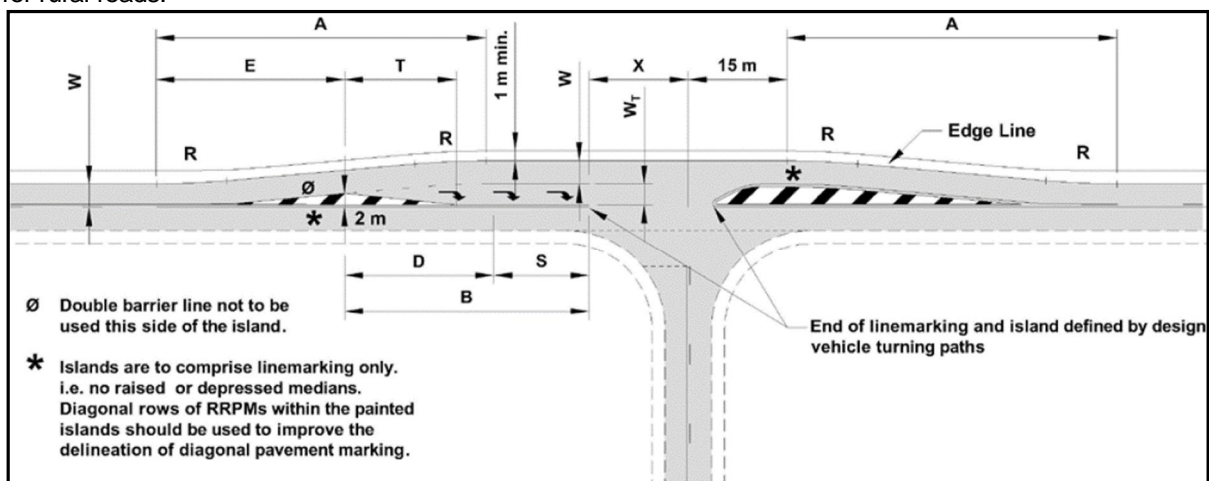


Figure 6-1 Rural CHR(S) Treatment

By re-aligning the line marking to facilitate for a continuous left lane and a right turn storage bay, a turning lane of 100 metres can be introduced (See **Figure 6-2**). Vehicles intending to continue southbound, will remain in the left lane as vehicles intending to access Woodburn-Coraki Road, will be accommodated by the storage bay. This will minimise the delay and the number of overtaking manoeuvres performed by vehicles caught behind right-turners. This treatment can be implemented temporarily, however permanent conversion would provide safer long-term operation, following the completion of W2B.

NOTE - Further study will need to be pursued by the Portion Team, to assess safety, radius and sight distance criteria, for the satisfactory implementation of this treatment.

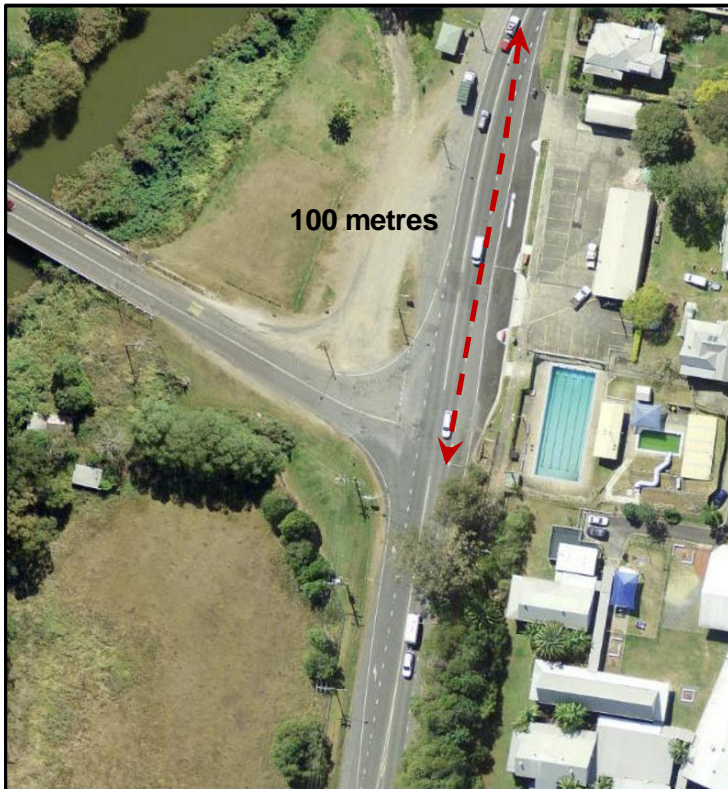


Figure 6-2 Storage Bay Distance for Southbound on the Pacific Highway

6.2 Temporary Traffic Management Plan and Signage

Due to fluctuations in project demands; there will be circumstances where the frequency of haulage operations will increase or decrease. An alternative to delineation amendments, would be the introduction of a traffic management plan (TMP). Positioning traffic controllers, variable message signs and adequate tapering, this intersection could be managed during peaks in construction activities. Already operating at 50km/h and within a school zone, the slowing down of traffic typically takes place at this location. Therefore, to accommodate for the number of turning vehicles accessing entering/exiting Woodburn-Coraki Road, a TMP could be applied.

Pacific Complete construction staff and/or their contractor would need to liaise with the Pacific Complete logistics team, to ascertain other construction activities, such as concrete and precast unit deliveries, to ensure future proposed TMPs account for situation specific traffic movements. These TMPs will be prepared in accordance with the approved Woolgoolga to Ballina Pacific Highway Upgrade Construction Traffic and Access Management Plan (CTAMP), Appendix B1 of the Construction Environmental Management Plan.

6.3 Additional Safety Measures and Practices

The implementation of GPS tracking of haulage vehicles should be investigated to observe the location of haulage trucks during school peak hours and ensure minimal impact on bus operations.

Prefaced within Section 3.2, it has been assumed 9 hours of effective hauling time, due to the clash with school peaks. The application of GPS tracking will facilitate for more predictable traffic management, particularly between 7:00-9:00AM and 3:00PM- 5:00PM, to ensure more effective road utilisation for buses and trucks.

7. CONCLUSION

Moonimba Borrow Site is presently operating under a Richmond Valley Council DA 2015/97 approved for the extraction of 30,000m³ of material per annum. An additional consent was granted in 2015 for the extraction of 90,000 m³ of material and importation of 30,000 m³ of fill material. This consent has not currently been activated. Pacific Complete is proposing to extract one million tonnes (1,000,000 tonnes), which is equivalent to 400,000m³ of aggregate per annum. By utilising the previous Transport and Traffic Impact Assessment developed by **Greg Alderson & Associates** and the previously issued **W2B EIS**, existing traffic and road data; this high-level traffic impact assessment produced the following observations:

Table 7.1 Summary of Observations

Observations	Comments
Study Area traffic volumes	<ul style="list-style-type: none"> With the ongoing completion of segments of the W2B alignment, traffic switches and traffic behaviours are anticipated to change. Prior to the anticipated completion of the W2B project in 2020, total through volumes on the Pacific Highway are expected to be lower than existing AADT. Without specific traffic count data, it was assumed that general traffic volumes would increase over the course of the project, to provide a conservative assessment of the network's performance. In reality this could be different, implicating a lower impact than initially measured. Therefore, temporary changes and improvements to the study area are considered more feasible for the operational purposes of the Project Team and general public.
Coraki Borrow Site	<ul style="list-style-type: none"> North-West of the Moonimba Borrow Site, a quarry in Coraki is in operation. The quarry has approved to dispatch 21 vehicles per hour, with consideration to increase this to 31 vehicles per hour. These volumes contribute to the total volumes travelling via Woodburn-Coraki Road and turning onto the Pacific Highway.
Woodburn-Coraki Road and Pacific Highway Intersection	<ul style="list-style-type: none"> Forecasted traffic volumes implicate right-turn channelisation of this intersection. The extractive rates calculated in Section 3.2, present averaged and maximum truck movements, to account for influxes in project demands. This traffic impact assessment applied local traffic volumes 20% greater than forecasted, to anticipate changes in land use and Pacific Highway utilisation. Heavy vehicle impacts were compared against combined vehicle operation at this intersection. This assessment confirmed that the cumulative impacts from Coraki and Moonimba quarries warrants further management of the Woodburn-Coraki Road and Pacific Highway junction.

Considering these observations, it is clear the region depends on the efficient operation of Woodburn-Coraki Road. In the event of adverse weather and the potential temporary closure of this path, construction and haulage proceedings can be significantly set back, if not appropriately managed.

Changes to delineation on the Pacific Highway, in conjunction with adequate wayfinding and signage protocols, ingress and egress manoeuvres can be improved. Woodburn-Coraki Road and the Pacific Highway intersection are in proximity to schools and residences. The increased number of heavy vehicles introduces further risks and hazards to locals. Therefore, management of this access point are paramount.

Further studies into road condition, geometry, safety and construction scheduling will need to be pursued further by Pacific Complete and/or their contractor, to adequately address the feasibility of introducing a TMP or reconfiguring the Woodburn-Coraki Road - Pacific Highway intersection. The findings of this report are the indicative impacts created by future local and development traffic.

REFERENCES

Greg Alderson & Associates. (2014). *Transport and Traffic Impact Assessment - Extension of Moonimba Quarry Bungawalbin*. Nashua: Greg Alderson & Associates.

Roads and Maritime Service + Aurecon + SKM. (2012). *Pacific Highway Upgrade - Environmental Impact Statement*. North Sydney: Roads and Maritime Services.

APPENDIX D NOISE IMPACT ASSESSMENT



global environmental solutions

Woolgoolga to Ballina Pacific Highway Upgrade
Moonimba Borrow Site
Noise Impact Assessment

Report Number 610.16962.00000.0650-R01

25 July 2017

Pacific Complete
21 Prince Street,
Grafton
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Version: v2.1

Woolgoolga to Ballina Pacific Highway Upgrade

Moonimba Borrow Site

Noise Impact Assessment

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This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

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610.16962.00000.0650-R01-v1.2	13 July 2017	Alex Campbell / Mark Russell / Micheal Allan	Mark Russell	Alex Campbell

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1 INTRODUCTION

Pacific Complete on behalf of Roads and Maritime Services (RMS) is preparing a modification report for the Woolgoolga to Ballina Pacific Highway Upgrade Project (W2B) for the use of the Moonimba Quarry, known to the project as Moonimba Borrow Site, situated in Bungawalbin, NSW ('the facility'). This noise assessment has been prepared by SLR Consulting Pty Ltd (SLR) and will form part of the modification report.

Pacific Complete is proposing to intensify the extraction rate at the site to one million tonnes (1,000,000 tonnes), which is equivalent to 400,000 m³ of aggregate per annum to provide sufficient material to complete the W2B project. The purpose of this assessment is to address potential noise impacts from the increased extraction rate on the surrounding community. Matters addressed in this assessment are:

- Airborne noise from extraction processes on the site
- Airborne noise impacts from haulage vehicles travelling on the public road network

The Moonimba Borrow Site is situated approximately 16km south-west of Woodburn. It resides to the west of Portion C of the W2B project. Split between two pits, the site will operate with a total excavation area of 21 hectares.

2 PROJECT OVERVIEW

2.1 Project locality

The project site is situated in the Northern Rivers region of north-eastern New South Wales, located about 10 km south west of Woodburn and 5km south of the Richmond River at Swan Bay. The site is accessed from the north via Boggy Creek Road. Excavation pits are located on top of a plateau, above the Moonimba Ridge and is the main topographical high point in the localised area, situating the borrow site above neighbouring residents. **Figure 1** illustrates the location of the project site.

Land use in the vicinity of the project site is primarily large agricultural holdings, mainly grazing and cropping.

Figure 1 Location of the project site



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Project Number:	610.16962
Location:	Richmond Valley, NSW
Other Information:	
Projection:	GDA 1994 MGA Zone 55
Date:	25/05/2017



Pacific Complete
**Moonimba Quarry Expansion
Air Quality Impact Assessment**
Project Location

2.2 Project description

Pacific Complete is proposing to intensify the extraction rate at the site to 400,000 m³ per annum for two years to provide sufficient material to complete the W2B project. The project site consists of two pits i.e. the Eastern Pit and the Western Pit.

The operations on the project site will generally involve:

- Clearing of Vegetation
- Removal and stockpiling of topsoil and overburden;
- Offsite transport of overburden;
- Crushing and screening of raw material in mobile processing plants and stockpile products;
- Importation of fill for use in rehabilitation of the borrow site.

It is proposed to extract a total of 800,000 m³ of aggregate in two years. In order to achieve this, it is proposed to open 21 hectares of land (total area of the two pits) and commence quarrying in the two pits. As such, mobile processing plants will be used on site and stockpiling of overburden and product will be carried out at various locations within the two pits.

The project site is accessed from Boggy Creek Road via a 1.6 km dedicated paved road which has been constructed to Council's requirements pursuant to consent 127/95. The paved road ends at the boundary of the project site, from which point an unpaved access road continues south for 1.4 km to a fork from which one road heads to the Eastern Pit, and the other to the Western Pit.



A description of the activities for the first and second year of operation at the project site is presented in **Table 1**. **Figure 2** illustrates the layout of the project site.

Table 1 Description of proposed operations

Description	Year 1	Year 2
Process	Removal of topsoil Placement of topsoil Removal of overburden Removal of raw material Processing of raw material in mobile screening and crushing plants Loading of product and overburden to trucks for off-site transportation	Removal of raw material Drilling and Blasting Processing of raw material in mobile screening and crushing plants Loading of product and overburden to trucks for off-site transportation
Operating hours	7 am to 6 pm Monday to Friday 8 am to 5 pm Saturday	7 am to 6 pm Monday to Friday 8 am to 5 pm Saturday
On-site transportation	Dump trucks	--
Off-site transportation	B-Doubles	B-Doubles

Figure 2 Project site layout



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	<p><small>© 2017 DigitalGlobe, GeoEye, Earthstar Geographics, CNR Aero, IGN, AeroGRID, IGN, SIO, © 2017 Microsoft Corporation</small></p>	

2.3 Current operational approvals

The existing borrow site operates under Development Consent 127/1995 with a maximum extraction of 30,000 m³ per annum. A more recent development consent (DA2015.0069) has been given consent by Richmond Valley Council for the extraction of 90,000m³, however this consent has not been activated at this time. The borrow site operation extracts sand and sandstone by blasting and excavation. The Noise Impact Assessment submitted as part of the application to work under this extract rate has been reviewed by SLR in developing this assessment (document reference: “*Noise Impact Assessment – Extension of Moonimba Quarry Bungawalbin*”, Greg Alderson & Associates Report No. 06139_NIA_Rev B dated 23/09/2014 herein referred to as the ‘existing approval noise assessment’). Where necessary, for example in establishing operational noise emission criteria, SLR’s assessment makes reference to this report.

The existing approval assessment is based upon compliance with the NSW EPA “*Industrial Noise Policy*” for on-site operational noise sources.

In relation to noise emission the existing Consent Conditions list the following:

- The use shall not interfere with the amenity of the locality by reason of emission of noise (...)
- The development shall meet noise emission criteria (...) as specified by the Environmental Protection Authority
- The noise activities required by the operation of the quarry should not create, generate or emit offensive noise so as to be heard at the nearest affected residence. Offensive noise means noise that by reason of its level, nature, character or quality or the time at which it is made or any other circumstances is likely:
 - To be harmful to,
 - To be offensive to, or
 - To interfere unreasonably with the comfort or response of a person.

2.3.1 Summary of 2015 Noise Assessment

The approved 2015 assessment (DA2015.0069) was assessed to an extraction rate of 193,000 tonnes per annum using the following equipment:

- Excavator
- Loader
- Crusher
- Screener

In addition to this, material was assessed to be taken off site using HGV trucks. There are no proposed changes to the type of vehicles or haulage route used to remove material from the site.

The assessment undertaken for the 2015 approval allowed for one (1) item of each of the proposed equipment, operating simultaneously in both the East and the West pits. Predictions were made at the then current pit level of 4-10m below relative ground level representing commencement of operations.

The 2015 assessment was undertaken using the SoundPlan software package. The calculation algorithm used is not stated within the assessment. However, the following meteorological assumptions were used:

- 50% humidity,
- Ambient temperature of 25°C,
- Receiver height of 2m, and a worst case
- Wind speed of 5m/s.

The 2015 assessment showed compliance with the established criteria for all on-site operational noise sources, however a number of ‘best practice’ management measures were recommended to limit overall noise emissions. Minor (<2dB) exceedances to the criteria were reported for off-site vehicle movements and, as a result, mitigation was recommended in the form of reduced vehicle speeds on public roads.

3 PROJECT SETTING

3.1 Sensitive receivers

The site is situated in a rural environment surrounded by farming properties and nature reserves. A number of non-project related residential dwellings are situated in the area surrounding the project site. A list of existing sensitive receptor points identified in the immediate vicinity of the project site is provided in **Table 2** along with the respective distances of each of these receptor points to the site boundary and the proposed extraction boundary.

Figure 3 illustrates the location of the surrounding receptors in relation to the project site. The numbering used in the SLR AQIA 2017 (SLR report 610.16962-AQIA-R01-v0.1) has been used in this assessment in order to facilitate comparison between the two reports. Note that Receiver R36 is within the boundary of the borrow site, as this is the residence of the borrow site owner.

Figure 3 Location of the Identified Sensitive Receptors

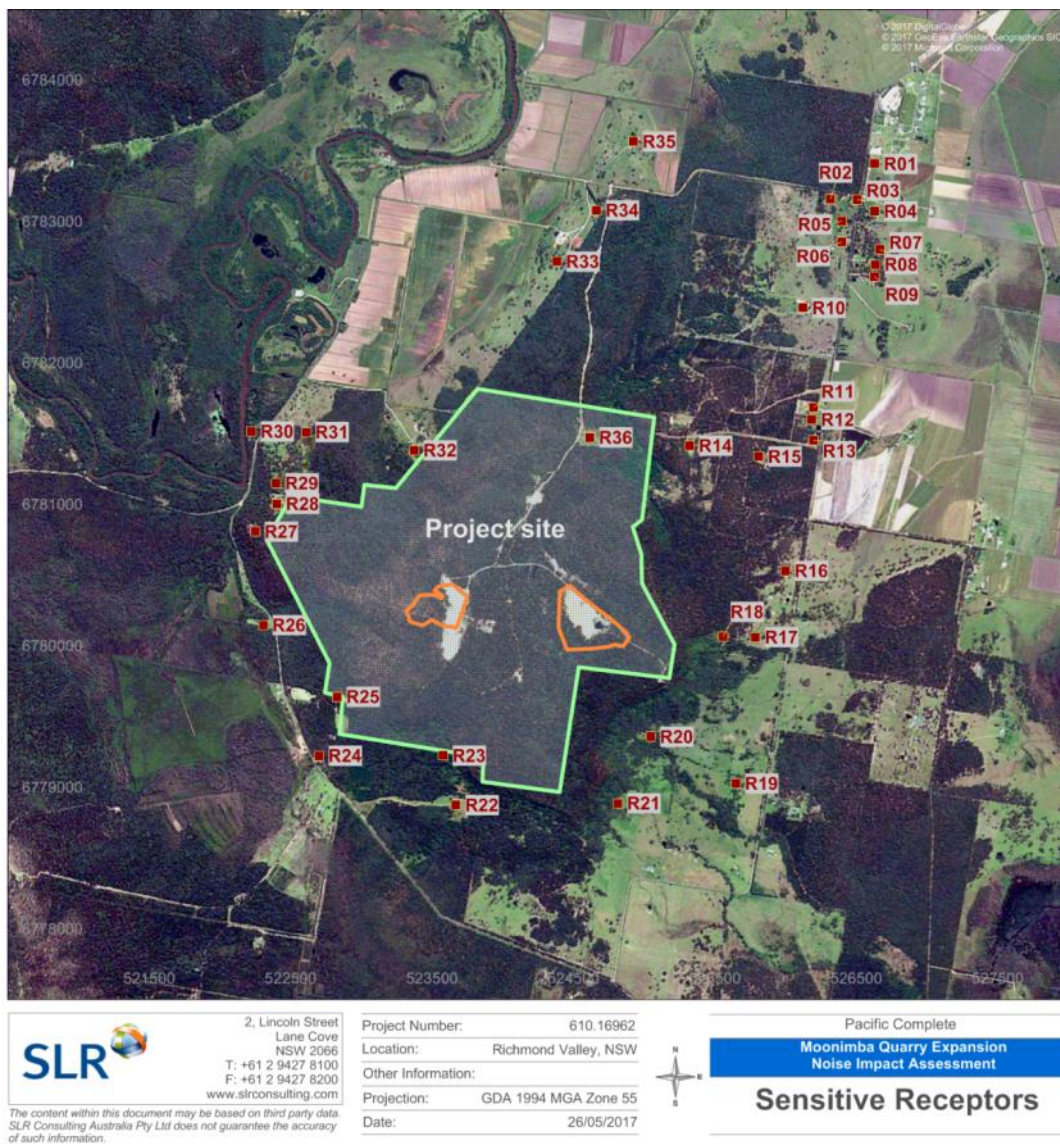


Table 2 Details of identified sensitive receivers

Receptor ID	Location (m, UTM)		Distance (m) from nearest proposed extraction boundary	Elevation (m, AHD)
	Easting	Northing		
R1	526,627	6,783,408	3,660 / NE	27
R2	526,316	6,783,160	3,285 / NE	26
R3	526,504	6,783,156	3,400 / NE	30
R4	526,627	6,783,073	3,400 / NE	19
R5	526,392	6,783,005	3,220 / NE	17
R6	526,394	6,782,855	3,090 / NE	11
R7	526,664	6,782,802	3,210 / NE	18
R8	526,631	6,782,697	3,120 / NE	18
R9	526,625	6,782,609	3,040 / NE	18
R10	526,121	6,782,390	2,550 / NE	9
R11	526,197	6,781,687	2,050 / NE	13
R12	526,183	6,781,599	2,000 / NE	12
R13	526,195	6,781,452	1,900 / NE	14
R14	525,319	6,781,416	1,290 / NE	65
R15	525,808	6,781,339	1,550 / NE	28
R16	525,997	6,780,531	1,200 / E	33
R17	525,785	6,780,062	885 / E	39
R18	525,555	6,780,067	660 / E	66
R19	525,645	6,779,028	1,250 / SE	40
R20	525,044	6,779,358	666 / SE	73
R21	524,812	6,778,888	1,100 / S	80
R22	523,667	6,778,875	1,230 / S	58
R23	523,577	6,779,225	885 / S	92
R24	522,700	6,779,224	1,140 / SW	27
R25	522,827	6,779,641	715 / SW	43
R26	522,303	6,780,147	1,005 / W	17
R27	522,248	6,780,808	1,185 / NW	45
R28	522,399	6,781,005	1,180 / NW	31
R29	522,394	6,781,150	1,270 / NW	30
R30	522,219	6,781,517	1,650 / NW	16
R31	522,607	6,781,512	1,410 / NW	7
R32	523,371	6,781,383	980 / N	26
R33	524,380	6,782,717	2,280 / N	11
R34	524,659	6,783,080	2,660 / N	15
R35	524,921	6,783,566	3,150 / N	13
R36*	524,613	6,781,474	1,050 / N	97

*Note R36 is the borrow site owner

4 EXISTING ACOUSTICAL ENVIRONMENT

Background noise measurements were undertaken by Greg Alderson & Associates in 2014 and documented in their report *Noise Impact Assessment – Extension of Moonimba Quarry Bungawalbin (ref 06193_NIA_RevB)*.

Unattended measurements were conducted at 4 locations surrounding the project site, with daytime Rating Background Levels (RBL) close to or below 30 dBA. Measurements presented in the existing approval noise assessment report are representative of a quiet rural environment with limited influences from local traffic or industrial sources.

In addition to the background monitoring conducted for receivers close to the project site, the existing approval noise assessment report conducted two measurements at locations close to the road to establish existing noise levels from local traffic. Results from these measurements have been used to assess the impact from haulage vehicles on local roads and is presented in **Section 7.2** of this report.

The monitoring conducted in the existing approval noise assessment report is considered valid and representative of the local ambient environment. At this stage no further monitoring has been undertaken for this assessment.

5 NOISE CRITERIA

The following policies have been used in this assessment:

- On-site noise sources from extraction process: NSW EPA “*Industrial Noise Policy*” (INP)
- Off-site road traffic sources: NSW RMS “*Road Noise Policy*” (RNP)

5.1 Operational noise: NSW Industrial Noise Policy

The NSW Industrial Noise Policy (INP), dated January 2000, provides a framework and process for deriving noise criteria for consents and licences that enables the EPA to regulate premises that are scheduled under the Protection of the Environment Operations Act 1997.

The specific policy objectives are to:

- Establish noise criteria that would protect the community from excessive intrusive noise and preserve the amenity for specific land uses;
- Use the criteria as the basis for deriving project specific noise levels;
- Promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects;
- Outline a range of mitigation measures that could be used to minimise noise impacts;
- Provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of the industrial development; and
- Carry out functions relating to the prevention, minimisation and control of noise from the premises scheduled under the Act.

5.1.1 Intrusiveness criteria

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{eq}) of the source should not be more than 5dBA above the measured (or default) Rating Background Level (RBL).

In relation to the default RBL, if a minimum background noise level of 30dBA is assumed as the RBL and the assessment shows no impact, then there is no need for background noise monitoring, as this represents a conservative and limiting case.

5.1.2 Amenity criteria

The amenity assessment is based on noise criteria specific to the land use and associated activities. The criteria relate only to industrial-type noise and does not include road, rail or community noise. If present, the existing noise level from industry is generally measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion. For high-traffic areas there is a separate amenity criterion. The cumulative effect of noise from industrial sources also needs to be considered in assessing the impact.

The Amenity Criteria for ‘Rural Residential’ receivers such as those surrounding the Moonimba Borrow Site are shown in **Table 3**.

Table 3 - INP amenity criteria

Type of receiver	Time of day	Recommended $L_{eq,t}$ Noise Level, dBA	
		Acceptable	Maximum
Residential - Rural	Day	50	55
	Evening	45	50
	Night	40	45

5.1.3 Project specific criteria

The Project Specific criteria are the more onerous of either the Intrusiveness or Amenity criteria for a given receiver.

Site measurements and assessment in accordance with INP methodology was undertaken as part of the existing approval noise assessment. All receivers showed a background noise level represented by (or below) 30 dBA L_{90} in all periods. As a result, a consistent Project Specific noise criteria of **35 dBA $L_{eq,t}$** was applied to all receivers at all times of day, evening and night. This is based on the 'Intrusiveness Criteria' of the INP.

5.2 Off-site road traffic: NSW Road Noise Policy

While light and heavy vehicle movements within the site are classified as part of the site noise, once they move off the site and onto public roads they are assessed under the *NSW Road Noise Policy* (RNP).

One of the objectives of the RNP is to apply relevant permissible noise increase criteria to protect sensitive receivers against excessive decreases in amenity as a result of the project. In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

On this basis, construction traffic NMLs set at 2 dB above the existing road traffic noise levels during the daytime and night-time periods are considered appropriate to identify the onset of potential noise impacts. Where the road traffic noise levels are predicted to increase by more than 2 dB as a result of construction traffic, consideration would be given to applying feasible and reasonable noise mitigation measures to reduce the potential noise impacts and preserve acoustic amenity.

In considering feasible and reasonable mitigation measures where the relevant noise increase is greater than 2 dB, consideration would also be given to the actual noise levels associated with construction traffic and whether or not these levels comply with the following road traffic noise criteria in the RNP:

- 60 dB $L_{Aeq(15hour)}$ daytime and 55 dB $L_{Aeq(9hour)}$ night-time for existing freeway / arterial / sub-arterial roads.
- 55 dB $L_{Aeq(1hour)}$ daytime and 50 dB $L_{Aeq(1hour)}$ night-time for existing local roads.

An increase of greater than 2 dB requires an increase in overall traffic volumes on the road of approximately 60% or higher.

The following roads may experience increased traffic due to the proposed increased extraction from the facility:

- Public areas of the borrow site Access Road
- Boggy Creek Road (East of access road)
- Reardons Lane (North of Boggy Creek Road)

- Woodburn-Coraki Road (East of Reardons Lane)

The existing approval noise assessment identified these sections of roads as a 'principal haulage route' confirmed by Richmond Valley Council. As a result, in accordance with Section 2.2.2 of the RNP, the noise criteria for Arterial / Sub-Arterial roads stated in the RNP are to be used. That is:

- **Day (07.00 – 22.00): 60 dB L_{Aeq(15hour)}**
- **Night (22.00 – 07.00): 55 dB L_{Aeq(9hour)}**

6 ASSESSMENT OF ON-SITE OPERATIONAL NOISE EMISSIONS

6.1 Calculation

This section describes the calculations undertaken and presents the results for operational noise predictions from the extraction process.

6.1.1 Methodology

In order to predict the noise emissions from the plant and equipment operating on-site to extract materials, a computer noise prediction model using the CONCAWE algorithms was developed using SoundPLAN 7.1 software.

Local terrain has been digitised in the noise model to develop a three-dimensional representation of the construction sites and surrounding environment. The noise modelling takes into account source sound level emissions and locations, screening effects, receiver locations, meteorological effects, ground topography and noise attenuation due to spherical spreading and atmospheric absorption.

6.1.1.1 Concawe

The SoundPLAN model utilised noise propagation calculation algorithms in accordance with CONCAWE prediction method. The CONCAWE method was developed for large open air industrial facilities and incorporates the influence of wind and atmospheric stability on propagation.

6.1.1.2 Meteorological conditions for modelling

One of the objectives of the noise assessment is to consider the effects of relevant meteorological conditions (wind, temperature, humidity and temperature inversions) on noise propagation from the project area. The meteorological conditions used for the noise modelling have been determined in accordance the guidelines presented in the NSW *Industrial Noise Policy* (NSW Department of Environment and Climate Change & Water (DECCW), 2000).

SLR has prepared an air quality assessment for the project and as part of that study a detailed analysis was undertaken to characterise prevailing weather conditions at the project site (refer to report 610.16962-AQIA-R01-v0.1)

Year 2016 annual meteorological data (the most recent available) was analysed by SLR using the CALMET meteorological model to determine prevailing wind and atmospheric conditions and to determine whether noise modelling should account for enhanced propagation conditions (SLR Consulting Australia, 2016).

6.1.1.3 Wind effects

Wind has the potential to increase noise at a receiver when wind is light and stable, and blows from the direction of the source of noise to the receiver. At higher wind speeds, the noise produced by the wind can obscure noise generated from industrial and transport sources.

Wind effects need to be considered where wind is a feature of the project area. The INP states that where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30 per cent of the daytime, evening or night-time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

The weather data was analysed to determine the frequency of occurrence of winds speeds up to 3 m/s during the operating period of the project site (daytime). The results of the wind analysis for the daytime periods are presented in **Table 4**. The table presents the direction and percentage of occurrence where wind is found to occur for greater than 30 per cent of the time. Where wind is found not to occur 30 per cent of more for a given seasonal period, the most dominant wind direction is presented.

Table 4 Seasonal Frequency of occurrence wind speed intervals – Daytime

Period	Calm (<0.5 m/s)	Wind Direction ±45°	Wind Speed ¹		
			0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Annual	2.1%	SE	23.6%	6.1%	29.6%
Summer	0.4%	NNE	11.6%	18.9%	30.5%
		NE	14.7%	16.2%	30.9%
		ESE	20.3%	10.1%	30.4%
		SE	23.3%	12.3%	35.6%
		SSE	24.7%	12.8%	37.6%
		S	21.4%	10.7%	32.1%
Autumn	4.3%	E	33.2%	1.5%	34.7%
		ESE	38.4%	2.1%	40.6%
		SE	37.9%	3.1%	41.0%
		SSE	32.8%	4.1%	36.9%
Winter	2.6%	SSE	21.9%	3.3%	25.2%
Spring	1.1%	NNE	15.2%	17.0%	32.2%
		NE	16.1%	17.6%	33.7%
		ENE	15.9%	14.2%	30.1%

Note 1: Shading represents wind direction occurrences of greater than 30%

The above analysis of prevailing wind conditions indicates that during the daytime period, winds of up to 3 m/s exceed the 30% threshold during most seasons.

Based on the prevailing wind analysis, assessment of adverse weather from wind influence during the daytime is required.

6.1.1.4 Temperature inversion

Temperature inversions have the ability to increase noise levels by focusing sound waves towards sensitive receivers. Temperature inversions occur predominantly at night-time when the atmosphere is stable and temperatures are cooler. For a temperature inversion to be a significant characteristic of the area, the INP defines that it needs to occur for approximately 30% of the total night-time during winter.

The Pasquill-Gifford assignment scheme identifies seven Stability Classes – A to G – to categorise the degree of atmospheric stability, as shown in **Table 5**. Atmospheric Stability Class F represents the conditions in which temperature inversion are likely to occur. Class D represents neutral conditions, where temperature inversions are unlikely to occur.

Table 5 Description of Atmospheric Stability Classes

Atmospheric Stability Class	Category Description
A	Extremely unstable
B	Moderately unstable
C	Slightly unstable
D	Neutral
E	Slightly stable
F	Moderately stable
G	Extremely stable

As site operations are limited to daytime hours only, temperature inversions have not been considered. The atmospheric stability class “D” has been used for all .

6.1.1.5 Modelled meteorological parameters

As per the findings of the meteorological data analysis detailed above, enhanced propagation conditions have been modelled based on local wind conditions. This atmospheric and wind speed class triggers CONCAWE meteorological category 6 which provides for the most enhanced (worst case) propagation conditions from source to receiver.

Selected temperature and humidity conditions are based on indicative average values for the day period at the project area (refer to SLR air quality assessment report 610.16962-AQIA-R01-v0.1) **Table 6** summaries the meteorological modelling parameters used within this assessment.

Table 6 Modelled meteorological parameters

Weather conditions	Neutral weather	Enhanced weather
Temperature	25°C	25°C
Humidity	50%	50%
Atmospheric stability class	D	D
Wind speed	0 m/s	3 m/s
Wind direction	N/A	Downwind
Temperature inversion	No	No

6.1.2 Modelled scenarios

Work activities will be undertaken in three (3) operating scenarios

- Scenario 1 - Site establishment
- Scenario 2 - Extraction, crushing and loading operations in the existing excavation area (typical RL 90 m western pit and RL120 m eastern pit)
- Scenario 3 - Extraction ,crushing and loading operations in the worst case highest works elevation (typical RL 109 m western pit and RL 145 m eastern pit)

Figure 4 indicates the general locations within the site of each scenario.

6.1.3 Equipment list and equipment locations

The list of equipment provided to SLR for each operational scenario above is presented in **Table 7**.

Figure 4 Modelled operation scenario locations

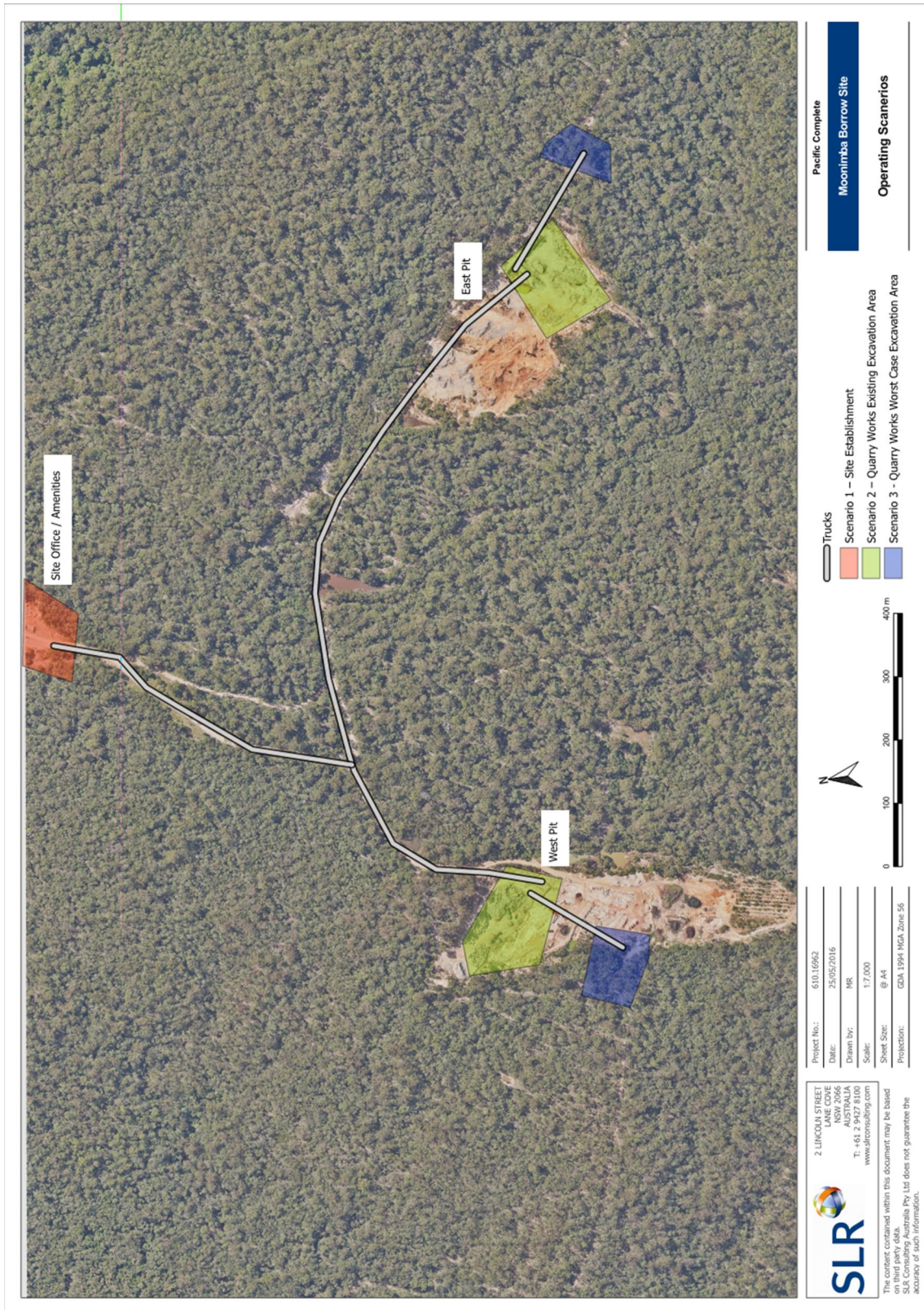


Table 7 - Equipment list for operational scenarios

	Description of works	Hours	Plant (total plant items operating)
Scenario 1: Site establishment/ decommissioning (site office/amenities)	Site Establishment - works required to prepare the site for extraction operations	7am-6pm (Mon - Fri), 8am-5pm Saturday	3x Semi trailers and other delivery trucks 1x Small mobile crane 1x Grader 1x 13T Padfoot roller 1x 13T Smooth drum roller 1x 23T Excavator, 5 x LVs 1x Watercart
Operational scenarios 2 and 3	Extraction Operations – Modelled operating within each pit	7am-6pm (Mon - Fri), 8am-5pm Saturday	1x Excavator 1x Bulldozer 3x Articulated dump truck 1x Water cart 1x Smooth drum roller 2x Light vehicles
	Crushing, screening, stockpiling Modelled operating within each pit	7am-6pm (Mon - Fri), 8am-5pm Saturday	1x Metso 1213 S Impact crusher screen 1x Excavator 1x Front end loader, 1x Watercart, 2x Light vehicles
	Crushing, screening, stockpiling with jaw crusher Modelled operating within each pit	7am-6pm (Mon - Fri), 8am-5pm Saturday	1x Additional Metso LT106 Jaw crusher 1x McCloskey R155 reclaimer screen 1x Excavator 1x Front end loader 1x Watercart 2x Light vehicles
	Loading Modelled operating within each pit	7am-6pm (Mon - Fri), 8am-5pm Saturday	Trucks (14 movements per 15 minutes) Front end loader

The fixed plant and mobile equipment noise levels used in the noise model have been obtained from the existing SLR database. **Table 8** presents overall maximum A weighted sound power level (SWL) for each item of significant noise emitting equipment which Pacific Complete has indicated will be used at the borrow site.

Table 8 SWLs of Fixed Plant and Mobile Equipment

Operational Scenario	Equipment	SWL LAeq (dBA)
Site Establishment	Semi-trailers	108
	Mobile crane	108
	Grader	114
	Padfoot roler	102
	Smooth drum roller	102
	Excavator	108
	Light vehicles	101
	Watercart	116
Extraction Operations	Excavator	110
	Bulldozer	121
	Dump truck	108
	Watercart	116
	Smooth drum roller	102
	Light vehicles	101
Crushing, screening, stockpiling	Metso 1213 S Impact crusher screen	124
	Excavator	110
	front end loader,	114
	watercart,	116
	Light vehicles	101
Crushing, screening, stockpiling with jaw crusher	Additional Metso LT106 Jaw crusher	124
	McCloskey R155 reclaimer screen	117
	Excavator	110
	Front end loader	114
	Watercart	116
	Light vehicles	101

It should be noted that the sound power level given for each item of mobile equipment does not include noise emissions which emanate from reversing alarms.

6.1.4 Modifying factors

'Modifying factors' in accordance with the NSW INP for noise sources identified in **Table 8** have been considered for appropriateness within this assessment.

- Tonal noise: The only equipment that will contain tonal characteristics are reversing beepers on vehicles and machinery. As these operate for short durations within any 15minute period and are unlikely to be loud enough to be audible at the surrounding noise sensitive receivers, no correction factor is to be applied. Further discussion on reversing beepers is included in **Section 6.5**.
- Low frequency noise: Assessment was undertaken as part of the previous noise impact assessment for the 2015 Development Application. Based on measurements of the equipment on the site no low-frequency correction was required to be applied. Noise spectra from manufacturer data for all equipment used in SLR's assessment have also shown that no low frequency noise correction should be applied.
- Impulsive noise: No sources are impulsive in nature as described by the INP.
- Intermittent noise: No sources are intermittent in nature as described by the INP.

As a result, no modifying factors have been applied in SLR's calculations.

6.2 Results

The following tables, **Table 9**, **Table 10** and

Table 11 present the predicted LAeq(15minute) noise level contributions from the proposed borrow site operations together with the respective criteria at each sensitive receiver.

Colouring presented within the following tables indicates the range of predicted worst case exceedances:

- Blue: 1-5 dBA
- Yellow: 6-10 dBA
- Orange 11-20 dBA
- Red: > 20 dBA

Table 9 Noise Level Impact Assessment - Scenario 1

Receiver Name (ID)	LAeq(15minute) Criterion	Site Establishment	
		Neutral Weather	Enhanced Weather
R01	35	<20	22
R02	35	<20	24
R03	35	<20	23
R04	35	<20	23
R05	35	<20	24
R06	35	<20	25
R07	35	<20	24
R08	35	<20	24
R09	35	<20	25
R10	35	22	28
R11	35	<20	<20
R12	35	<20	<20
R13	35	<20	<20
R14	35	<20	<20
R15	35	<20	<20
R16	35	<20	<20
R17	35	<20	<20
R18	35	<20	<20
R19	35	<20	<20
R20	35	<20	<20
R21	35	<20	<20
R22	35	<20	<20
R23	35	<20	<20
R24	35	<20	<20
R25	35	26	31
R26	35	26	32
R27	35	28	33
R28	35	28	34
R29	35	28	33
R30	35	26	32
R31	35	28	34
R32	35	34	39
R33	35	25	31
R34	35	23	29
R35	35	20	26
R36	35	27	32

Table 10 Noise Level Impact Assessment - Scenario 2

Receiver Name (ID)	LAeq(15minute) Criterion	Crushing East		Crushing West		Extraction East		Extraction West		JAW Crushing East		JAW Crushing West		Loading East		Loading West	
		Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather
R01	35	<20	25	<20	<20	<20	22	20	25	24	28	<20	22	<20	<20	<20	<20
R02	35	21	26	<20	20	<20	22	20	26	25	29	20	24	<20	<20	<20	<20
R03	35	21	26	<20	<20	<20	22	<20	25	25	29	<20	23	<20	<20	<20	<20
R04	35	20	25	<20	<20	<20	20	<20	25	24	28	<20	23	<20	<20	<20	<20
R05	35	<20	24	<20	20	<20	20	21	26	25	28	20	24	<20	<20	<20	<20
R06	35	<20	23	<20	21	<20	<20	21	26	24	27	20	24	<20	<20	<20	<20
R07	35	<20	22	<20	<20	<20	<20	20	25	23	26	<20	23	<20	<20	<20	<20
R08	35	<20	22	<20	20	<20	<20	21	26	23	26	<20	23	<20	<20	<20	<20
R09	35	<20	22	<20	20	<20	<20	21	26	23	26	<20	23	<20	<20	<20	<20
R10	35	20	24	<20	23	<20	<20	23	28	26	28	22	26	<20	21	<20	21
R11	35	<20	23	<20	<20	<20	<20	<20	20	25	27	<20	<20	<20	<20	<20	<20
R12	35	<20	23	<20	<20	<20	<20	<20	<20	25	27	<20	<20	<20	<20	<20	<20
R13	35	<20	23	<20	<20	<20	<20	<20	<20	25	28	<20	<20	<20	<20	<20	<20
R14	35	23	27	<20	<20	<20	<20	<20	<20	28	31	<20	<20	<20	<20	<20	<20
R15	35	<20	20	<20	<20	<20	<20	<20	<20	24	26	<20	<20	<20	<20	<20	<20
R16	35	<20	22	<20	<20	<20	<20	<20	<20	23	26	<20	<20	<20	<20	<20	<20
R17	35	<20	<20	<20	<20	<20	<20	<20	<20	21	24	<20	<20	<20	<20	<20	<20
R18	35	<20	21	<20	<20	<20	<20	<20	<20	24	27	<20	<20	<20	<20	<20	<20
R19	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
R20	35	29	33	<20	<20	<20	23	<20	<20	28	31	<20	20	<20	20	<20	<20
R21	35	<20	21	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
R22	35	<20	20	<20	<20	<20	<20	<20	<20	25	28	<20	<20	<20	<20	<20	<20
R23	35	<20	<20	<20	<20	<20	<20	<20	<20	26	29	<20	<20	<20	<20	<20	<20
R24	35	<20	<20	21	25	<20	<20	26	30	20	23	25	27	<20	<20	<20	<20
R25	35	<20	22	38	42	<20	23	40	45	24	27	37	40	<20	24	25	30
R26	35	21	25	36	41	21	26	37	42	26	29	39	42	<20	23	23	28
R27	35	31	36	37	41	27	32	37	42	33	37	40	43	22	28	28	33
R28	35	30	36	40	45	26	32	38	43	33	37	41	45	23	28	28	34
R29	35	30	35	40	45	26	31	37	42	33	37	41	45	22	28	28	33
R30	35	28	34	37	42	24	30	34	39	31	35	39	43	20	26	25	30
R31	35	31	36	39	44	27	32	36	41	33	37	42	45	22	28	26	32
R32	35	29	33	44	48	24	29	42	46	33	36	46	49	23	28	32	37
R33	35	29	35	26	31	26	31	29	34	32	36	30	33	22	28	20	26
R34	35	27	33	23	28	23	29	26	31	30	34	27	31	<20	26	<20	23
R35	35	23	28	20	25	21	26	24	29	27	30	24	28	<20	23	<20	20
R36	35	38	43	28	33	35	40	34	38	43	46	37	40	44	46	44	46

Table 11 Noise Level Impact Assessment - Scenario 3

Receiver Name (ID)	LAeq(15minute) Criterion	Crushing East		Crushing West		Extraction East		Extraction West		JAW Crushing East		JAW Crushing West		Loading East		Loading West	
		Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather	Neutral Weather	Enhanced Weather
R01	35	25	30	23	28	<20	24	<20	24	29	32	27	31	<20	<20	<20	<20
R02	35	25	31	24	30	21	26	21	26	27	32	28	32	<20	21	<20	21
R03	35	25	31	24	29	<20	25	20	25	28	32	27	31	<20	<20	<20	21
R04	35	25	30	23	29	<20	23	<20	25	27	31	26	30	<20	<20	<20	<20
R05	35	24	29	24	30	<20	22	21	26	27	31	28	31	<20	<20	<20	21
R06	35	22	27	25	30	<20	21	21	26	27	30	28	31	<20	<20	<20	21
R07	35	21	26	23	29	<20	21	20	26	26	29	26	30	<20	<20	<20	<20
R08	35	21	25	23	29	<20	20	21	26	26	29	26	30	<20	<20	<20	20
R09	35	21	25	23	28	<20	20	21	26	26	29	26	30	<20	<20	<20	20
R10	35	22	26	27	32	<20	21	23	29	27	30	29	33	<20	21	<20	23
R11	35	23	27	<20	24	<20	22	<20	<20	29	32	25	28	<20	<20	<20	<20
R12	35	23	27	<20	22	<20	22	<20	<20	29	32	24	27	<20	<20	<20	<20
R13	35	23	27	<20	21	<20	22	<20	<20	29	32	23	25	<20	<20	<20	<20
R14	35	24	27	<20	21	<20	24	<20	<20	30	32	22	25	<20	<20	<20	<20
R15	35	25	29	<20	22	<20	23	<20	<20	31	34	24	26	<20	<20	<20	<20
R16	35	21	24	<20	<20	<20	<20	<20	<20	27	29	<20	<20	<20	<20	<20	<20
R17	35	23	27	<20	<20	<20	21	<20	<20	28	30	<20	21	<20	<20	<20	<20
R18	35	26	30	<20	21	21	25	<20	<20	31	33	<20	23	<20	<20	<20	<20
R19	35	<20	24	<20	<20	<20	22	<20	<20	25	28	<20	21	<20	<20	<20	<20
R20	35	29	33	<20	20	26	30	<20	20	33	36	<20	23	<20	21	<20	21
R21	35	<20	23	<20	<20	<20	<20	<20	<20	23	26	<20	22	<20	<20	<20	<20
R22	35	<20	<20	<20	<20	<20	<20	<20	<20	21	23	<20	<20	<20	<20	<20	<20
R23	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
R24	35	<20	23	33	37	<20	<20	29	33	25	28	39	41	<20	<20	<20	23
R25	35	22	26	47	52	<20	23	44	48	28	31	51	54	<20	24	35	39
R26	35	33	39	44	49	29	34	40	45	35	39	47	50	21	27	31	36
R27	35	34	39	42	47	31	36	38	43	37	41	45	48	23	28	30	35
R28	35	33	39	42	47	30	35	39	43	37	40	45	49	22	28	30	35
R29	35	33	38	41	46	30	35	38	42	37	40	44	48	22	28	29	34
R30	35	31	36	37	43	28	33	34	39	35	38	41	44	20	26	26	31
R31	35	33	39	40	45	30	35	36	41	37	40	43	47	22	28	28	33
R32	35	34	39	44	49	29	34	41	46	37	40	47	51	24	29	32	38
R33	35	31	36	32	37	27	32	29	34	34	38	36	39	22	27	23	28
R34	35	29	34	30	35	25	30	27	32	33	36	33	37	<20	25	20	26
R35	35	27	32	27	32	23	28	24	29	30	34	31	34	<20	22	<20	23
R36	35	38	43	37	42	35	40	33	38	42	45	40	44	44	46	44	46

6.3 Discussion

Table 12 presents a summary of the results in **Section 6.2** (under the 'Enhanced Weather' modelling scenarios). Note that the worst case exceedance is reported for each receiver.

Table 12 - Summary of predicted exceedances

Scenario	Number of receivers exceeding criteria within range			
	1-5 dBA	6-10 dBA	11-20 dBA	> 20dBA
Scenario 1	1	0	0	0
Scenario 2	1	7	1	0
Scenario 3	3	2	7	0

The above summary has not included results at Receiver 36. This on-site residential receiver is the owner of the borrow site and is hence considered to be reasonably impacted by operations of the facility.

The results from Scenario 3 show higher exceedances than Scenario 2 due to the work being undertaken at higher ground elevation levels, and hence there is less topographical screening between the source of the noise and the receiver positions. This demonstrates the sensitivity of noise emissions to the location of work on the site. As a result, the Scenario 2 results are representative of the likely noise emissions when appropriate screening is in place.

Whilst the Scenario 2 predicted levels are in excess of the INP recommended targets to limit intrusiveness at the identified receivers, in all instances the absolute levels of noise predicted are not considered to be excessive for the proposed hours of operations, and are below the INP 'Amenity' criteria of 50 dBA $L_{eq,t}$ during daytime periods for rural residential properties. The reason for the exceedance in the intrusiveness criteria is due to exceptionally low existing daytime background noise levels in the area. It is believed that the purpose of the Intrusiveness criteria in the INP is to manage the long-term impact of permanent industrial noise sources. The proposed increase in extraction at the facility is for a limited two year period to meet construction material requirements for the W2B project and as such would not be a permanent operation.

Results detailed in **Table 9** to **Table 11** indicate that works conducted within the eastern pit are predicted to result in a lower level of noise impact at nearby sensitive receivers when compared to works conducted in the western pit. This is due to the intervening topographical features which provide shielding to nearby receivers from works being conducted in the eastern pit.

This noise assessment is necessarily high level in nature as there is no set operational plan for the facility, and as a result several worst-case assumptions have been made in predicting the noise emissions. A detailed operations plan is recommended to be implemented once an operator for the facility is appointed. Should this plan follow the recommendations in **Section 6.5**, it is believed that noise emissions from the facility can be controlled to a level in accordance with the INP 'Amenity' criteria. In addition, noise impacts are restricted to daytime periods only as no night operations are proposed for the facility. As a result, it is considered that this is likely to be deemed acceptable given the short-term (two year) nature of the increased extraction rate from the facility.

6.4 Cumulative impacts

Concurrent noise impacts warrant assessment where more than one activity operates at the same time resulting in the same receiver(s) potentially being impacted by noise from more than one works.

A cumulative impact assessment has been included for activities identified to have the potential to operate concurrently near to similar groupings of receivers. It is important to note that quarrying activities generally move around the site which would result in the worst case impacts at any given receiver being likely to be variable in duration.

The activities that have been identified as having potential for concurrent operations are noted below in **Table 13**.

Table 13 Cumulative works scenarios

Cumulative Activity No.	Eastern Pit	Western Pit
1	Crushing Scenario 2	Extraction Scenario 2
2	Crushing Scenario 2	Loading Scenario 2
3	Jaw Crushing Scenario 2	Extraction Scenario 2
4	Jaw Crushing Scenario 2	Loading Scenario 2
5	Crushing Scenario 3	Extraction Scenario 3
6	Crushing Scenario 3	Loading Scenario 3
7	Jaw Crushing Scenario 3	Extraction Scenario 3
8	Jaw Crushing Scenario 3	Loading Scenario 3
9	Extraction Scenario 2	Crushing Scenario 2
10	Loading Scenario 2	Crushing Scenario 2
11	Extraction Scenario 2	Jaw Crushing Scenario 2
12	Loading Scenario 2	Jaw Crushing Scenario 2
13	Extraction Scenario 3	Crushing Scenario 3
14	Loading Scenario 3	Crushing Scenario 3
15	Extraction Scenario 3	Jaw Crushing Scenario 3
16	Loading Scenario 3	Jaw Crushing Scenario 3

Table 14 and

Table 15 present the worst case predicted noise level for each cumulative activity together with the number of receivers predicted to exceed the noise criteria in 5 dB increments.

Table 14 Cumulative assessment – neutral weather conditions

Cumulative Scenario (East / West)	Highest Predicted Noise level LAeq dBA (Receptor No.)	The number of receivers predicted to exceed 35 dBA				
		1 to 5 dBA	6 to 10 dBA	11 to 15 dBA	16 to 20 dBA	>20 dBA
1 Crushing Scenario 2 / Extraction Scenario 2	42 (R32)	6	2	-	-	-
2 Crushing Scenario 2 / Loading Scenario 2	45 (R36)	-	1	-	-	-
3 Jaw Crushing Scenario 2 / Crushing Extraction Scenario 2	44 (R36)	6	3	-	-	-
4 Jaw Crushing Scenario 2 / Loading Scenario 2	47 (R36)	1	-	1	-	-
5 Crushing Scenario 3 / Extraction Scenario 3	44 (R25)	6	3	-	-	-
6 Crushing Scenario 3 / Loading Scenario 3	45 (R36)	2	1	-	-	-
7 Jaw Crushing Scenario 3 / Extraction Scenario 3	44 (R25)	2	7	-	-	-
8 Jaw Crushing Scenario 3 / Loading Scenario 3	46 (R36)	8	-	1	-	-
9 Extraction Scenario 2 / Crushing Scenario 2	44 (R32)	6	3	-	-	-
10 Loading Scenario 2 / Crushing Scenario 2	44 (R36)	5	4	-	-	-
11 Extraction Scenario 2 / Jaw Crushing Scenario 2	46 (R32)	4	4	1	-	-

Cumulative Scenario (East / West)	Highest Predicted Noise level LAeq dBA (Receptor No.)	The number of receivers predicted to exceed 35 dBA				
		1 to 5 dBA	6 to 10 dBA	11 to 15 dBA	16 to 20 dBA	>20 dBA
12 Loading Scenario 2 / Jaw Crushing Scenario 2	46 (R32)	3	5	1	-	-
13 Extraction Scenario 3 / Crushing Scenario 3	47 (R25)	2	6	1	-	-
14 Loading Scenario 3 / Crushing Scenario 3	47 (R25)	1	7	1	-	-
15 Extraction Scenario 3 / Jaw Crushing Scenario 3	51 (R25)	2	4	4	1	-
16 Loading Scenario 3 / Jaw Crushing Scenario 3	51 (R25)	2	3	5	1	-

Table 15 Cumulative assessment – enhanced weather conditions

Cumulative Scenario (East / West)	Highest Predicted Noise level LAeq dBA (Receptor No.)	The number of receivers predicted to exceed 35 dBA				
		1 to 5 dBA	6 to 10 dBA	11 to 15 dBA	16 to 20 dBA	>20 dBA
1 Crushing Scenario 2 / Extraction Scenario 2	46 (R32)	1	7	2	-	-
2 Crushing Scenario 2 / Loading Scenario 2	48 (R36)	7	-	1	-	-
3 Jaw Crushing Scenario 2 / Crushing Extraction Scenario 2	47 (R36)	2	6	3	-	-
4 Jaw Crushing Scenario 2 / Loading Scenario 2	49 (R36)	7	-	1	-	-
5 Crushing Scenario 3 / Extraction Scenario 3	48 (R25)	2	6	3	-	-
6 Crushing Scenario 3 / Loading Scenario 3	48 (R36)	5	4	1	-	-
7 Jaw Crushing Scenario 3 / Extraction Scenario 3	48 (R25)	3	4	5	-	-
8 Jaw Crushing Scenario 3 / Loading Scenario 3	49 (R36)	5	6	1	-	-
9 Extraction Scenario 2 / Crushing Scenario 2	48 (R32)	-	6	3	-	-
10 Loading Scenario 2 / Crushing Scenario 2	48 (R32)	-	5	4	-	-
11 Extraction Scenario 2 / Jaw Crushing Scenario 2	49 (R32)	-	5	4	-	-
12 Loading Scenario 2 / Jaw Crushing Scenario 2	49 (R32)	-	4	5	-	-
13 Extraction Scenario 3 / Crushing Scenario 3	52 (R25)	3	2	6	1	-
14 Loading Scenario 3 / Crushing Scenario 3	52 (R25)	3	1	7	1	-
15 Extraction Scenario 3 / Jaw Crushing Scenario 3	54 (R25)	2	2	5	3	-
16 Loading Scenario 3 / Jaw Crushing Scenario 3	54 (R25)	2	2	5	3	-

Table 14 and Table 15 indicate that all cumulative activities are predicted to exceed the intrusive criteria (LAeq 35 dBA) at at least one sensitive receiver. It is important to note that a cumulative assessment represents a worst case scenario which includes all plant and equipment operating at 100% for total assessment duration. This situation is unlikely to occur as plant and equipment will move around within the quarry resulting in variable noise emissions levels.

6.5 Recommendations

Due to the necessarily high level nature of this assessment, it is recommended that the following measures are undertaken in order to limit the noise impact of the increased extraction rates from the facility on the surrounding residential receptors:

1. A program of regular noise monitoring is established. As a minimum, noise monitoring should be undertaken:
 - a. Upon commencement for the first time of any new or altered operations on the facility to meet the increased extraction rate (with the exception of Site Establishment works)
 - b. Any time equipment changes are made.
 - c. Any time operations are commenced concurrently for the first time.
 - d. Where operations move to a new location within the approved work area.
 - e. As a result of a valid complaint from a surrounding noise sensitive receptor.

It is recommended that this monitoring be undertaken in full time attendance by suitably qualified acoustic consultant (such as an appropriate employee of a member firm of the Association of Australasian Acoustical Consultants). Attended monitoring is necessary as the predicted noise levels at residences are low in absolute terms and hence may be impacted by sources other than noise emissions from the facility.

Noise shall be monitored concurrently at any impacted residence (identified in **Table 9 - Table 11**) with a position closer to the facility in order to ascertain the contribution that site operations is making to the overall measured noise levels at the residence.

2. Where any exceedances in the agreed criteria are measured, the operator of the facility is to implement all reasonable and feasible measures to achieve the agreed criteria. Such measures may include:
 - a. Forming noise barriers or screening around activities which are found to cause exceedances in the agreed criteria. Depending on the surrounding topography, localised screening around equipment may reduce noise emissions by 10-15 dBA.
 - b. Performing all high-noise activity such as crushing and/or screening at deep excavation areas in existing pits, irrespective of extraction location
 - c. Management surrounding the selection of activities that are undertaken concurrently in order to meet noise emission criteria. This may alter in each geographical section of the site due to topographical screening and distance to the surrounding receivers (i.e., in certain areas more work may be permissible concurrently than when the same work is undertaken on a different part of the site)
 - d. In the event that reversing alarm noise is considered to be a source of disturbance, the alarm noise level should be checked against the appropriate regulatory and health and safety requirements and the necessary mitigating action taken to achieve an acceptable noise reduction without compromising safety standards.
 - e. In the event that rumble grid noise is considered to be a source of disturbance, mitigation applied in the form of lower posted speeds at the grids or localised screening to be installed if appropriate.

3. Engage with the local community in order to ensure that they are kept informed as to the reasons for the short-term increase in noise from the facility. Provide ongoing updates and a suitable means of contact (such as a phone number) for residents to make enquiries. Produce a complaints management procedure in the event that complaints are made with respect to noise.
4. The CNVMP for the Approved Woolgoolga to Ballina project outlines a range of environmental requirements and control measures to minimise noise and vibration impacts associated with the project. The strategies are designed to minimise, to the fullest extent practicable, noise and vibration during construction and should be considered where reasonable and feasible for these works. This document shall be consulted when further exploring mitigation or management measures.

7 OFF-SITE ROAD TRAFFIC

Haulage trucks would generally proceed from the site along the private road access route heading north. This road is considered to be part of the project site and is not assessable as road traffic. Once the vehicles join the Boggy Creek Road noise generated from vehicle movements must be assessed in accordance with the NSW Environment Protection Authority's (EPA) Road Noise Policy (RNP).

7.1 Methodology

In accordance with the traffic impact assessment undertaken for the borrow site, heavy vehicles from the borrow site would enter public roads at Boggy Creek Road, heading east. Reaching Reardons Lane they would travel north onto Woodburn Coraki Road. Woodburn Coraki Road is an arterial road which carries vehicles between Casino and the Pacific Highway at North Woodburn. At this point heavy vehicles from Coraki and other quarries and developments in the area would also utilise the route and therefore noise generated from heavy vehicle movements would not be attributed just with the development and are therefore not required to be assessed.

The Moonimba Borrow Site proposes an average of 208 truck movements per day of material haulage from the site. In addition to these movements, material would be imported to the site for stockpiling. A total of (on average) 236 movements per day are expected.

Truck movements are likely to increase during peak periods. A peak of 300 truck movements per day is expected. While site activities would generally occur between 7 am and 6 pm, truck movements will be restricted to outside school bus times. As such the peak 300 movements would be distributed over a total of nine hours, resulting in an average of 33 truck movements per hour.

7.2 Results and discussion

7.2.1 Reardon Lane and Boggy Creek Road

Traffic modelling figures are provided in the previous noise assessment undertaken for this development assessed by Greg Alderson & Associates in 2014 and documented in their report *Noise Impact Assessment – Extension of Moonimba Quarry Bungawalbin (ref 06193_NIA_RevB)*.

Existing traffic figures are provided below in **Table 16**.

Table 16 Existing daily traffic movements

Location	Total daytime traffic movements	Heavy vehicle percentage (%)
Boggy Creek Road	240	62
Reardons Lane	220	70
Woodburn-Coraki Road	1397	30

Calculations of the road traffic noise levels with and without the project have been undertaken using the Calculation of Road Traffic Noise algorithm. Provided in **Table 17** is a summary of the predicted noise criteria and predicted noise levels.

Table 17 Predicted noise levels

Address	Sound Pressure Level LAeq(15hour), dB			
	Criteria	Existing	With development	Increase
165 Reardons Lane	60	56	60	4
18 Casuarina Drive	60	50	55	5
201 Reardons Lane	60	50	54	4
203 Reardons Lane	60	51	56	5
205 Reardons Lane	60	52	57	5
240 Reardons Lane	60	56	61	5
259 Boggy Creek Road	60	58	63	5
75 Boggy Creek Road	60	42	47	5

The results provided above in **Table 17** indicate that two buildings at the address of 240 Reardons Lane are predicted to exceed the daytime noise criteria and increase by more than 2 dBA. These buildings are situated on the corner of Boggy Creek Road and Reardons Lane. The exceedances are generated from the acceleration and deceleration of vehicles associated with the intersection.

7.2.2 Woodburn-Coraki Road

The Woodburn-Coraki road has an existing 1397 vehicle trips a day, of which heavy vehicles constitute 30per cent. The additional 300 movements per day will increase the total movements to 1697 with a heavy vehicle percentage of 42%. This represents an approximate increase in noise of 1.9 dB, compliant with the RNP relative increase noise criteria of 2.0 dB.

The receivers located on Woodburn-Coraki Road are not considered to be significantly affected by the additional truck movements. Further consideration of noise impacts is not required.

7.2.3 Pacific Highway and Woodburn Community

Due to the large number of vehicles that travel on the Pacific Highway, the additional movements from this project would increase noise levels by less than 1 dB. An increase of 2 dB or less is generally considered to be indiscernible. The impact by the project at these locations is not considered to be significant and further consideration of noise mitigation measures is not required.

7.3 Recommendations

7.3.1 Reardon Lane and Boggy Creek Road

The 2015 Development Application consent requires a noise wall to be built adjacent to 240 Reardons Lane. Although details of the noise wall are not available, a standard construction wall would break line-of-sight with the road and provide a reduction in noise of at least 5 dB. This reduction would be sufficient to ensure compliance with the applicable noise criteria. Considering details of the wall are not available, further consideration of this property should be given once the noise wall is built. An inspection of the noise wall and attended noise measurements should be undertaken to ensure that sufficient noise reduction is provided.

8 CONCLUSION

A noise assessment in accordance with relevant regulatory policies has been undertaken in order to address:

- Airborne noise from extraction processes on the site
- Cumulative airborne noise from extraction processes on the site
- Airborne noise impacts from haulage vehicles travelling on the public road network

The assessment has shown that without mitigation, exceedances are predicted for both elements addressed.

Regarding operational airborne noise from on-site operations, SLR has recommended a number of mitigation and management measures including a regular monitoring program. With mitigation in place it is considered likely that compliance with the INP Amenity criteria can be achieved at all receivers, however compliance with the NSW INP Intrusiveness criteria is not likely to be achieved at a number of the worst impacted receivers. Due to the short-term (two year) nature of the increased extraction works, the daytime-only operating hours and the State Significant nature of the need for the material (being linked to the Woolgoolga to Ballina Pacific Highway Upgrade Project) - this outcome may be considered acceptable by the regulatory body.

Regarding noise impacts from vehicles on public roads, exceedances were found to two buildings situated on the corner of Boggy Creek Road and Reardons Lane. The 2015 Development Application consent requires a noise wall to be built adjacent to 240 Reardons Lane. Although details of the noise wall are not available, a standard construction wall would break line-of-sight with the road and provide a reduction in noise of at least 5 dB. This reduction would be sufficient to ensure compliance with the applicable noise criteria. Considering details of the wall are not available, further consideration of this property should be given once the noise wall is built.

1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that in common usage 'noise' is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3 Sound Power Level

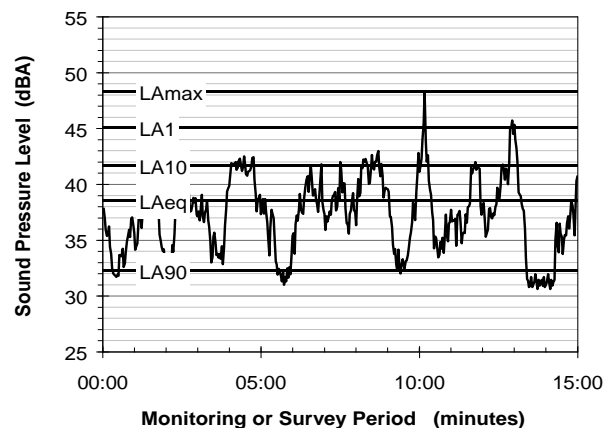
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or Lw, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the 'repeatable minimum' LA90 noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or 'average' levels representative of the other descriptors (LAeq, LA10, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than 'broad band' noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

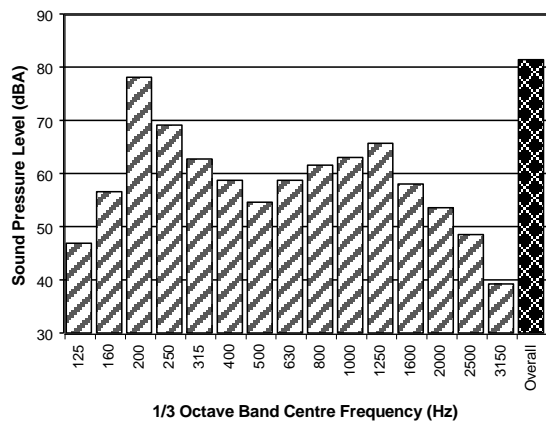
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V , expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_0)$, where V_0 is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organizations.

9 Human Perception of Vibration

People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

10 Over-Pressure

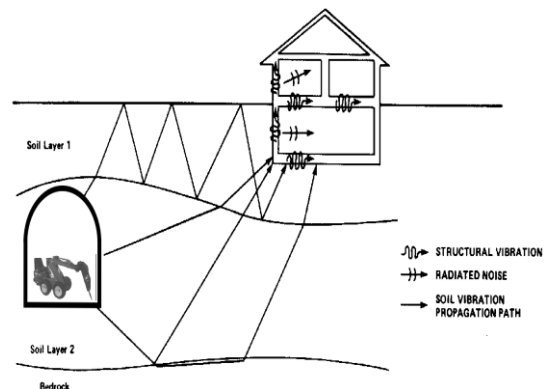
The term 'over-pressure' is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

11 Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

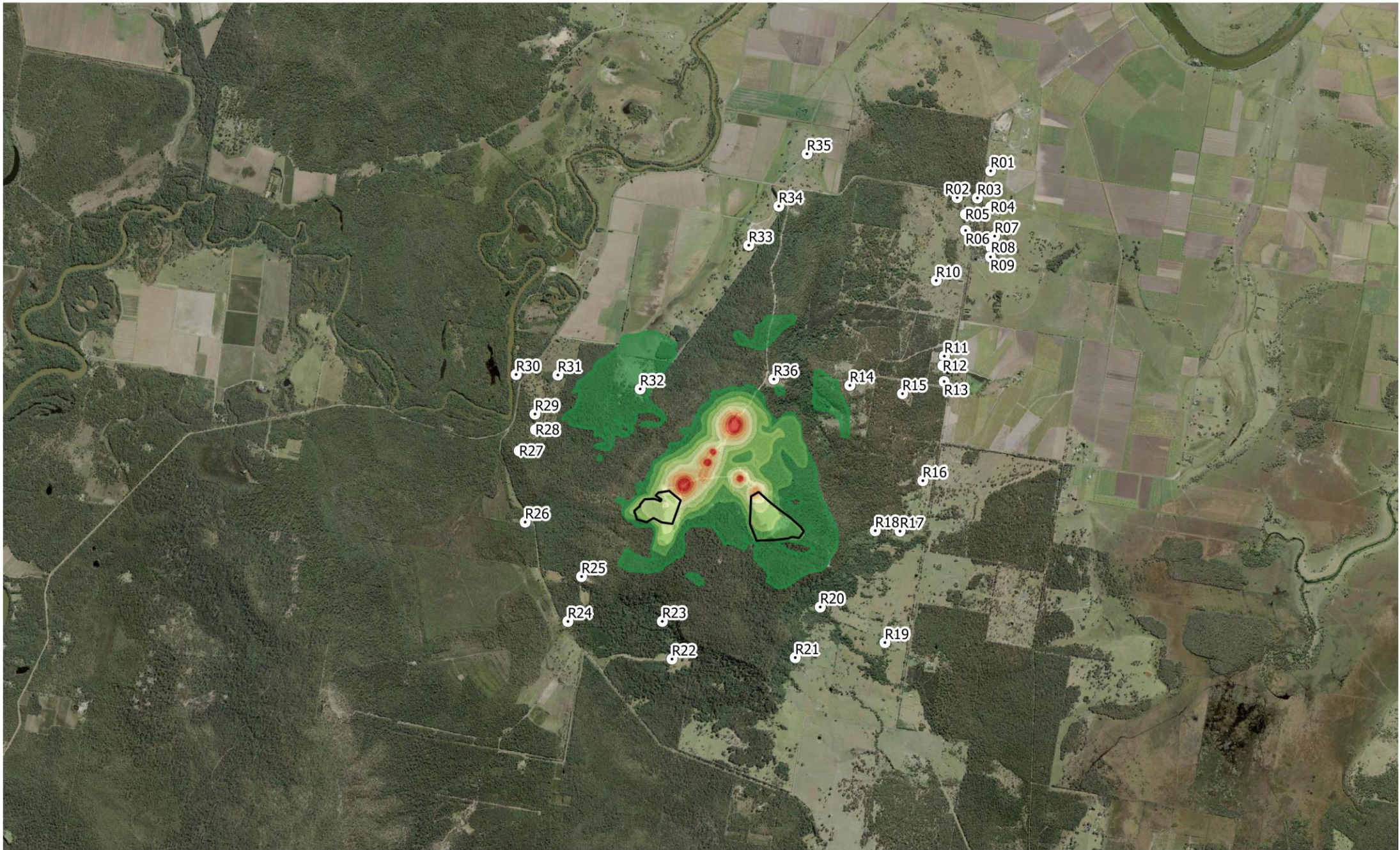
Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



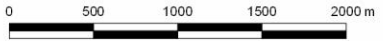
The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise

Scenario 1 – Contour Maps



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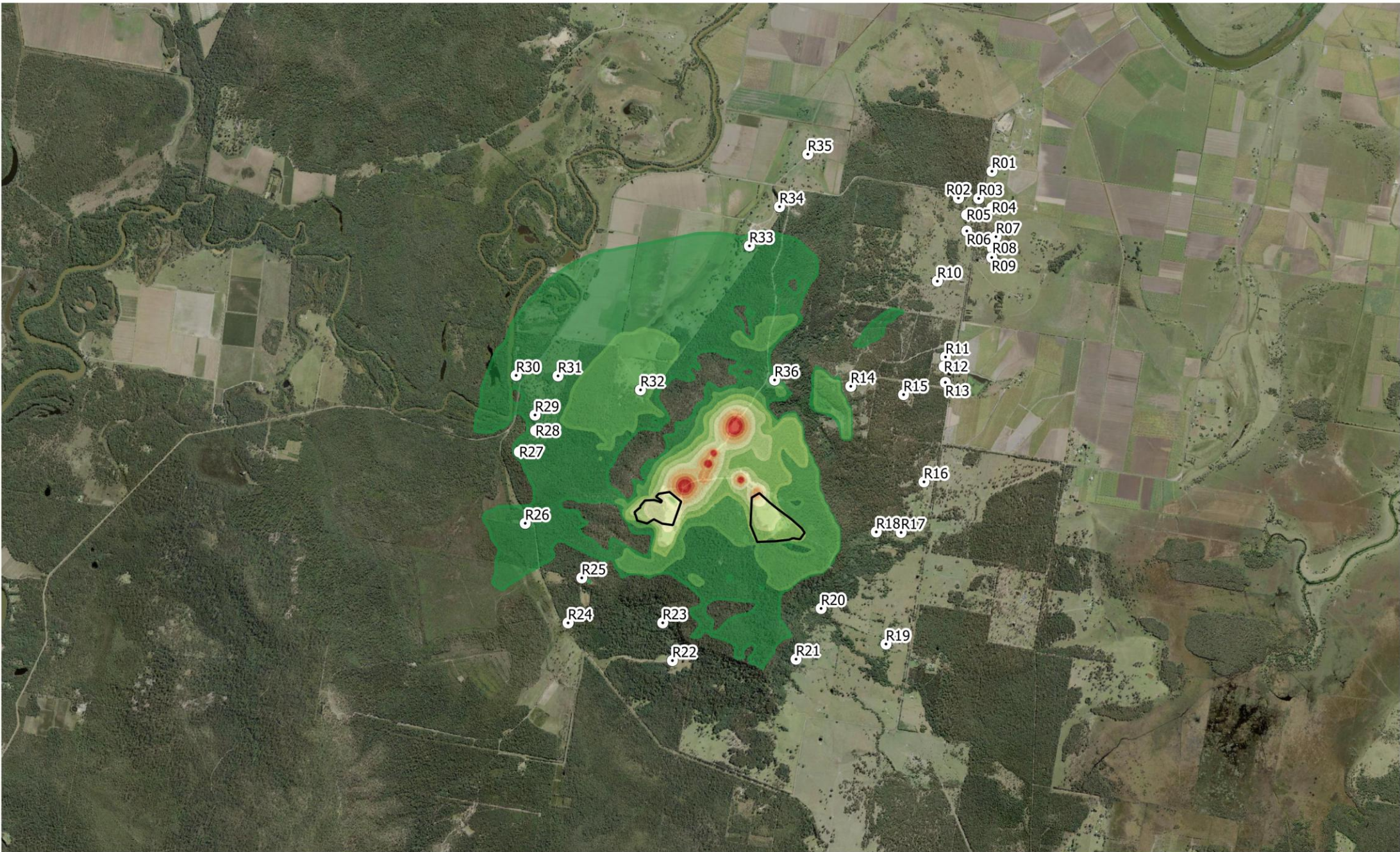
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35 dBA	45 dBA	65 dBA
	50 dBA	70 dBA
	55 dBA	

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Moonimba Quarry NIA

Site Establishment - Neutral Weather

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30 dBA	40 dBA	60 dBA
35 dBA	45 dBA	65 dBA
	50 dBA	70 dBA
	55 dBA	

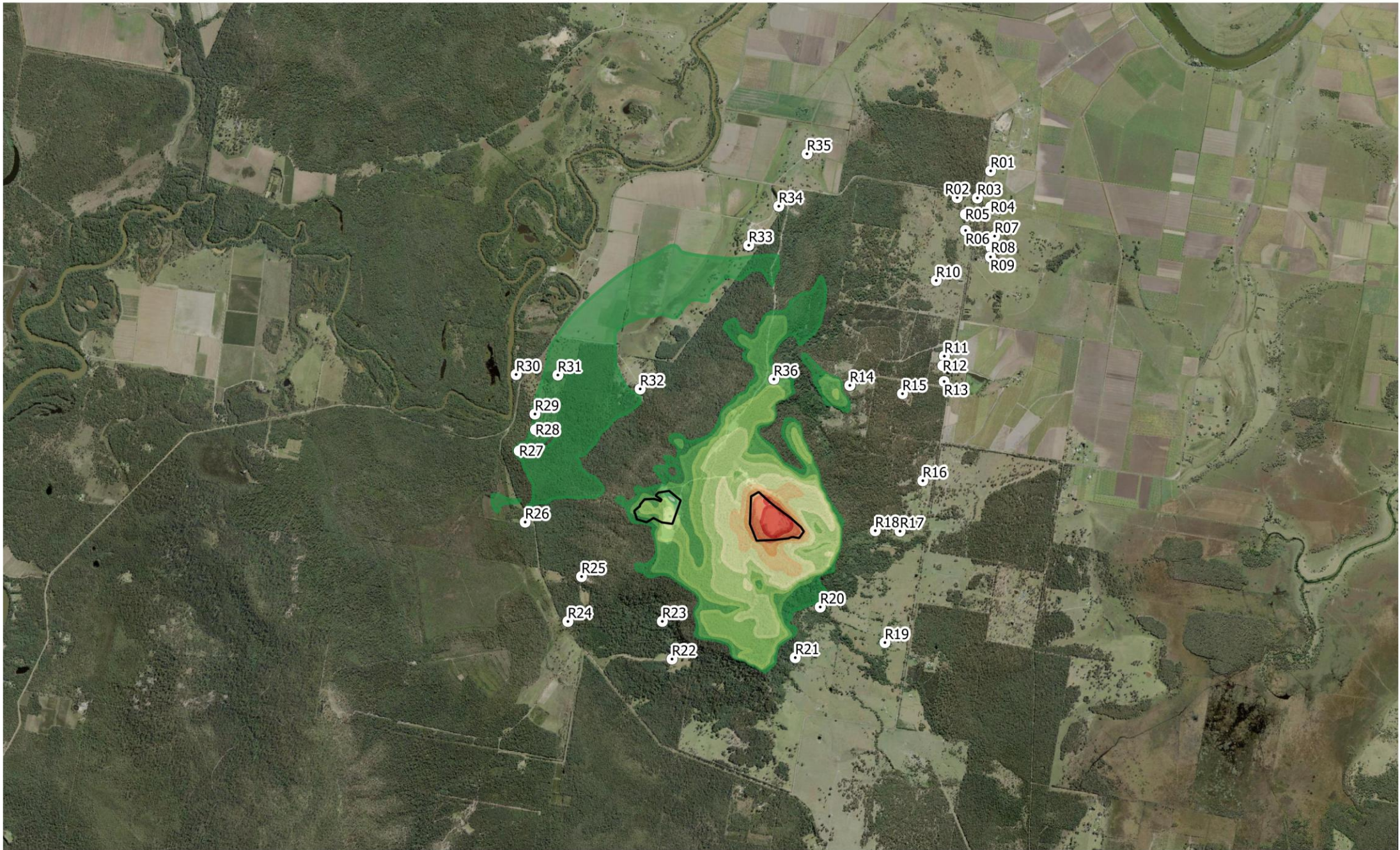
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Site Establishment - Enhanced
Weather

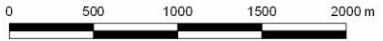
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Scenario 2 – Contour Maps



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Predicted Noise Levels - LAeq(15minute)

- 30 dBA
- 35 dBA
- 40 dBA
- 45 dBA

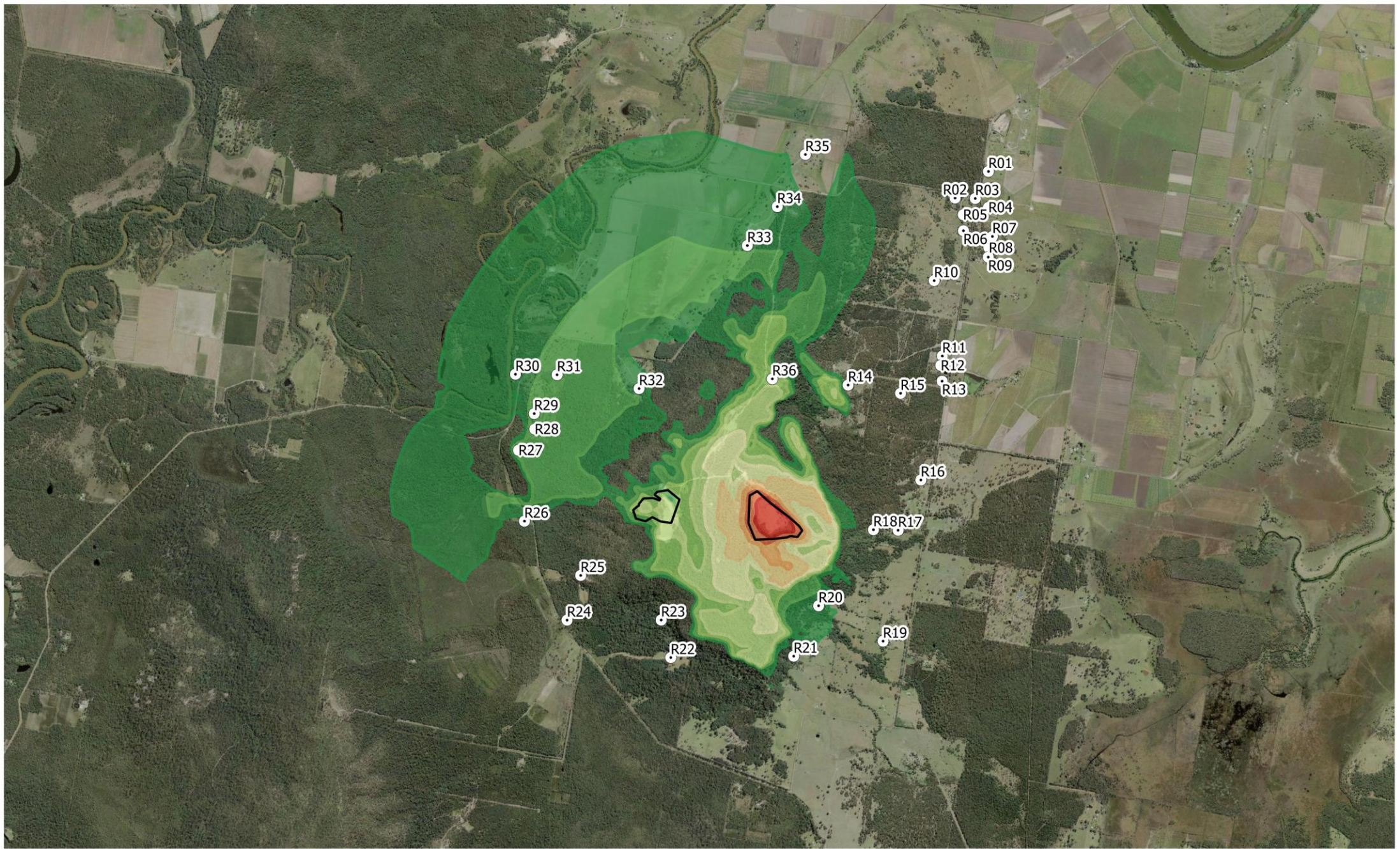
- 50 dBA
- 55 dBA
- 60 dBA
- 65 dBA
- 70 dBA

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Moonimba Quarry NIA

Crushing East - Neutral Weather

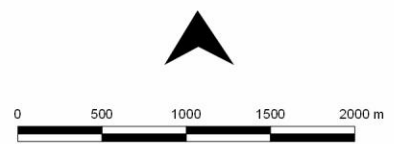
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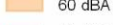

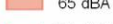

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Predicted Noise Levels - LAeq(15minute)

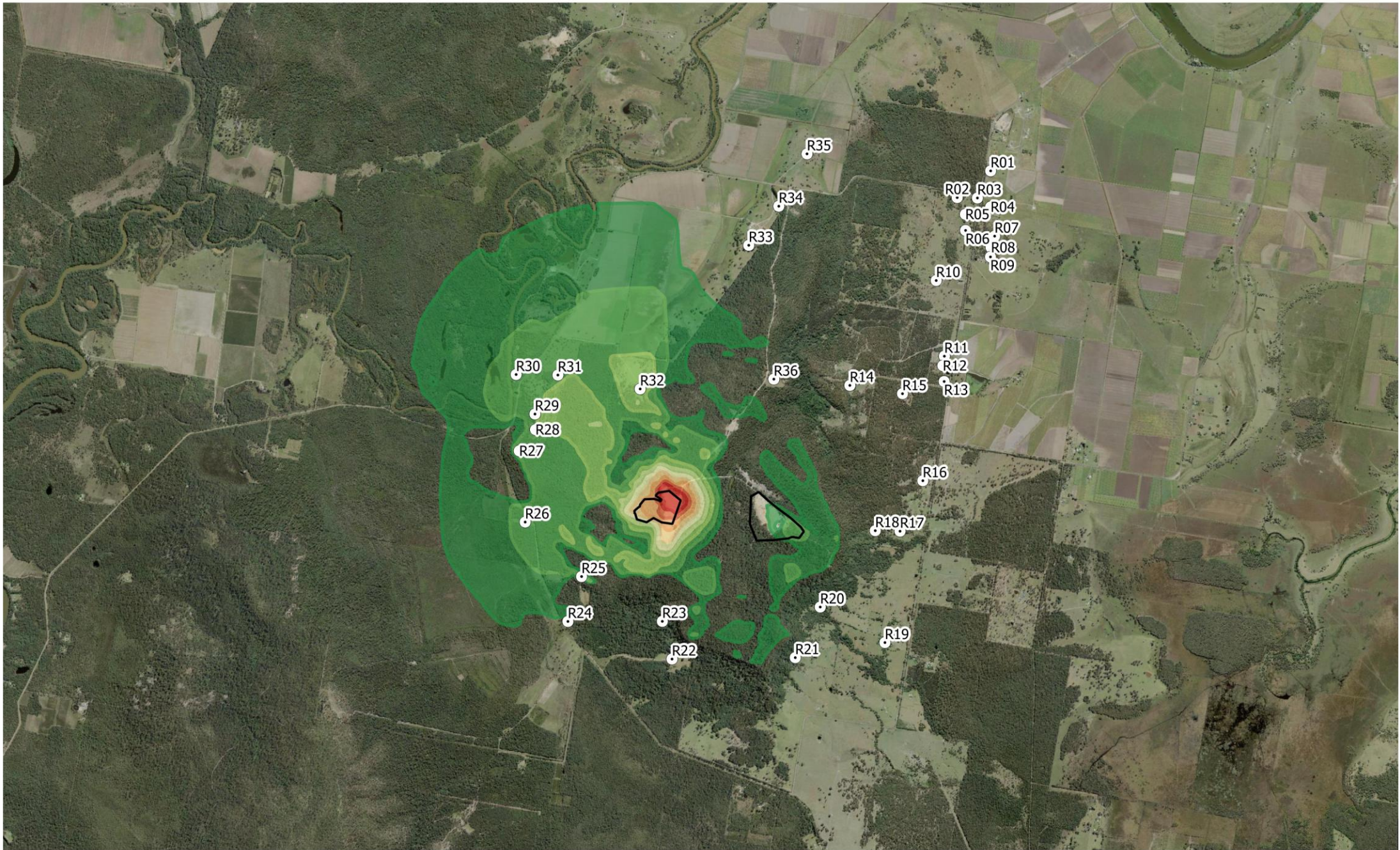
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	40 dBA		60 dBA
	45 dBA		65 dBA
			70 dBA

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Moonimba Quarry NIA

Crushing East - Enhanced Weather

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Predicted Noise Levels - LAeq(15minute)

30 dBA	35 dBA	40 dBA	45 dBA
--------	--------	--------	--------

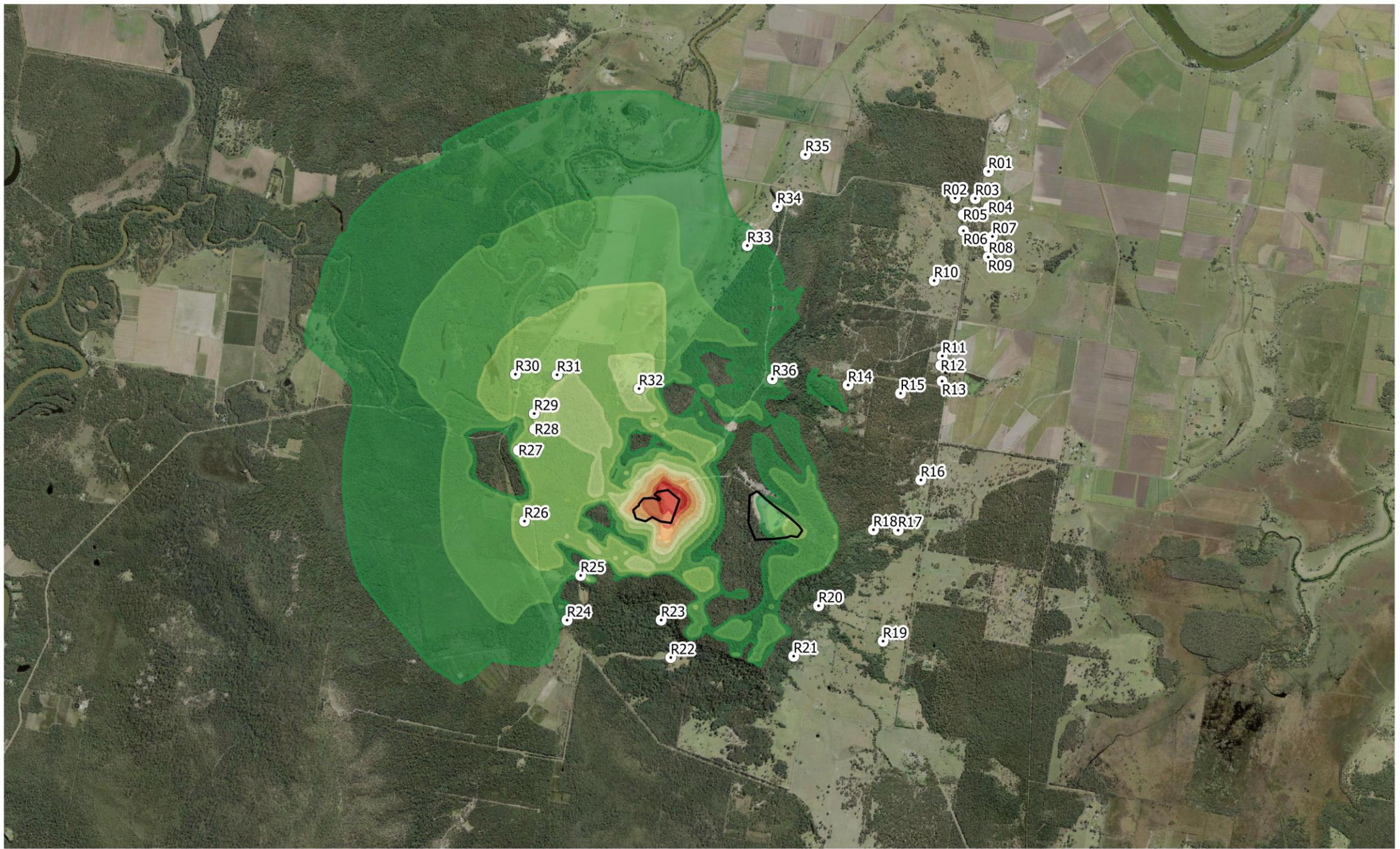
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Crushing West - Neutral Weather

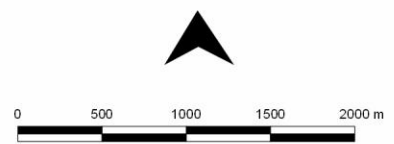
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Predicted Noise Levels - LAeq(15minute)

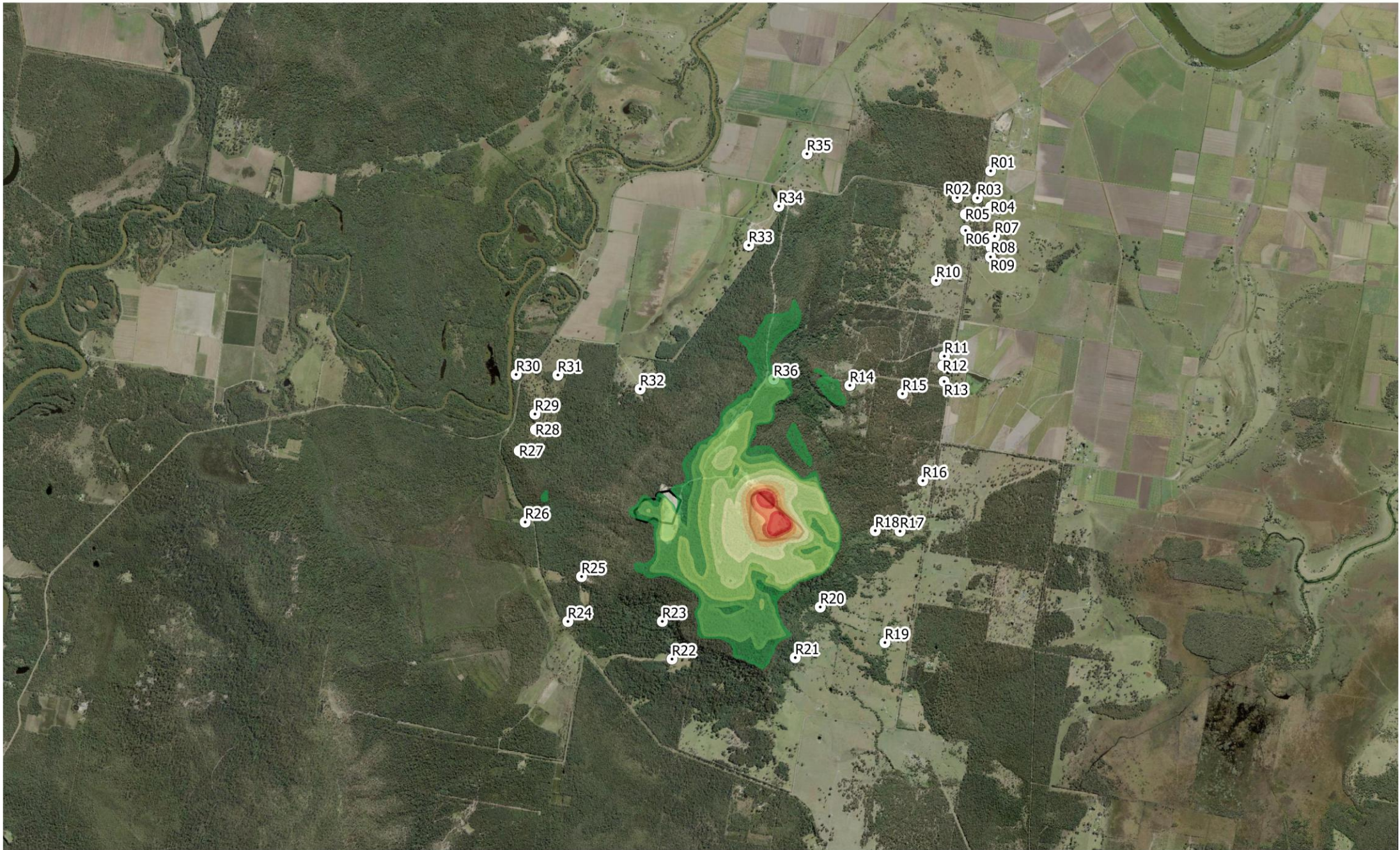
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			70 dBA

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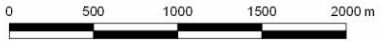
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Predicted Noise Levels - LAeq(15minute)

30 dBA
35 dBA
40 dBA
45 dBA

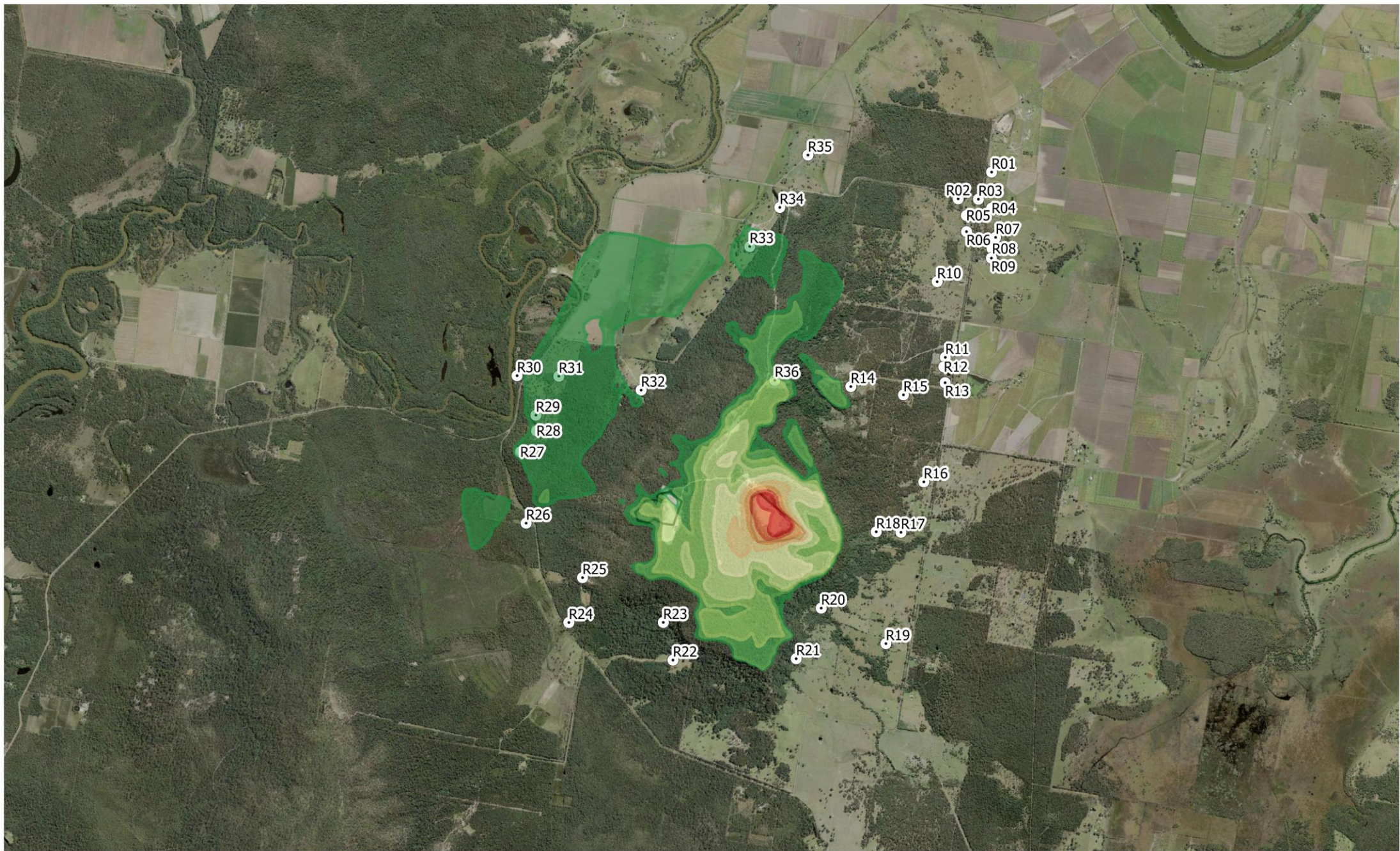
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60 dBA
65 dBA
70 dBA

Pacific Complete

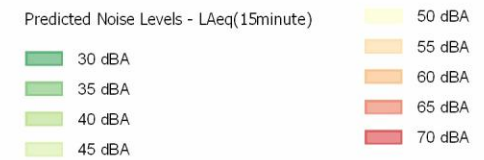
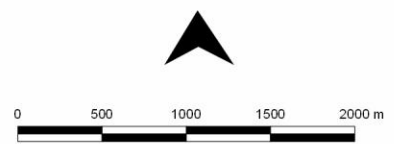
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Extraction East- Neutral Weather

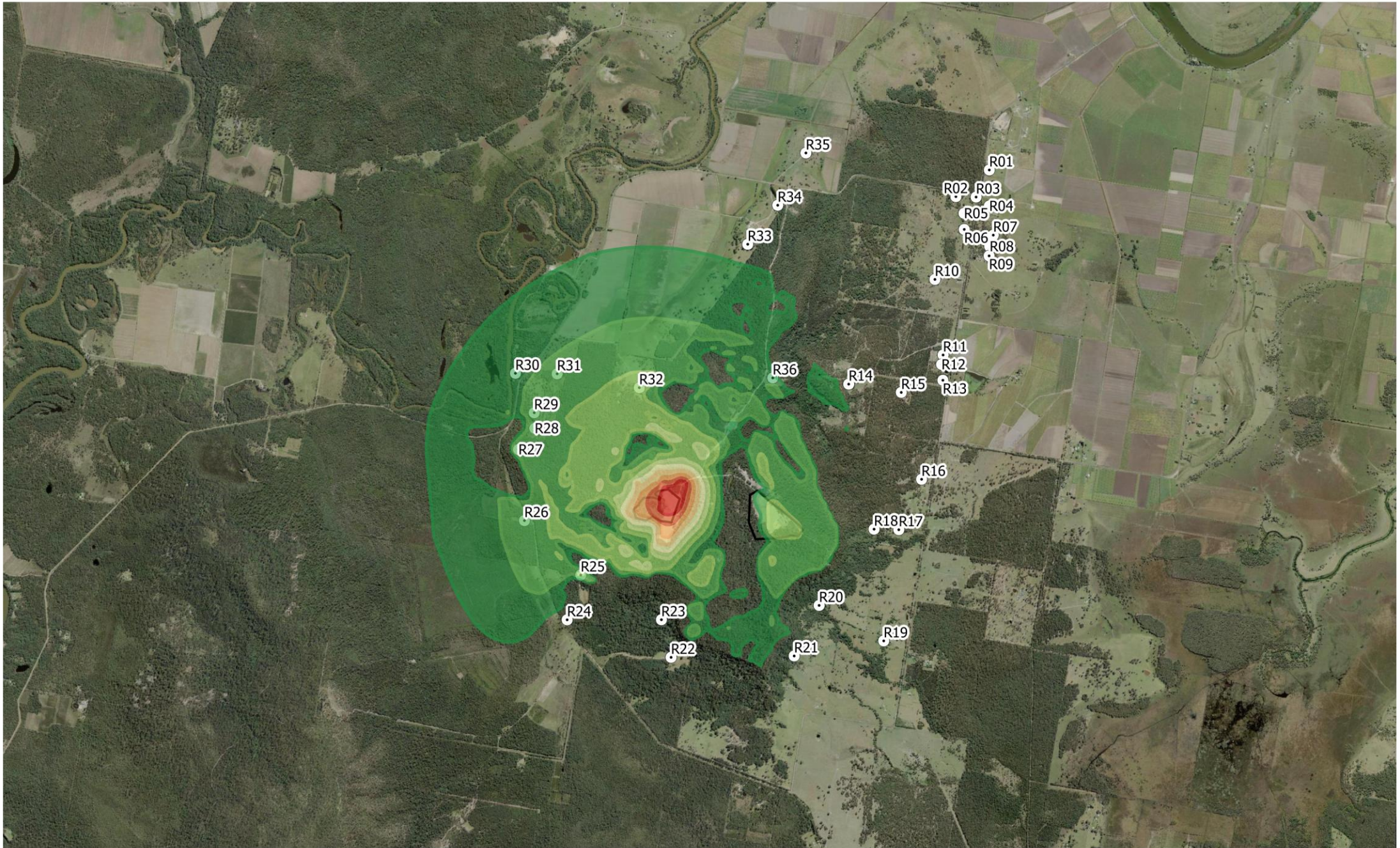
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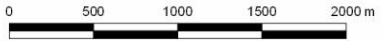


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Predicted Noise Levels - LAeq(15minute)

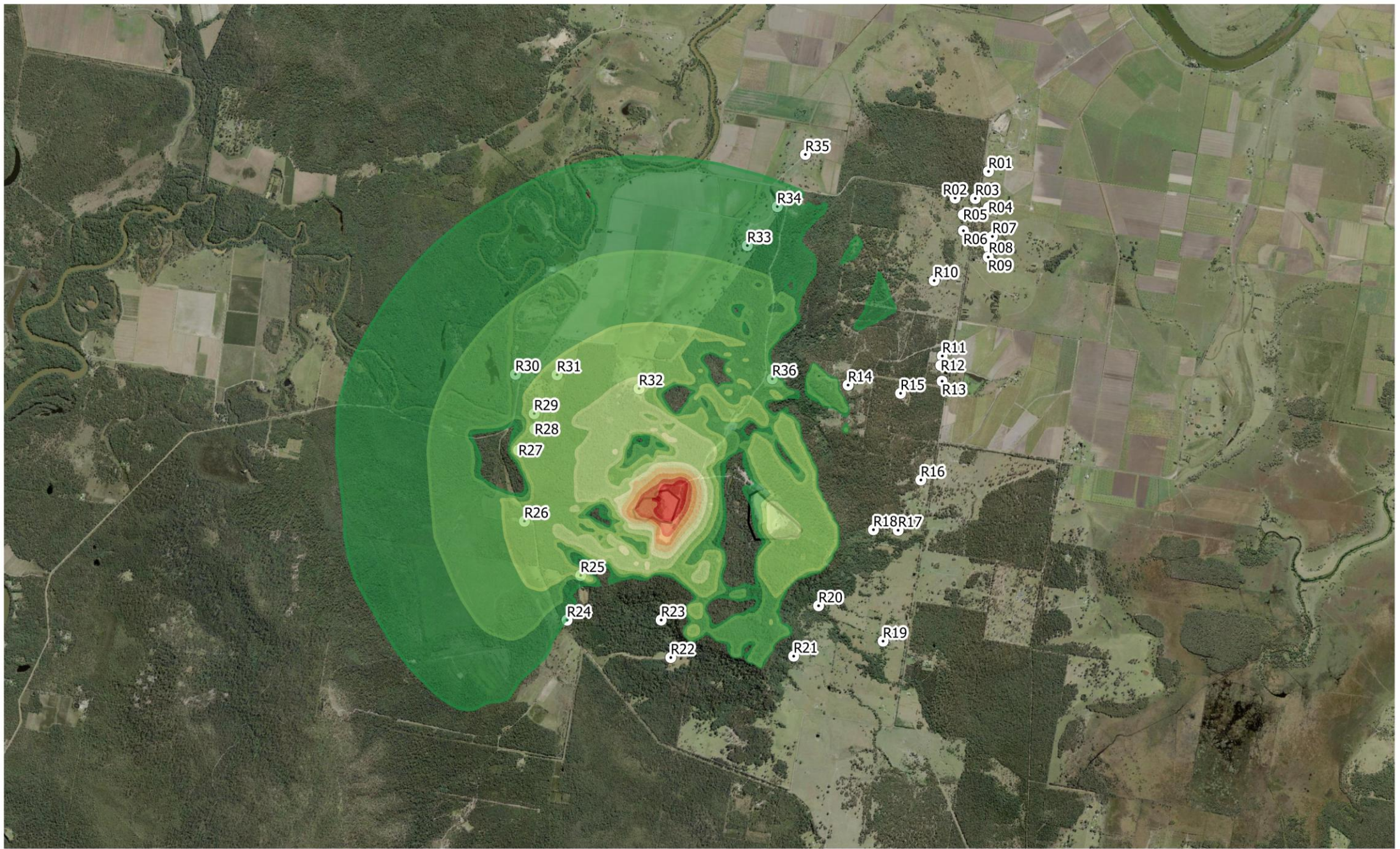
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40 dBA	60 dBA
45 dBA	65 dBA
	70 dBA

Pacific Complete

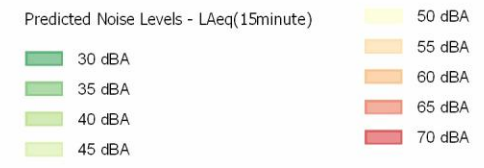
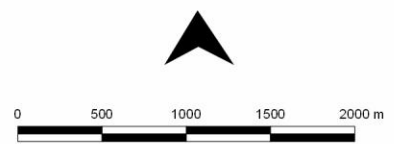
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Extraction West - Neutral Weather

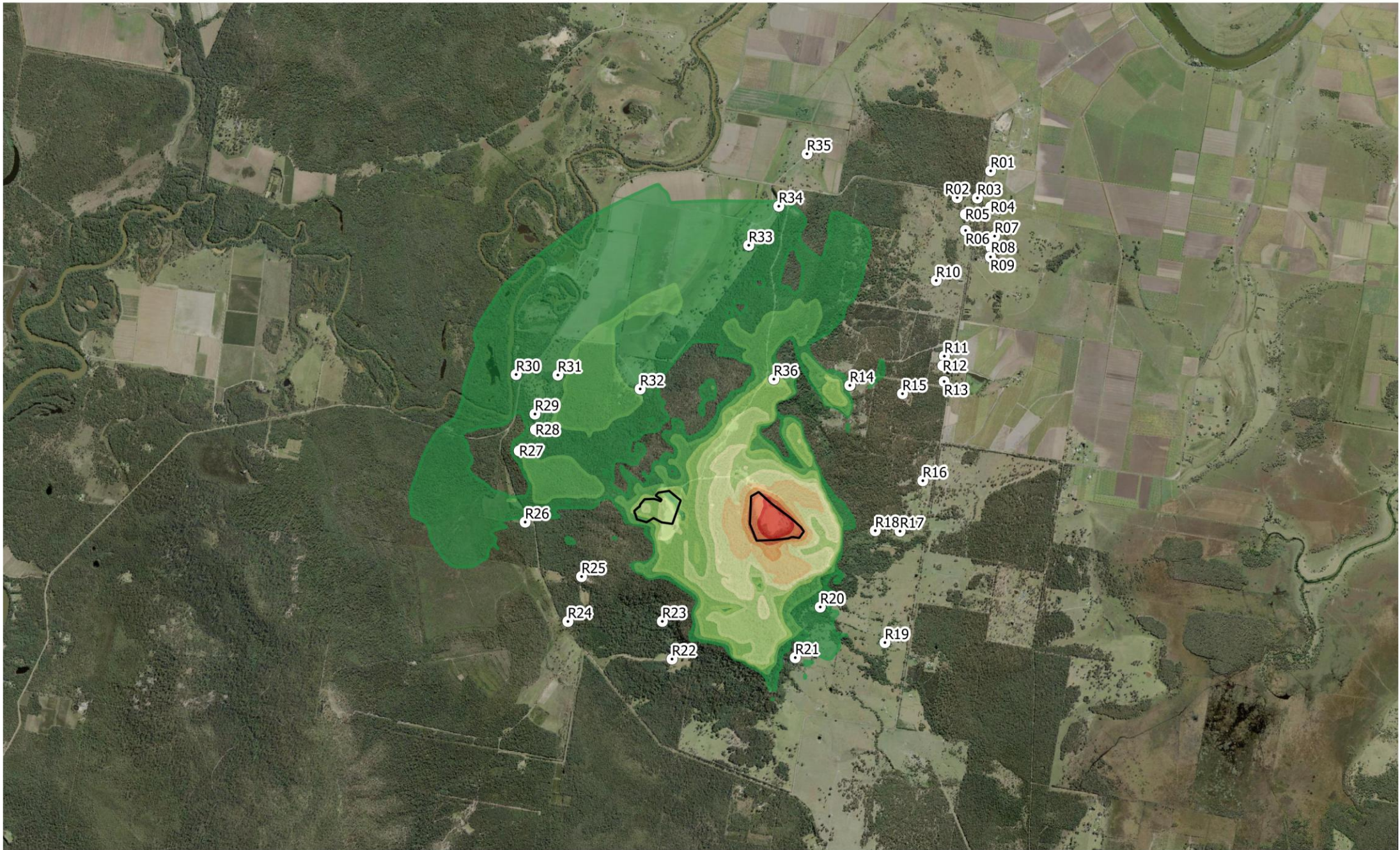
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30 dBA
35 dBA
40 dBA
45 dBA

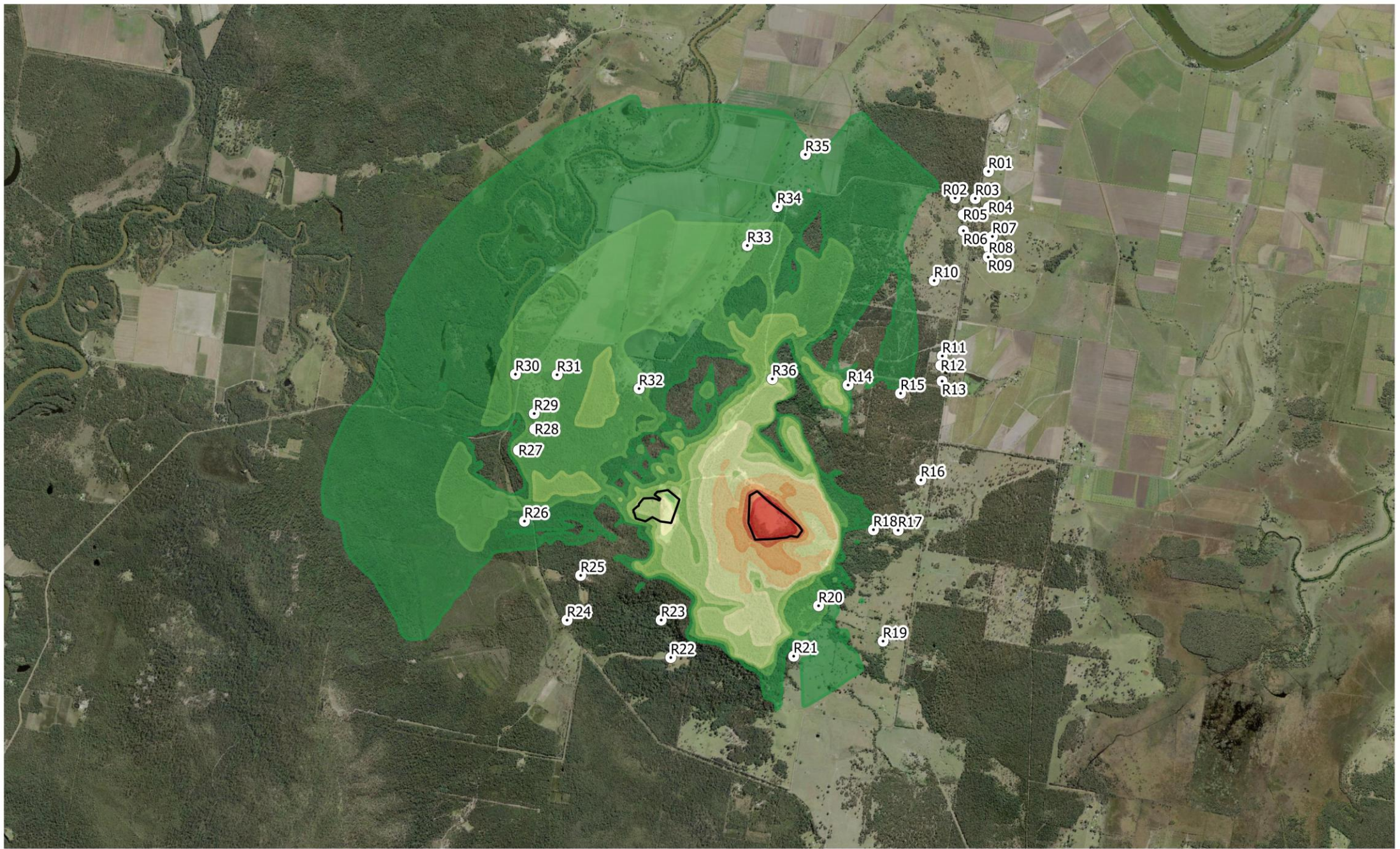
50 dBA
55 dBA
60 dBA
65 dBA
70 dBA

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JAW Crushing East - Neutral Weather

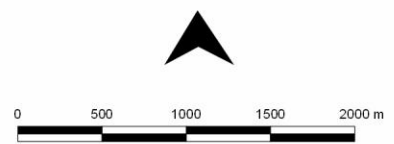
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Predicted Noise Levels - LAeq(15minute)

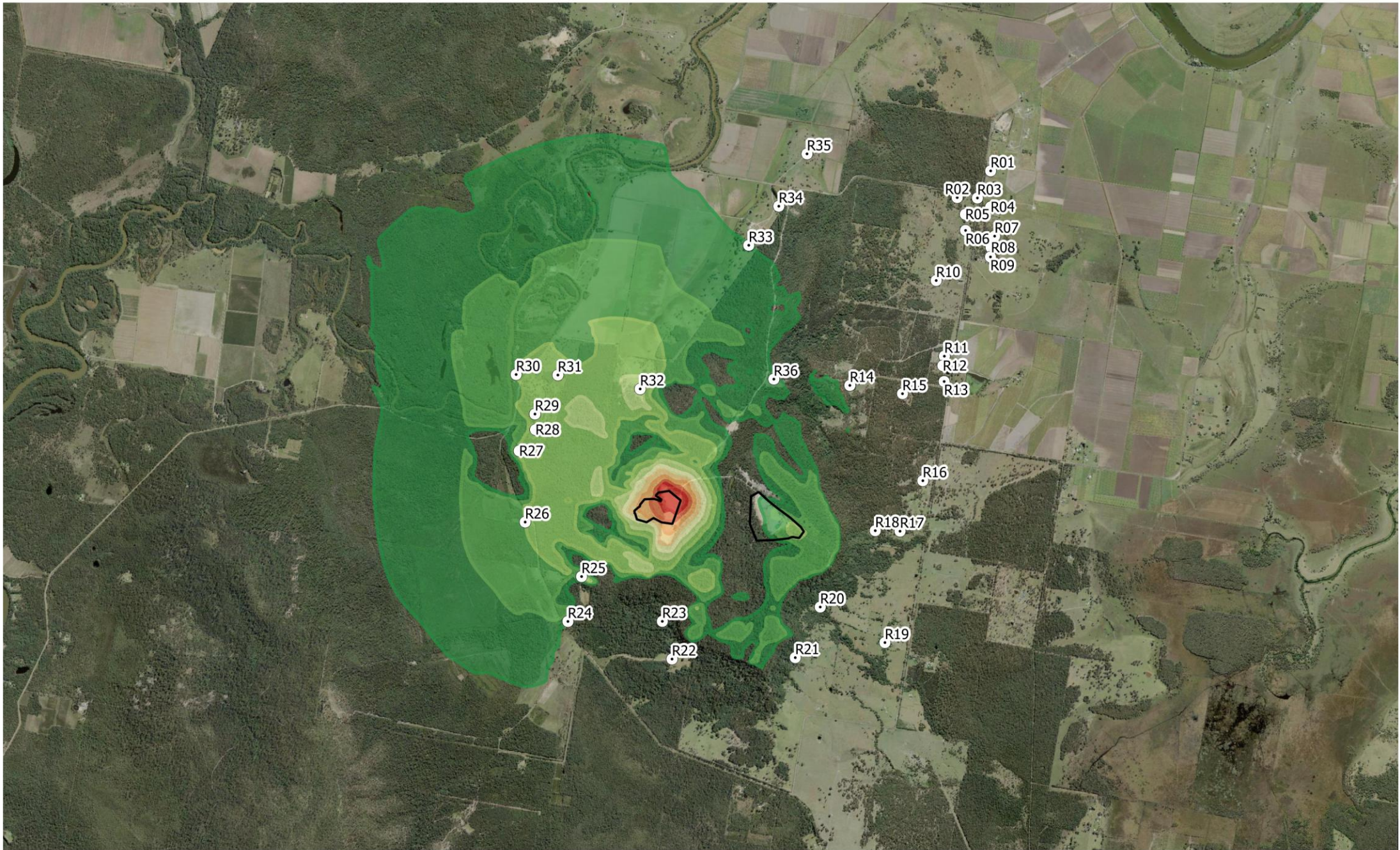
	30 dBA		50 dBA
	35 dBA		55 dBA
	40 dBA		60 dBA
	45 dBA		65 dBA
			70 dBA

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- 30 dBA
- 35 dBA
- 40 dBA
- 45 dBA

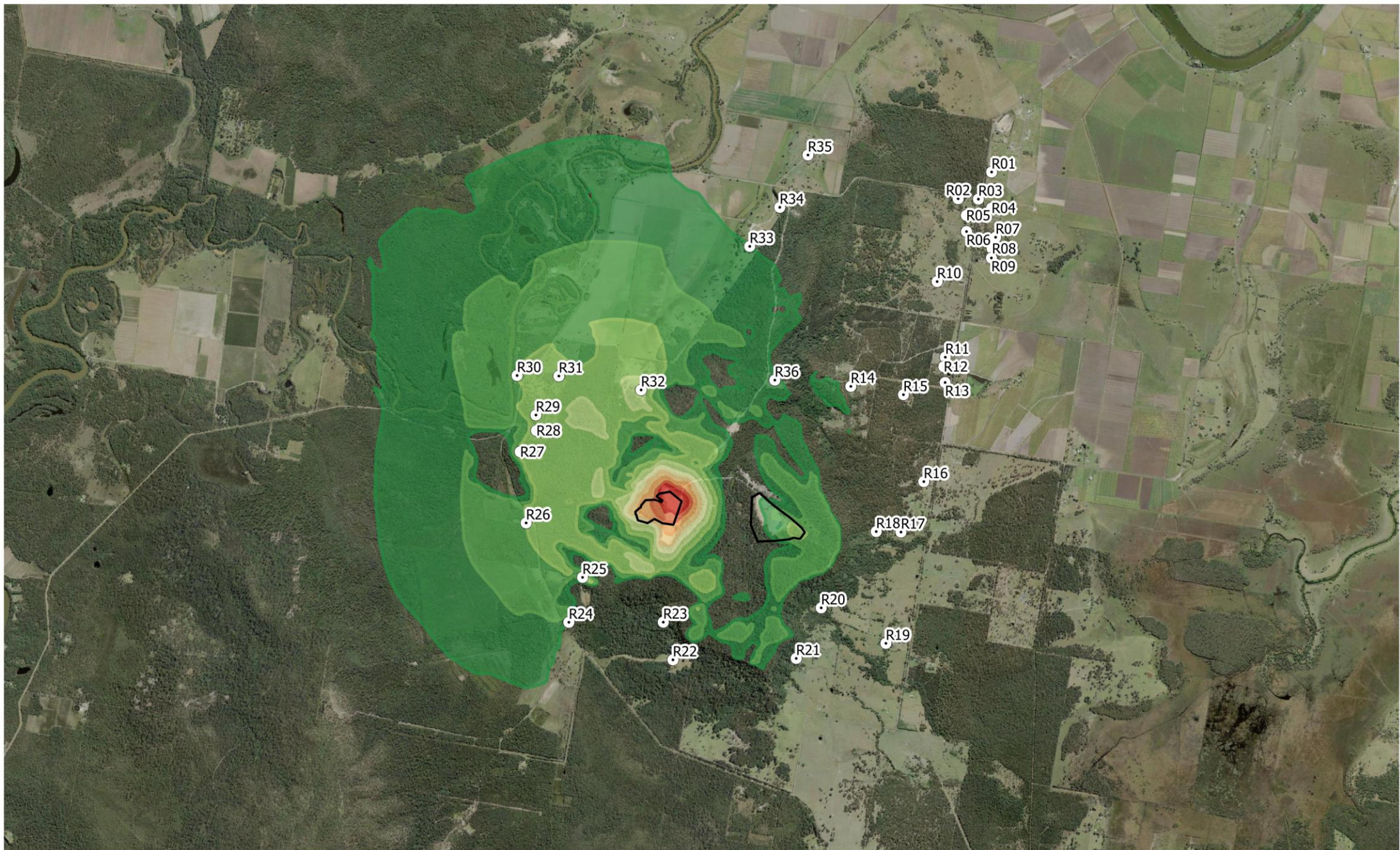
- 50 dBA
- 55 dBA
- 60 dBA
- 65 dBA
- 70 dBA

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JAW Crushing West - Neutral Weather

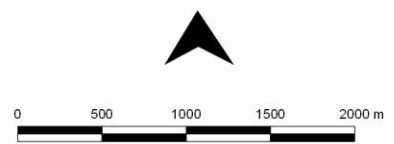
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Predicted Noise Levels - LAeq(15minute)

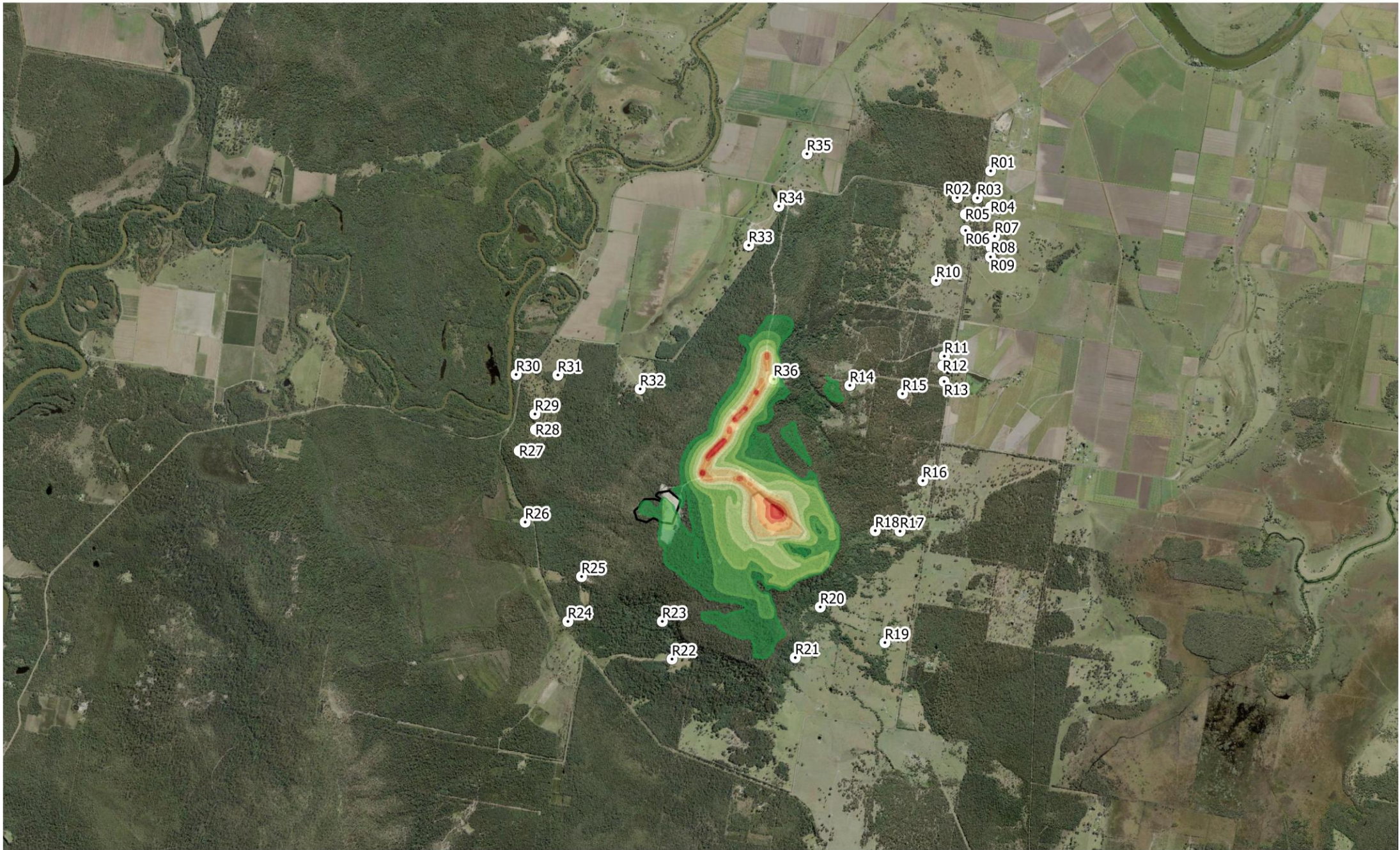
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	40 dBA		60 dBA
	45 dBA		65 dBA
			70 dBA

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Predicted Noise Levels - LAeq(15minute)

30 dBA
35 dBA
40 dBA
45 dBA

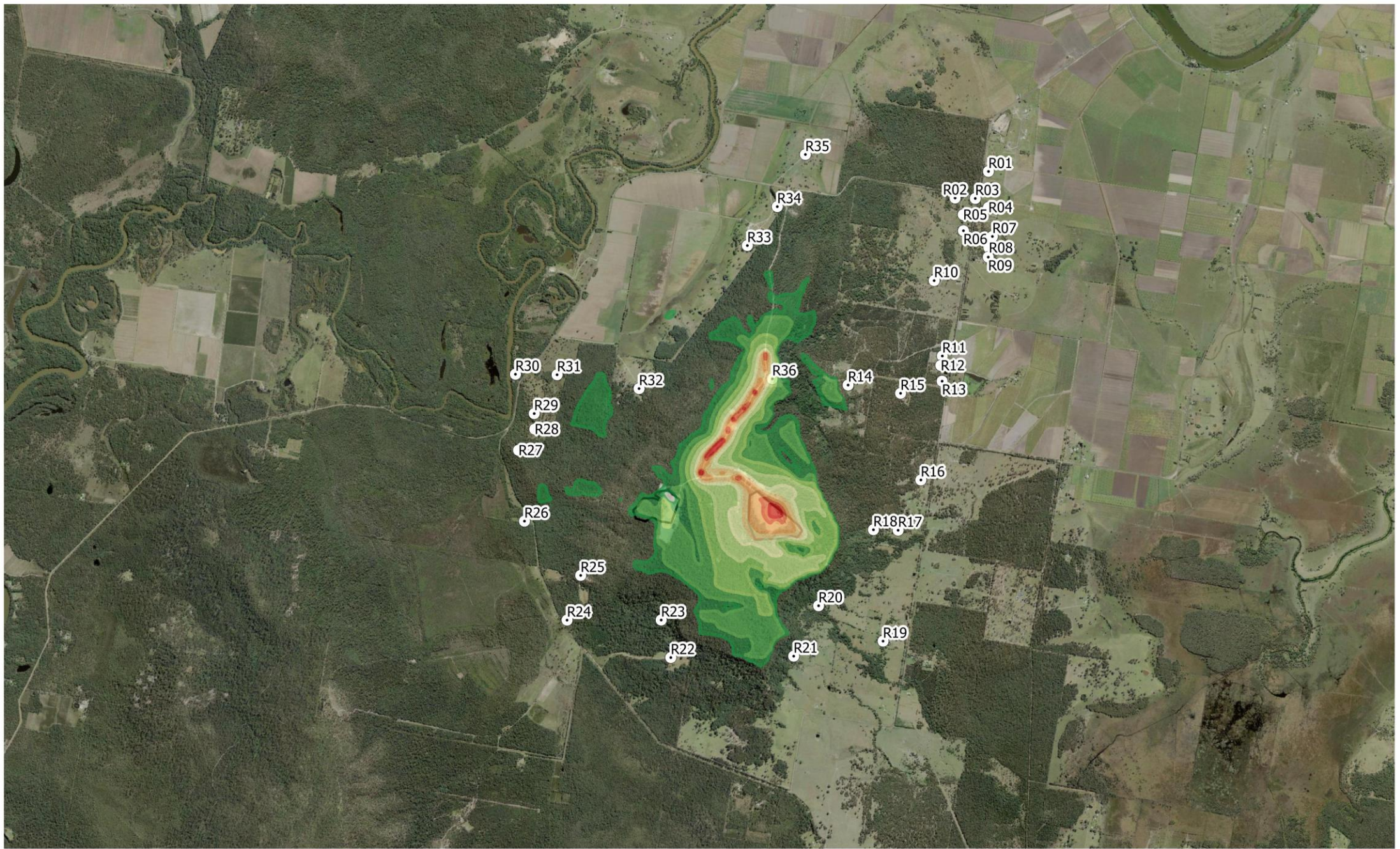
50 dBA
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70 dBA

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Loading East - Neutral Weather

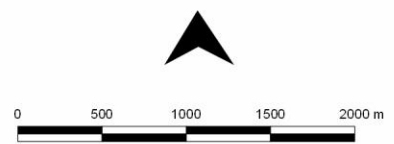
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Predicted Noise Levels - LAeq(15minute)

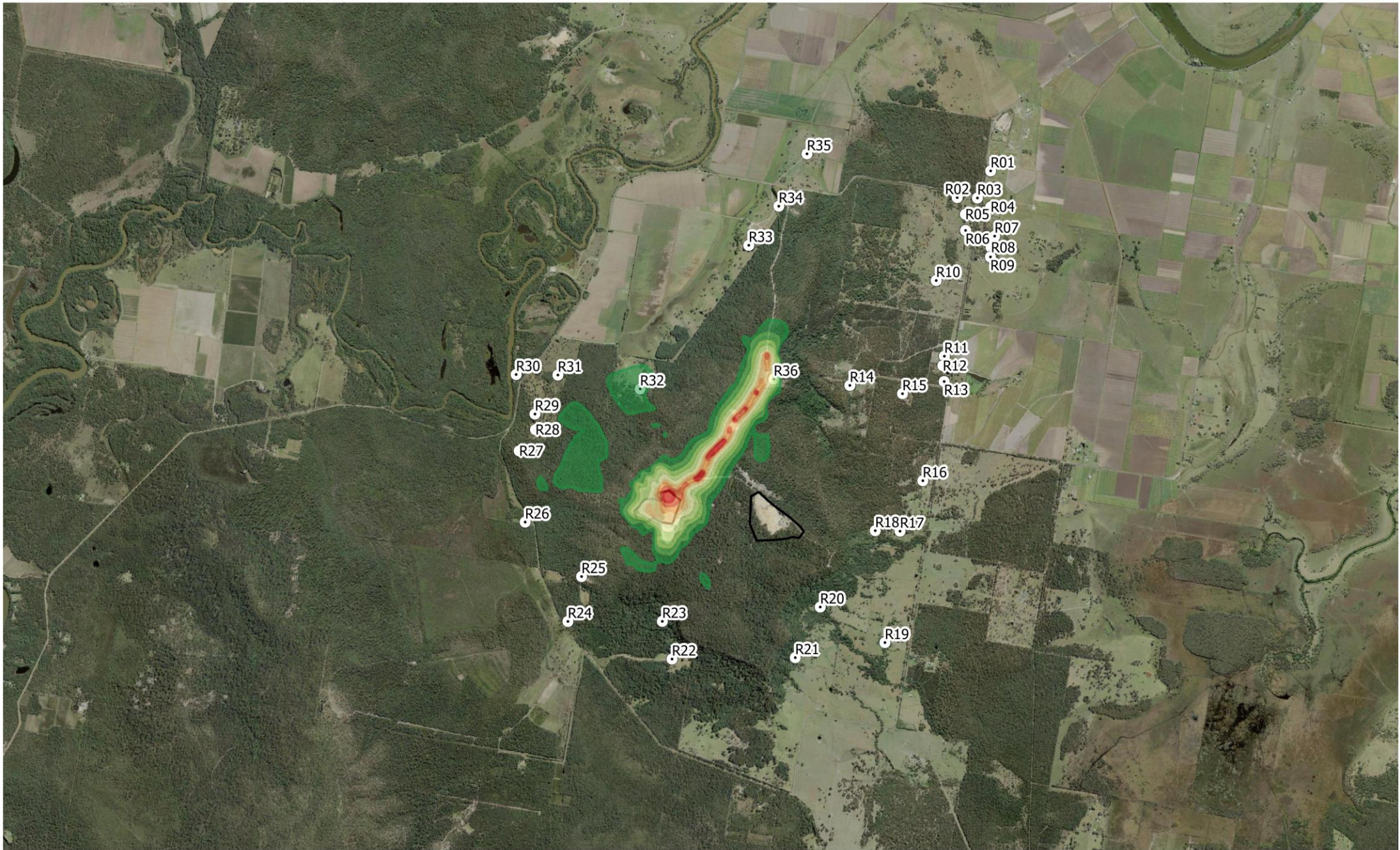
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	40 dBA		60 dBA
	45 dBA		65 dBA
			70 dBA

Pacific Complete

Moonimba Quarry NIA

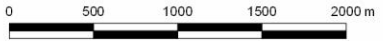
Loading East - Enhanced Weather

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Predicted Noise Levels - LAeq(15minute)

30 dBA
35 dBA
40 dBA
45 dBA

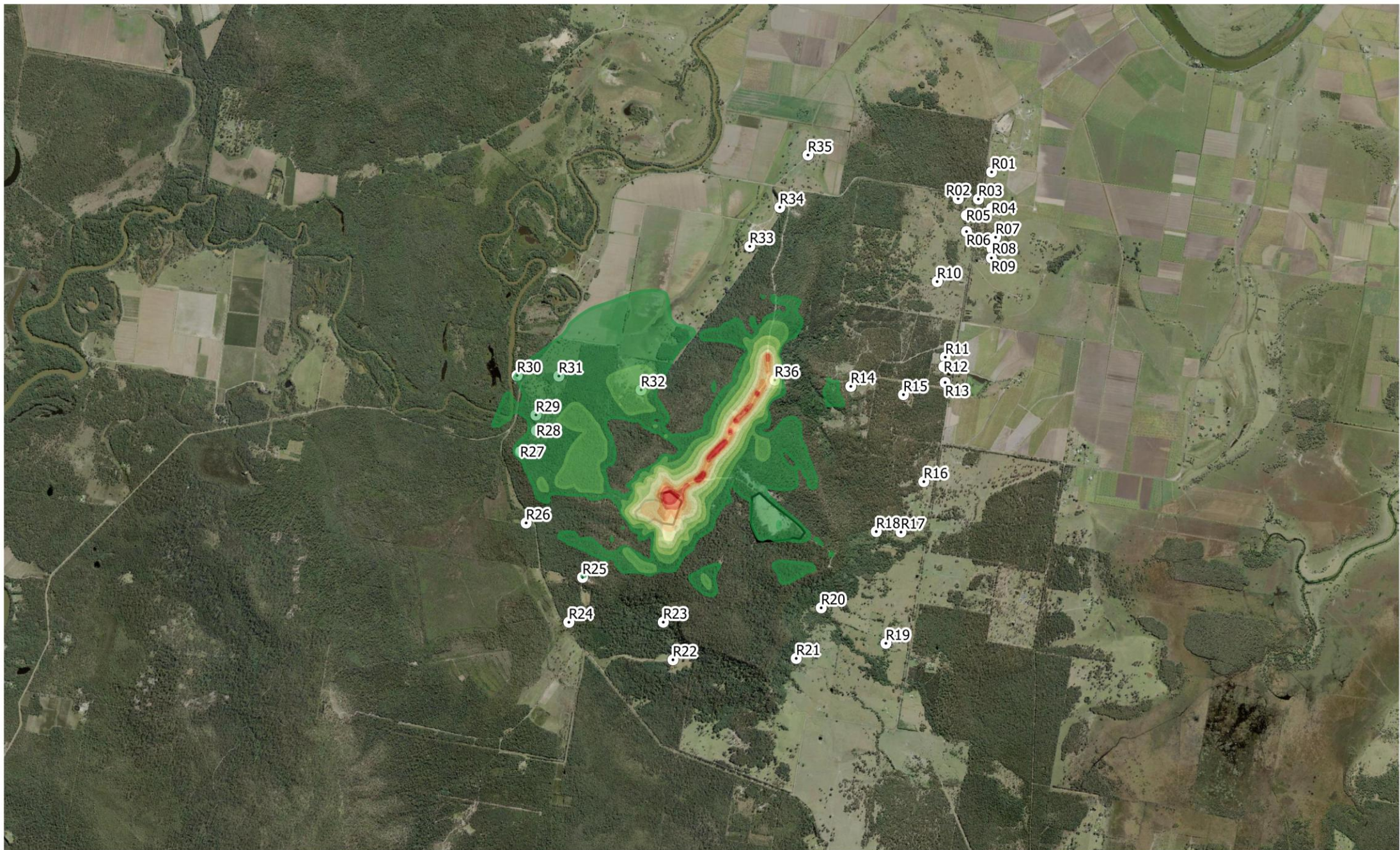
50 dBA
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65 dBA
70 dBA

Pacific Complete

Moonimba Quarry NIA

Loading West- Neutral Weather

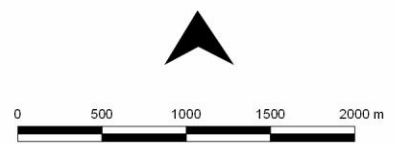
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Predicted Noise Levels - LAeq(15minute)

	30 dBA		50 dBA
	35 dBA		55 dBA
	40 dBA		60 dBA
	45 dBA		65 dBA
			70 dBA

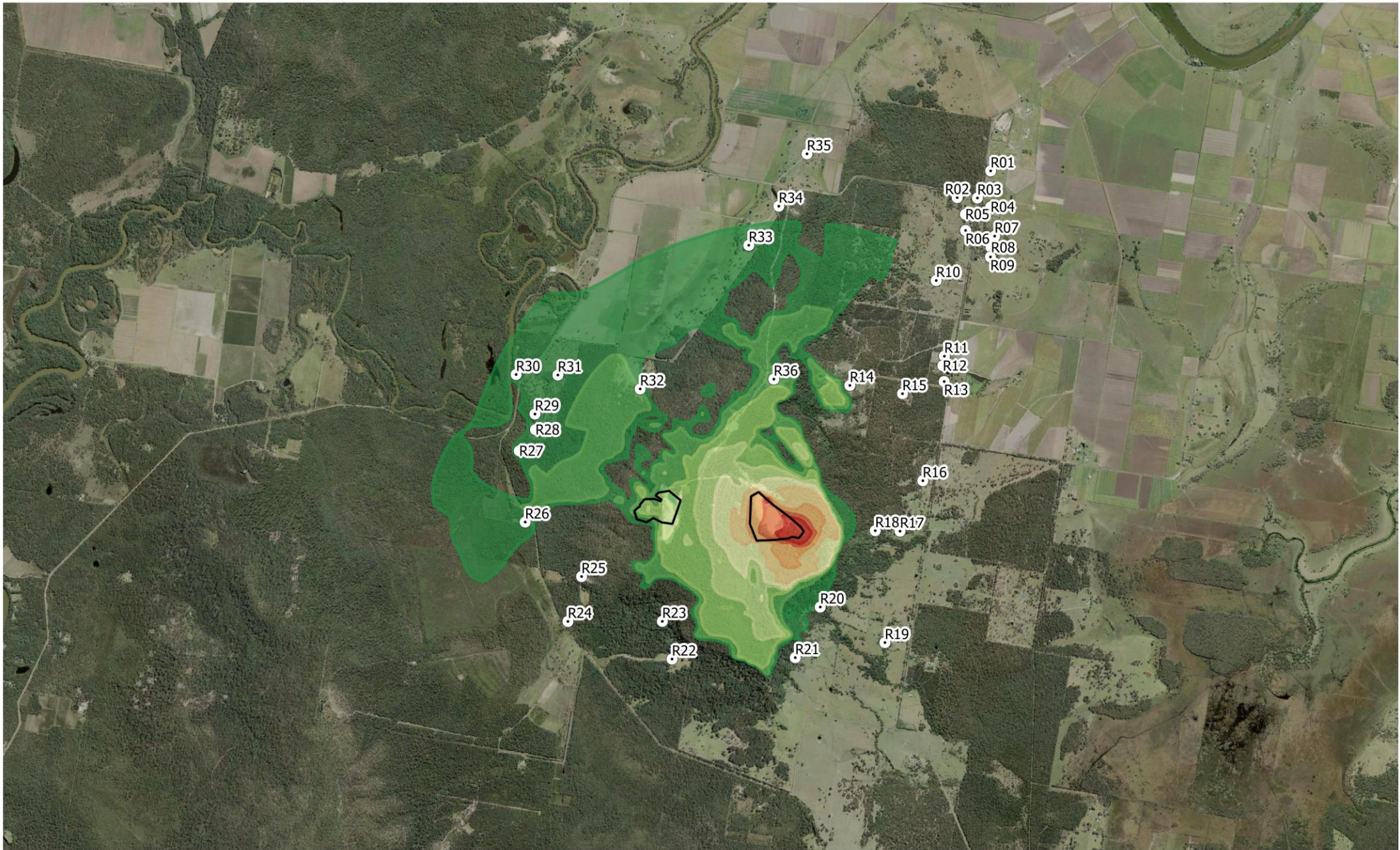
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Loading West - Enhanced Weather

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Predicted Noise Levels - LAeq(15minute)

- 30 dBA
- 35 dBA
- 40 dBA
- 45 dBA

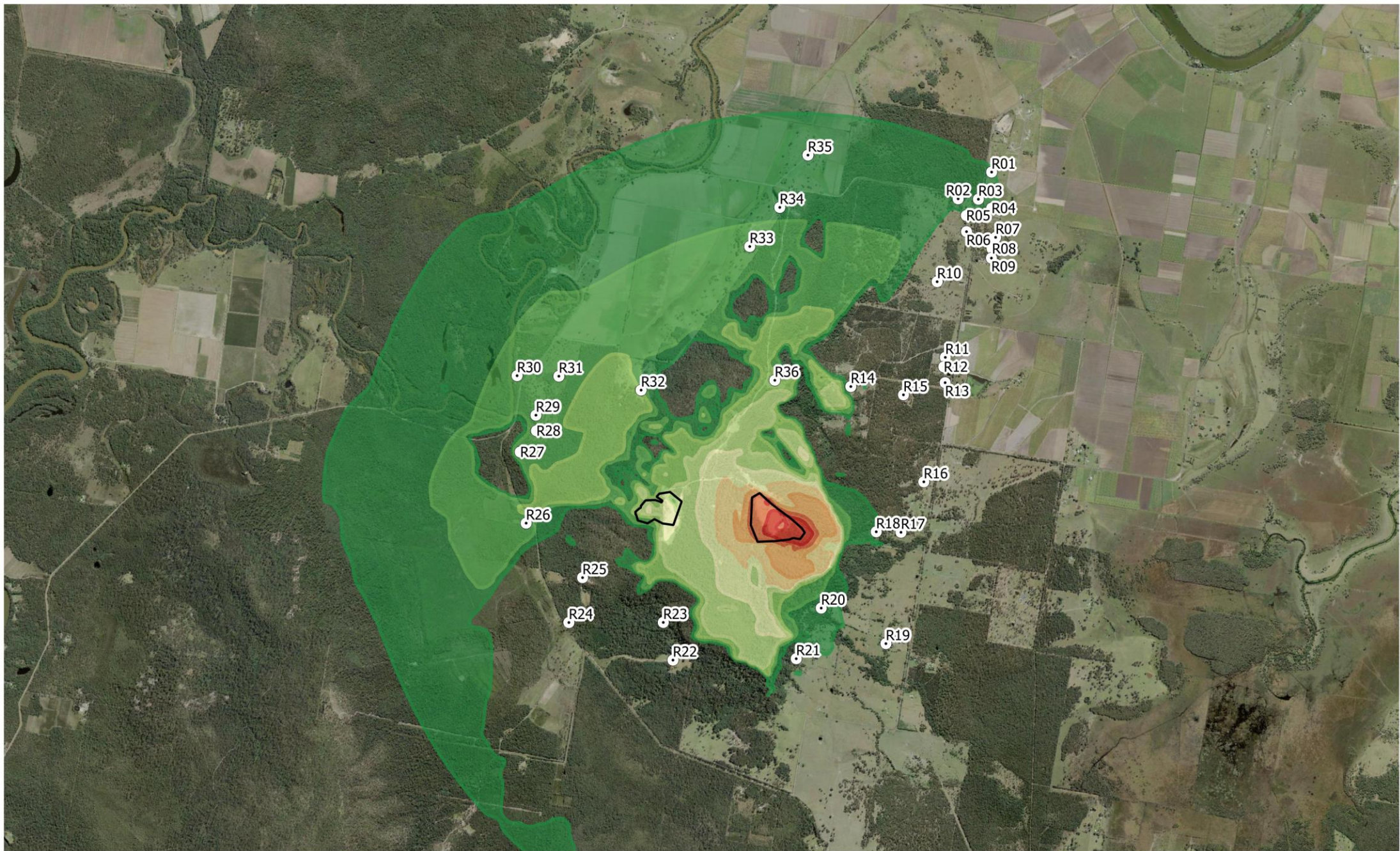
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- 55 dBA
- 60 dBA
- 65 dBA
- 70 dBA

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Scenario 3 - Crushing East - Neutral Weather

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Projection:	GDA 1994 MGA Zone 56



Predicted Noise Levels - LAeq(15minute)

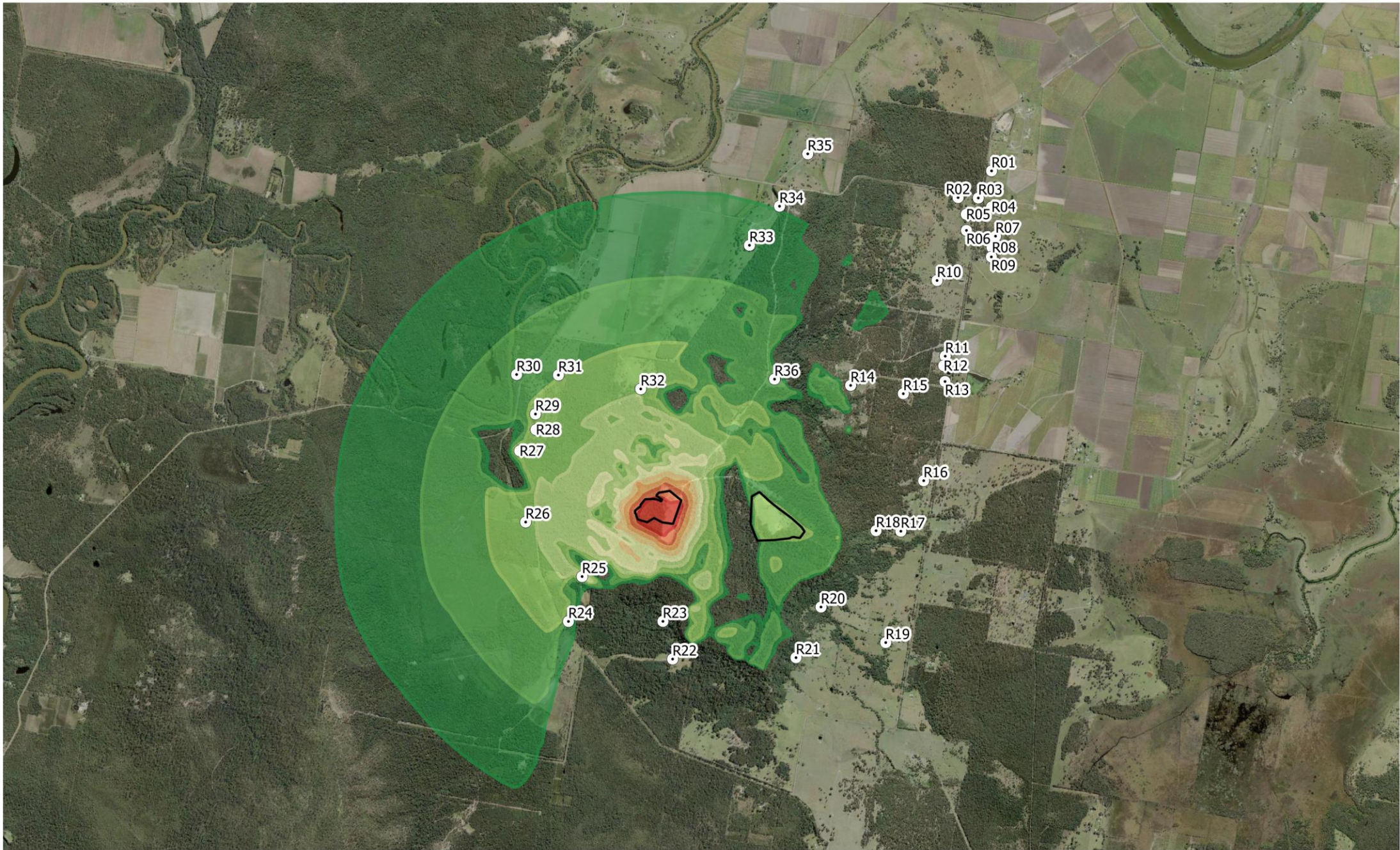
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35 dBA	55 dBA
40 dBA	60 dBA
45 dBA	65 dBA
	70 dBA

Pacific Complete

Moonimba Quarry NIA

Scenario 3 - Crushing East - Enhanced Weather

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Predicted Noise Levels - LAeq(15minute)

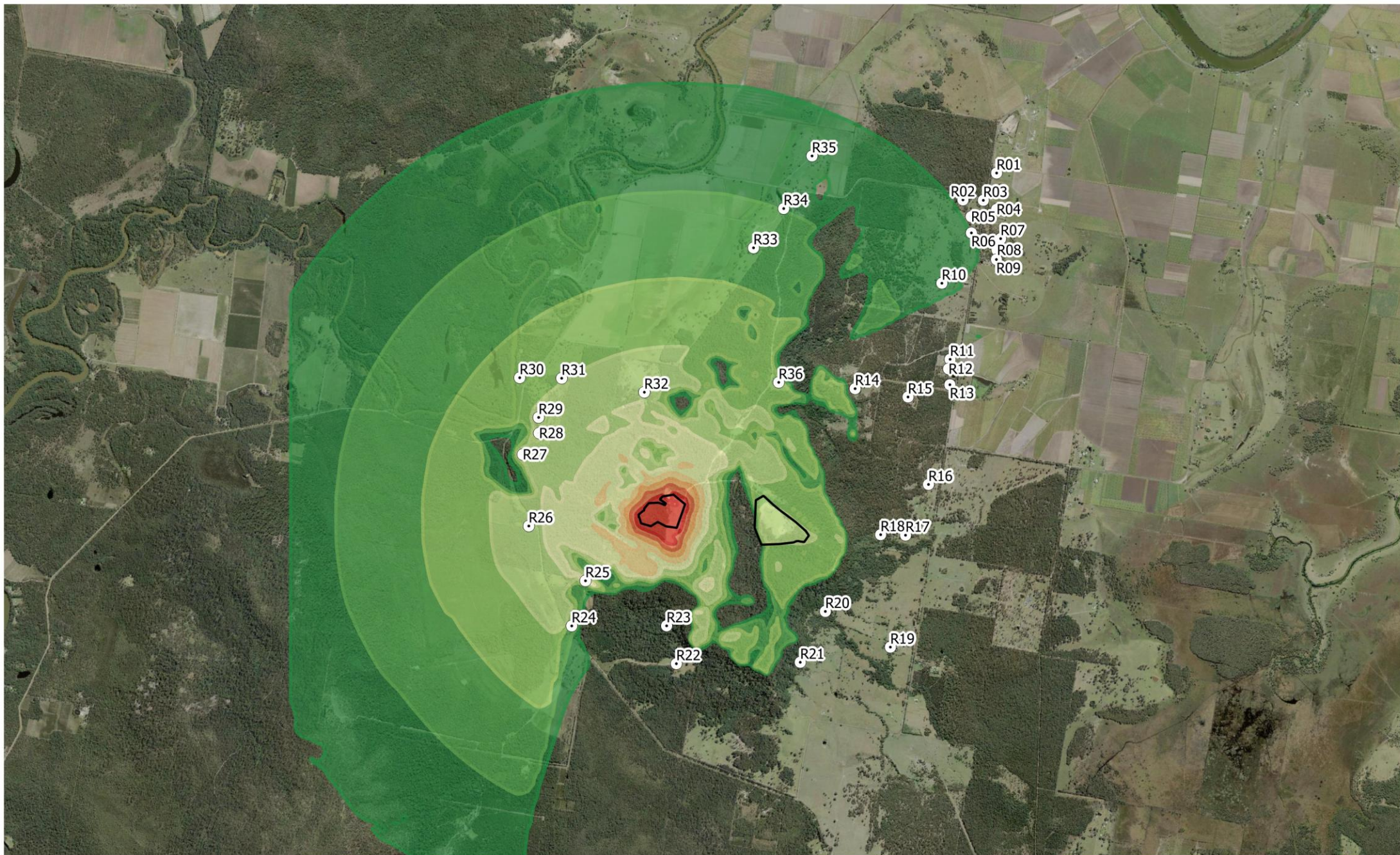
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45 dBA	65 dBA
	70 dBA

Pacific Complete

Moonimba Quarry NIA

Scenario 3 - Crushing West - Neutral Weather

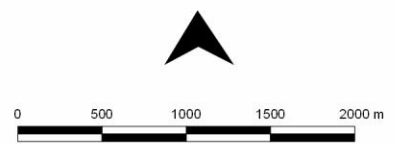
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Predicted Noise Levels - LAeq(15minute)

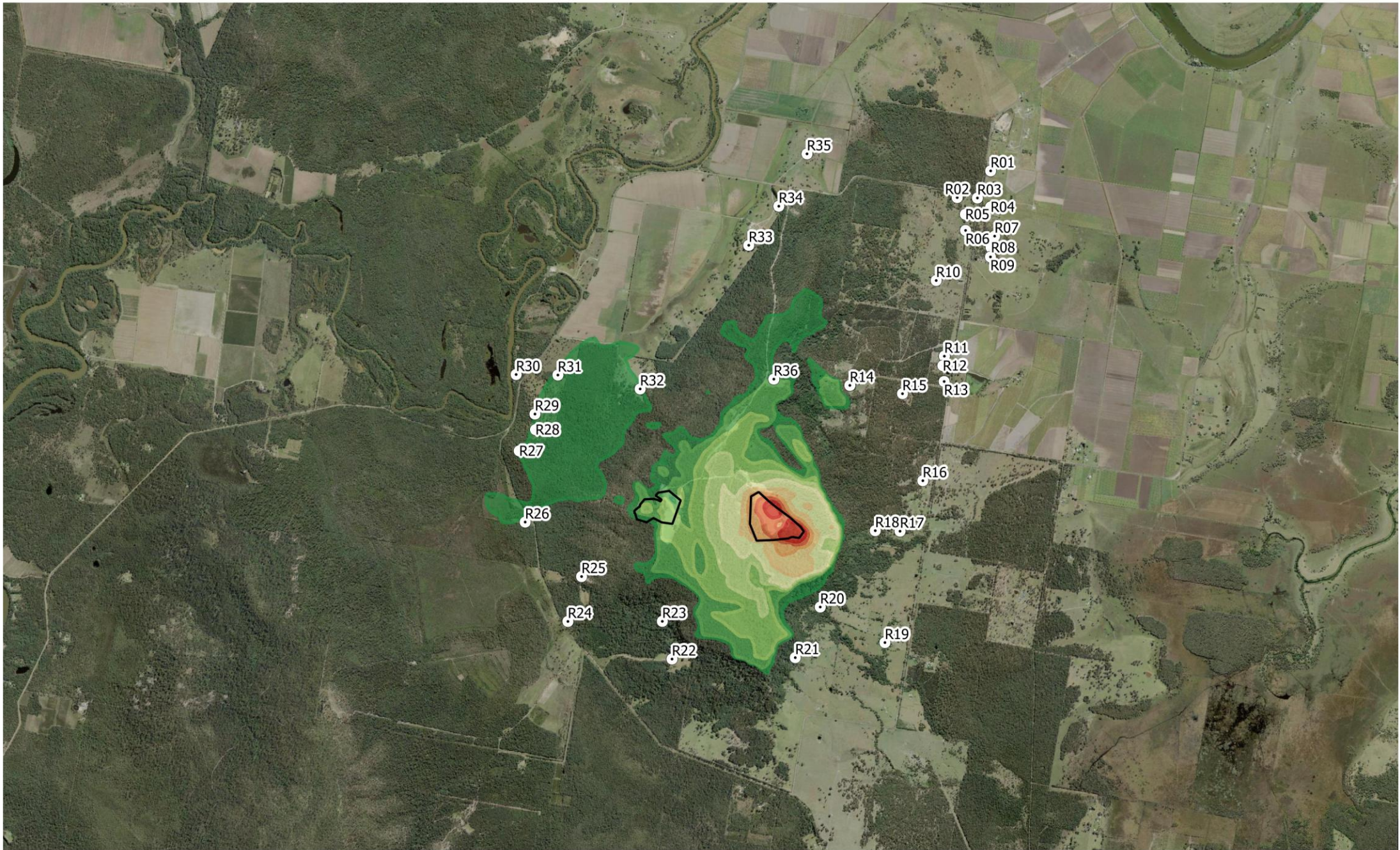
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			70 dBA

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Moonimba Quarry NIA

Scenario 3 - Crushing West - Enhanced Weather

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Predicted Noise Levels - LAeq(15minute)

- 30 dBA
- 35 dBA
- 40 dBA
- 45 dBA

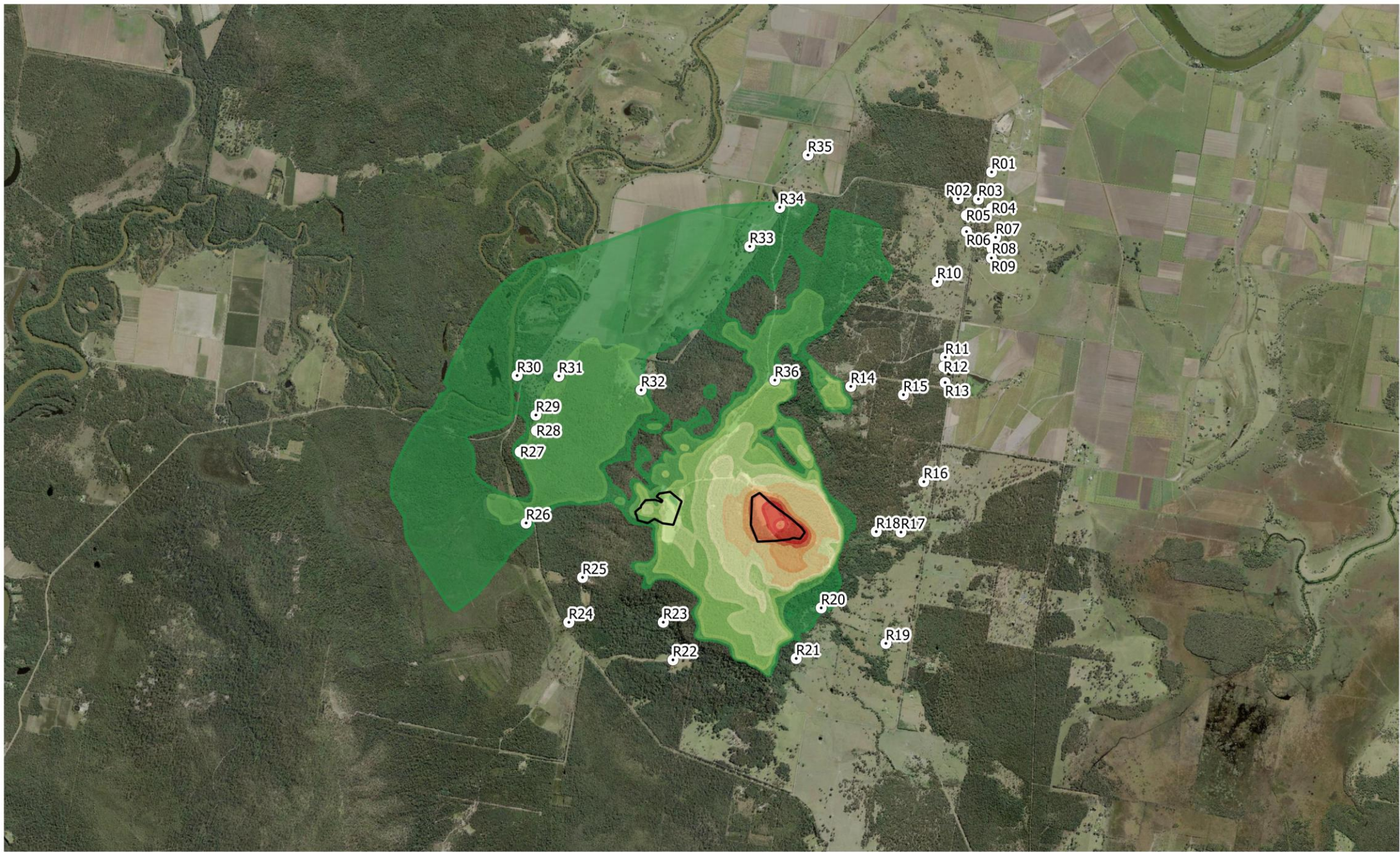
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- 60 dBA
- 65 dBA
- 70 dBA

Pacific Complete

Moonimba Quarry NIA

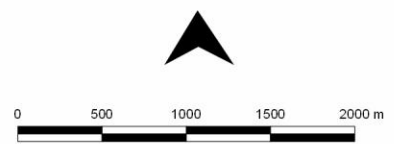
Scenario 3 - Extraction East - Neutral Weather

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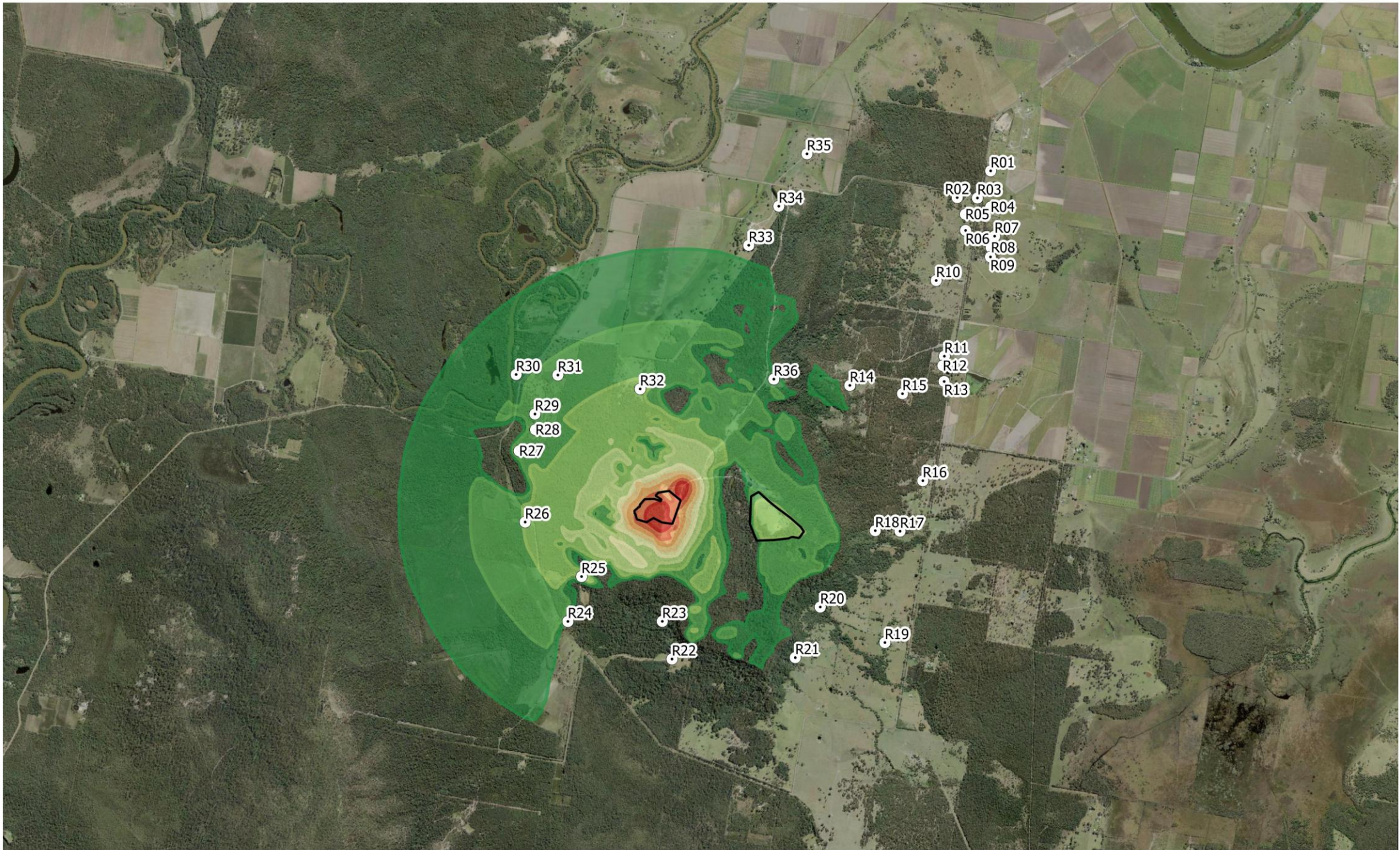
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Pacific Complete

Moonimba Quarry NIA

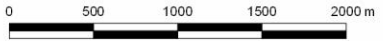
**Scenario 3 - Extraction East -
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Predicted Noise Levels - LAeq(15minute)

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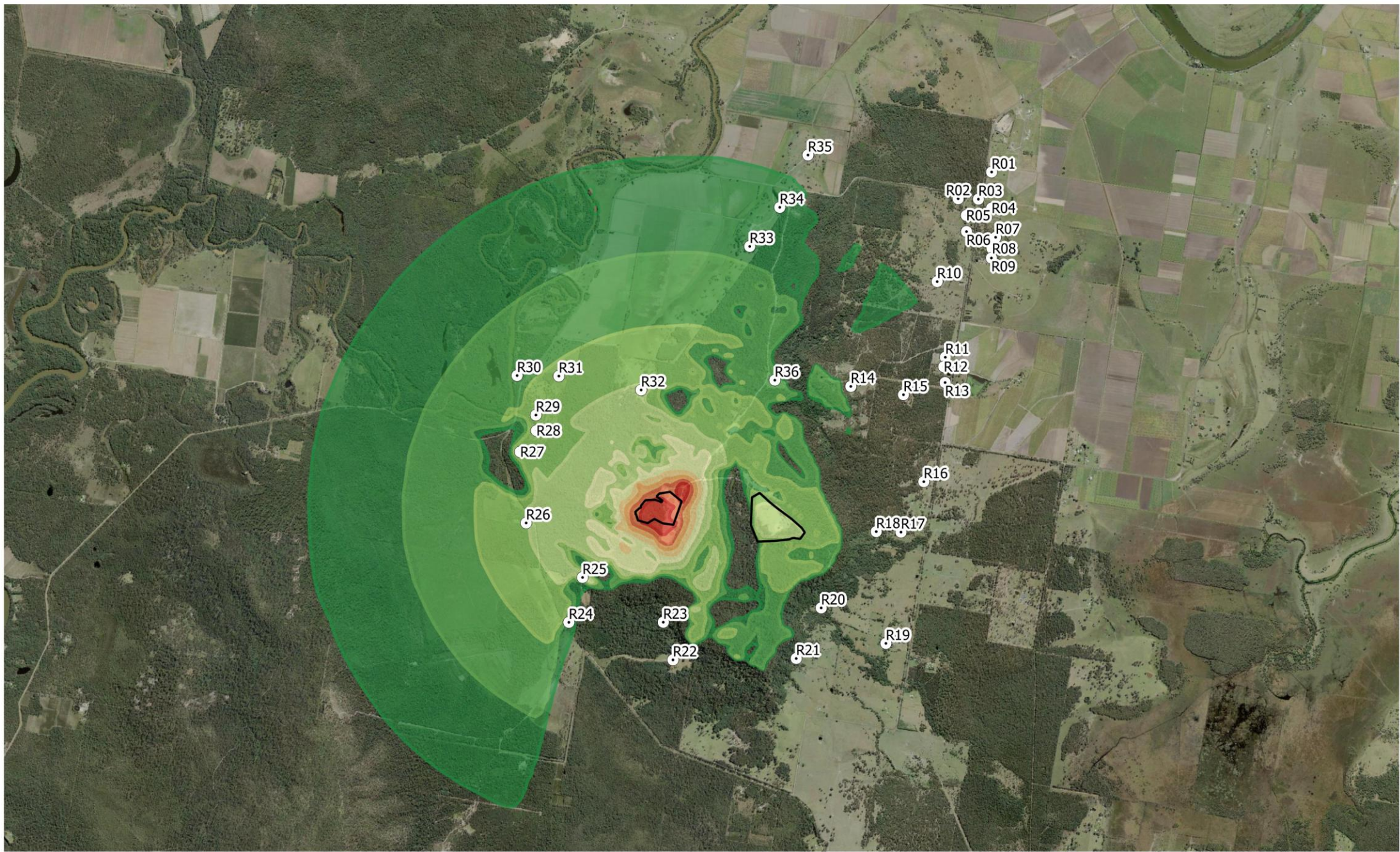
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- 65 dBA
- 70 dBA

Pacific Complete

Moonimba Quarry NIA

Scenario 3 - Extraction West - Neutral Weather

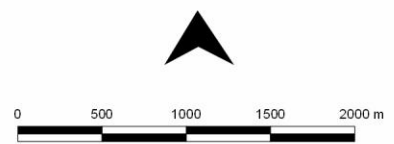
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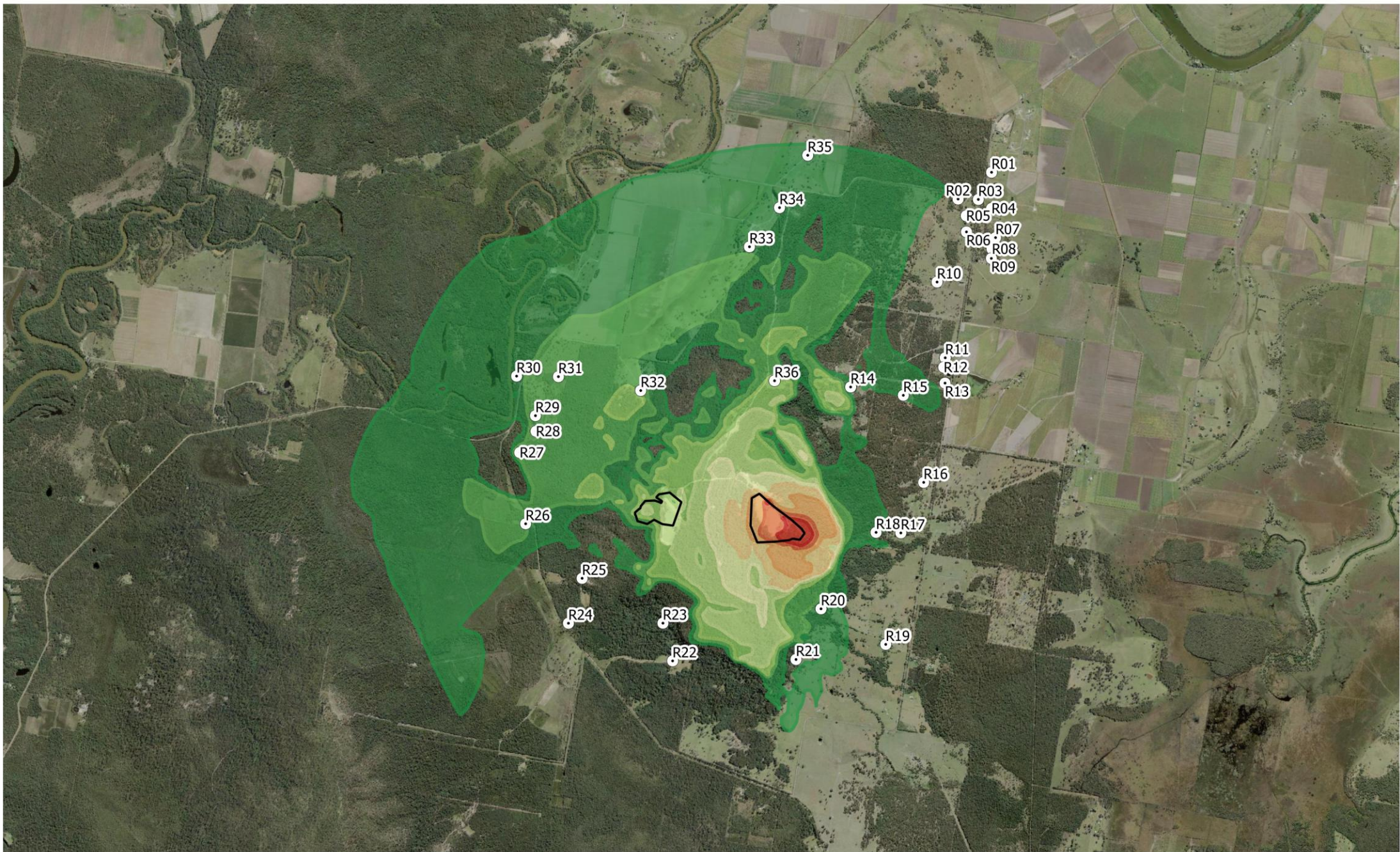
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Pacific Complete

Moonimba Quarry NIA

Scenario 3 - Extraction West - Enhanced Weather

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Predicted Noise Levels - LAeq(15minute)

30 dBA	35 dBA	40 dBA	45 dBA
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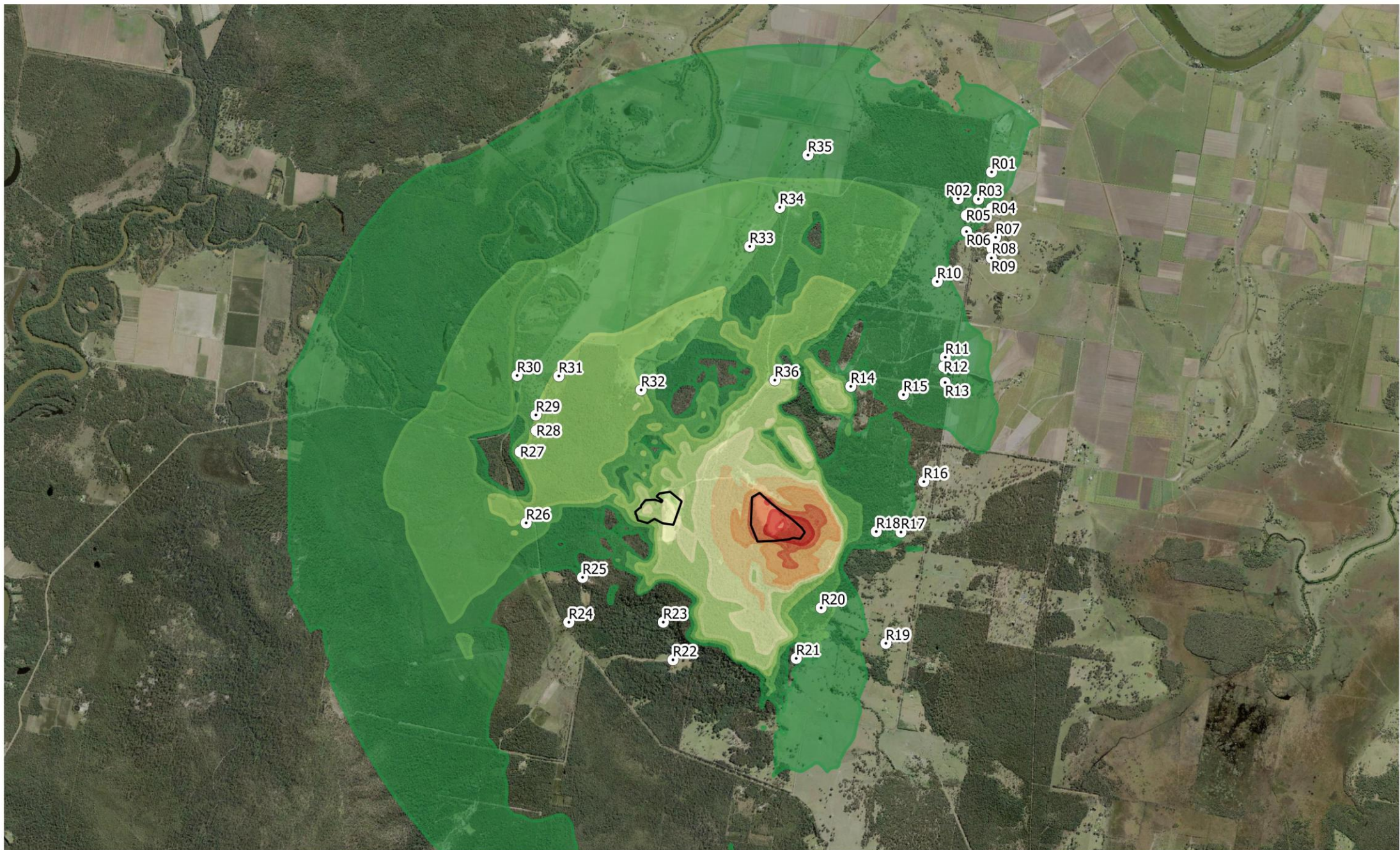
50 dBA	55 dBA	60 dBA	65 dBA	70 dBA
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Pacific Complete

Moonimba Quarry NIA

Scenario 3 - JAW Crushing East - Neutral Weather

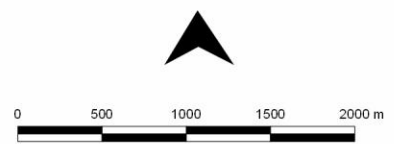
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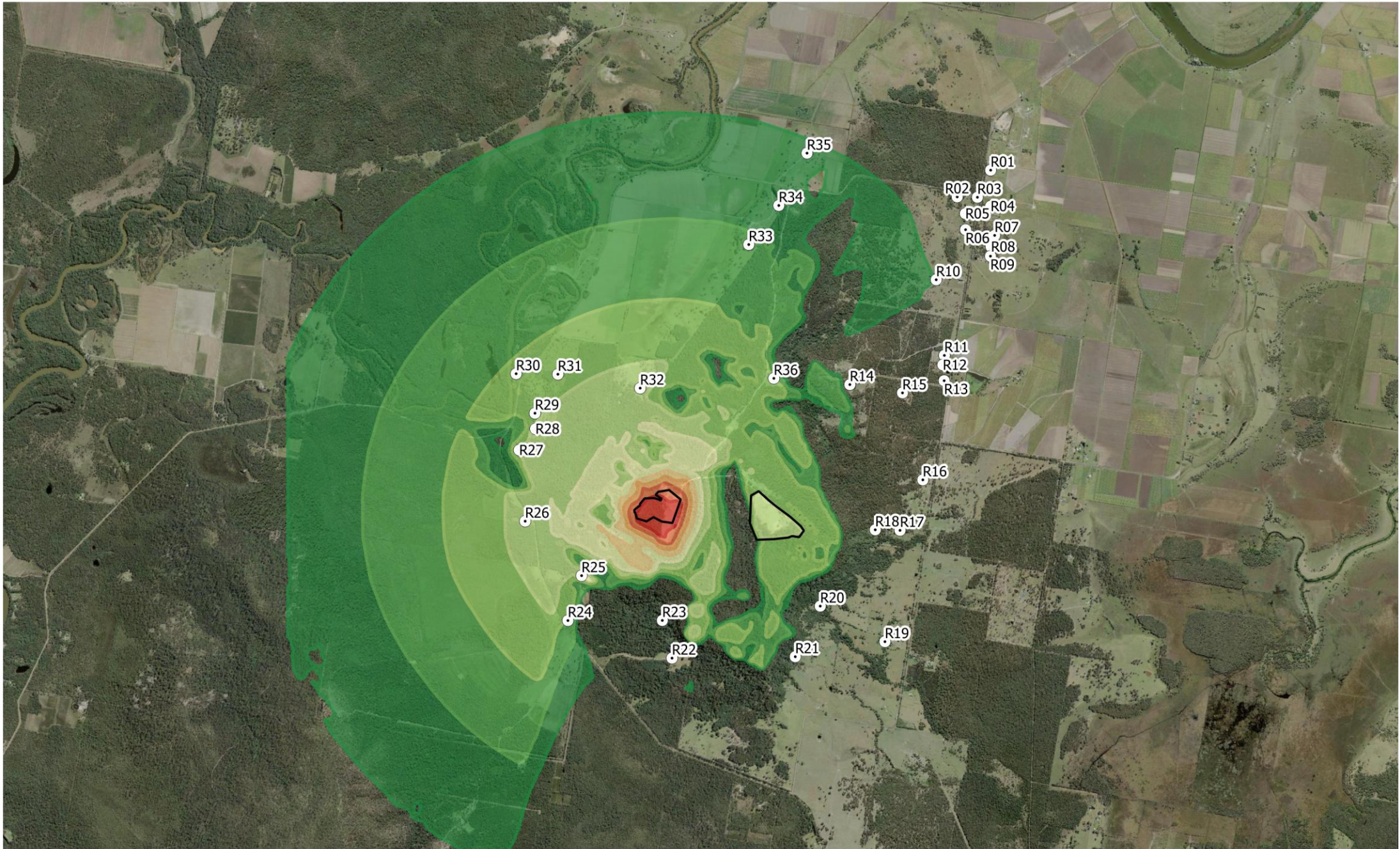
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Pacific Complete

Moonimba Quarry NIA

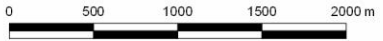
Scenario 3 - JAW Crushing East - Enhanced Weather

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Predicted Noise Levels - LAeq(15minute)

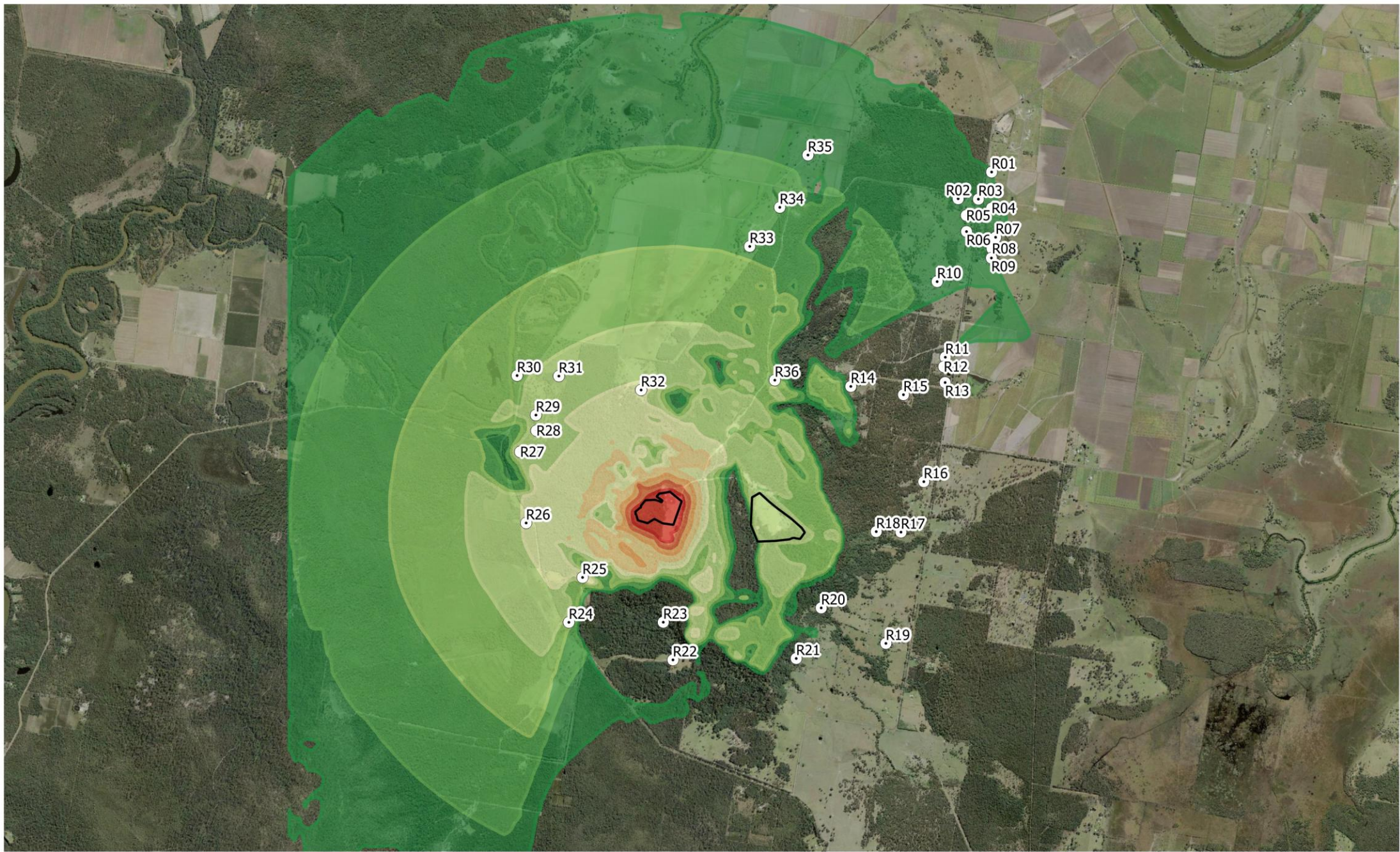
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	70 dBA

Pacific Complete

Moonimba Quarry NIA

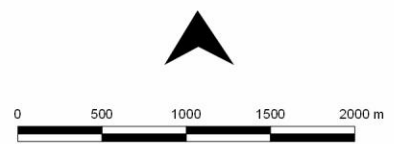
Scenario 3 - JAW Crushing West - Neutral Weather

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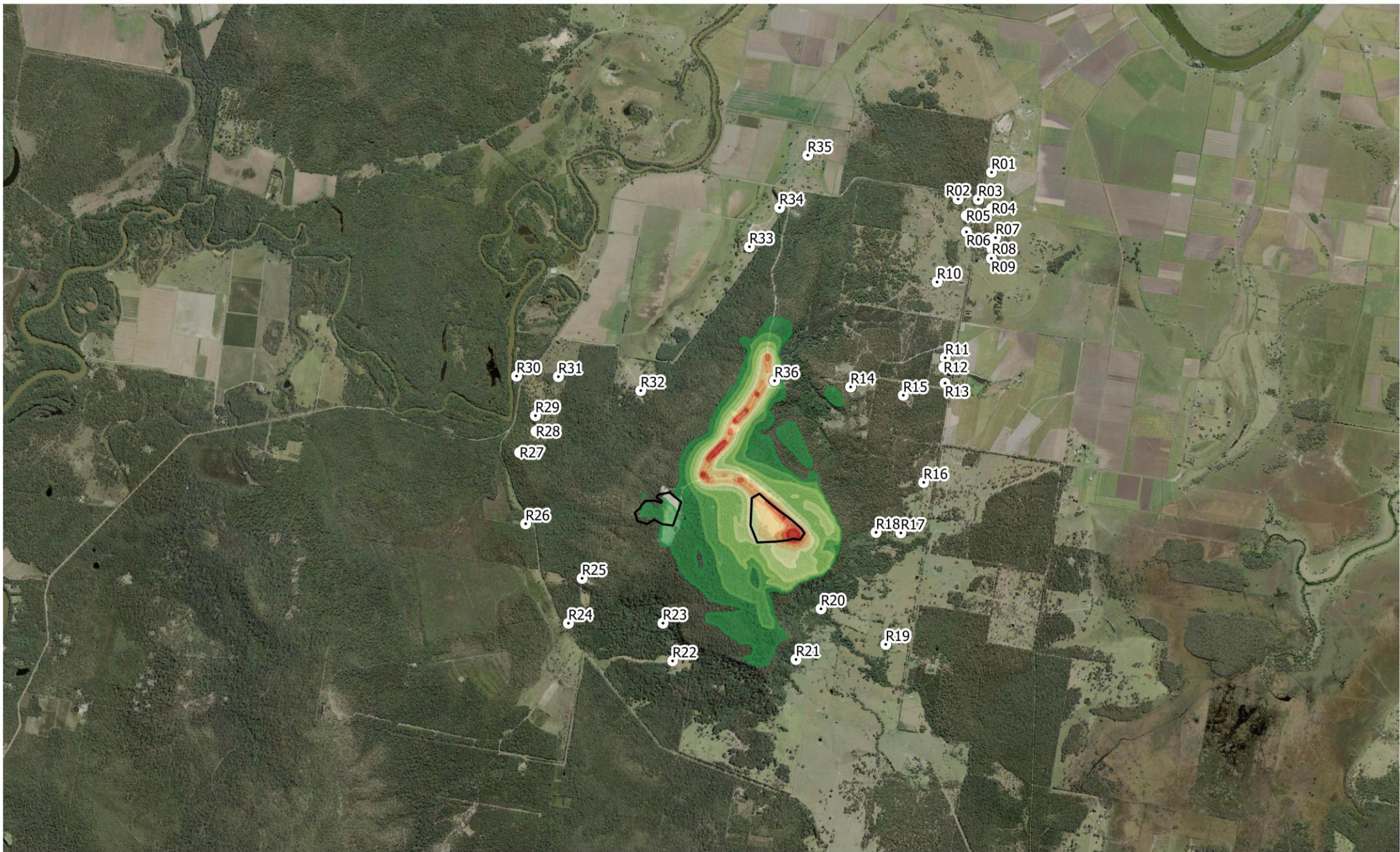
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Predicted Noise Levels - LAeq(15minute)	
■	30 dBA
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■	70 dBA

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Scenario 3 - JAW Crushing West - Enhanced Weather

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Predicted Noise Levels - LAeq(15minute)

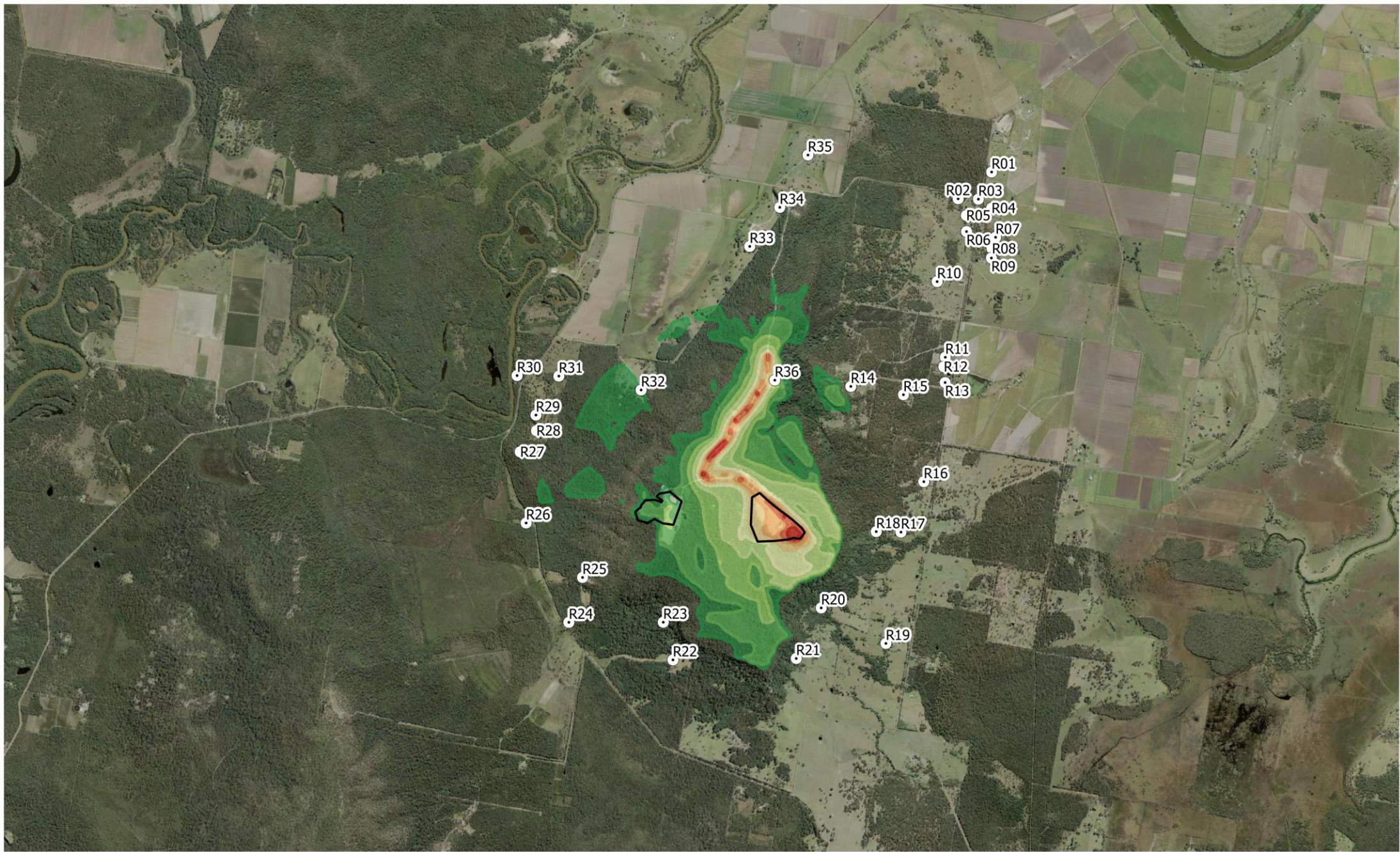
- 30 dBA
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- 45 dBA
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- 55 dBA
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- 65 dBA
- 70 dBA

Pacific Complete

Moonimba Quarry NIA

Scenario 3 - Loading East - Neutral Weather

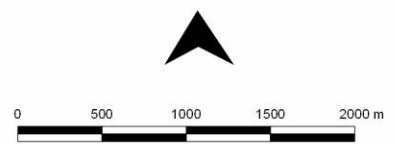
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	30 dBA		50 dBA
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	40 dBA		60 dBA
	45 dBA		65 dBA
			70 dBA

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Scenario 3 - Loading East - Enhanced Weather

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Scenario 3 - Loading East - Neutral Weather

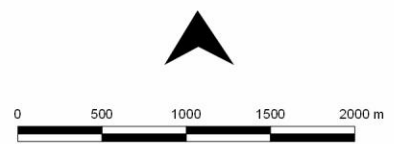
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	45 dBA		65 dBA
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Scenario 3 - Loading East - Enhanced Weather

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APPENDIX E

BIODIVERSITY REVIEW MEMO

MEMORANDUM



TO:	Andrea Zambolt	FUNCTION:	Planning & Approvals Team Leader
FROM:	Mark Stables	FUNCTION:	Senior Ecologist
CC:	Georgia Harmeay	DATE:	30/06/2017
REF:	2270001-ECO-MEMO-003 RevB.docx	NO. OF PAGES:	
SUBJECT:	Moonimba Quarry, Bungawalbin – Biodiversity Review		

1. INTRODUCTION AND BACKGROUND

It is understood that RMS has leased the Moonimba Quarry at Bungawalbin (West of Woodburn) to be used as a borrow site to supply material to the Woolgoolga to Ballina Pacific Highway Upgrade Project. This memo will form part of a modification to the Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (EIS), hence forth referred to as the W2B EIS, for the temporary intensification of operations at the site.

The Moonimba Borrow Site is located on Lot 193 DP755603 Boggy Creek Road, Bungawalbin (Figure 1.1). There are two existing council Development Applications associated with the existing quarry at the site. The current DA127/95 was executed in 1997. A new development application (DA2015/0069) was provided consent in 2015 for the expansion of the Moonimba Quarry, however this consent has not yet been activated.

As part of DA2015/0069 an Environmental Impact Statement (EIS), hence forth referred to as the Moonimba Quarry EIS, was prepared to support the development application for the expansion of the Moonimba Quarry. A Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014), hence forth referred to as the Moonimba Quarry Flora and Fauna Assessment, formed Appendix B4 of the Moonimba Quarry EIS and assessed the flora and fauna impacts from the proposed quarry expansion.

This memo provides updated ecological advice and significance assessments on threatened biodiversity matters relating to the proposed temporary intensification of operations at the Moonimba Borrow Site and should be read in conjunction with the Moonimba Quarry Flora and Fauna Assessment.

FIGURE 1.1 PROPOSAL LOCALITY

The proposal

The current proposal for Moonimba Borrow Site will include the following:

- Extraction of 1 million tonnes of material per annum for 2 years (this is equivalent to 400,000 m³ per year)
- Utilisation of the two extraction areas described within the Moonimba Quarry EIS and granted consent under DA2015/0069
- Clearing of 9.5 ha of vegetation (the extent of clearing is consistent with what was approved under DA2015/0069, however the clearing will now be completed in a single stage event)
- Storage of fuel on site (up to 10,000L of diesel) and other chemicals within a small site office
- Transportation of the material from the site to the project alignment (via the local road network).

2. METHODS

2.1 Database searches

A desktop investigation was undertaken in February 2017 to examine new database records and legislative changes since the 2014 Moonimba Quarry Flora and Fauna Assessment was produced. Searches of the following databases were undertaken on the 3rd February 2017 (specifically searching for any new records since 2014 when the previous searches were completed);

- NSW Office of Environment and Heritage BioNet Atlas of NSW Wildlife.
- Department of the Environment's Protected Matters Search Tool.
- Department of Primary Industries Threatened and Protected Species Record Viewer

Results from database searches and any new or updated listings of threatened species or communities are discussed in Section 3.

2.2 Site inspection

A site inspection was conducted on 28 February 2017 to confirm the findings of the Moonimba Quarry Flora and Fauna Assessment and to examine the existing site attributes and condition. Weather conditions were overcast and heavy rain had been recorded prior to the inspection (108 mm recorded at Evans Head RAAF Bombing Range AWS – Station 058212 on 27 February 2017).

The site inspection was focused around the two approved quarry pits areas, being the ‘eastern pit’ and the ‘western pit’.

The site inspection was limited to rapid assessment surveys that were designed to validate the existing biodiversity attributes to determine the validity of the previous detailed ecological survey findings.

Specifically the site inspection was designed to field validate the finding of the following detailed ecological surveys;

- Conacher Travers (2007) *Flora and Fauna Survey report Proposed Quarry Lot 193 DP755603 Bungawalbin-Whiporie Road Bungawalbin*. Report by Conacher Travers Pty Ltd.
- Australian Wetlands Consulting (2014) *Flora and Fauna Assessment Moonimba Quarry Lot 193 DP755603 Bungawalbin-Whiporie Road Bungawalbin*. Report by Australian Wetlands Consulting Pty Ltd, September 2014.

2.3 Existing environment

During the recent site inspection, soil water management within both the ‘eastern pit’ and ‘western pit’ appeared lacking and uncontrolled water with high sediment content was observed flowing off the sites and into adjacent bushland areas. In the ‘eastern pit’ an artificial channel (which was not previously identified in the 2014 Moonimba Quarry Flora and Fauna Assessment) was draining high sediment content water from the main pit directly into native vegetated areas (see Photo 5). This artificial draining channel has seemed to be purposely cut into the native landscape to drain water from the ‘eastern pit’ into the surrounding native bushland.

Uncontrolled high sediment content water flows were also observed leaving the ‘West Cell’ pit into adjacent native vegetated areas (see Photo 6).



Photo 5: Uncontrolled water flows from the eastern pit into adjacent area of native vegetation and drainage channel

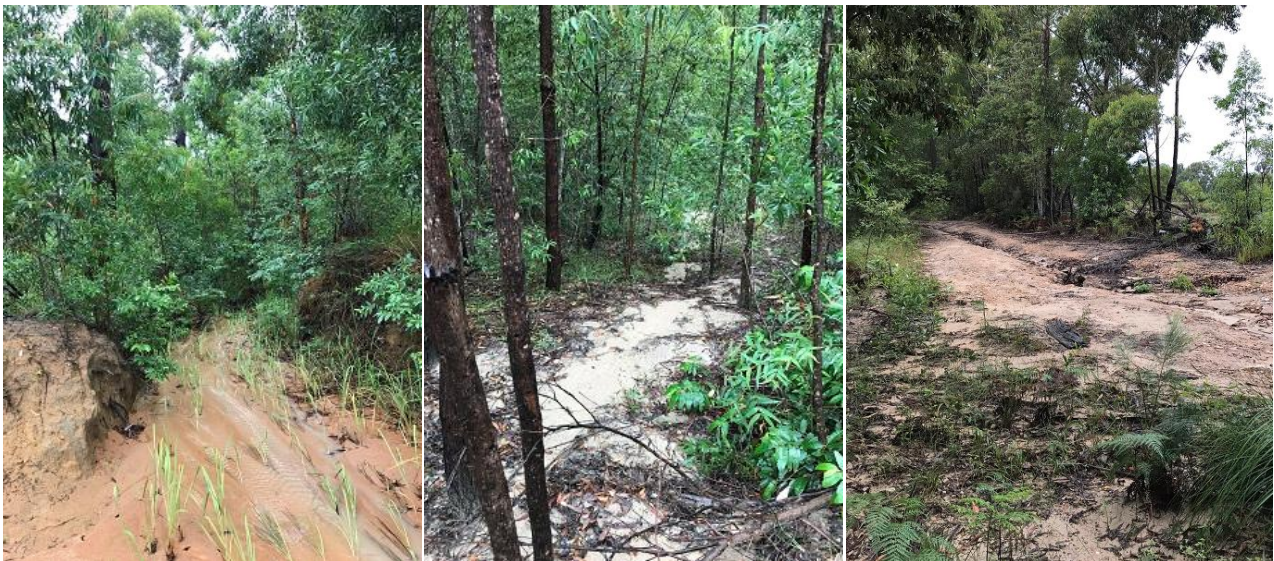


Photo 6: Uncontrolled water flows from the eastern pit into adjacent area of native vegetation

3. RESULTS

3.1 Database results

Threatened flora searches

Database searches identified records of 9 species within the locality of the study area, including 3 listed under the EPBC Act. Since the Moonimba Quarry Flora and Fauna Assessment, only one additional threatened species was identified in the locality of the study area (Table 3.1). Since the Moonimba Quarry Flora and Fauna Assessment, no threatened species that have been previously recorded in the locality have changed threat-listed status.

Table 3.1 Additional threatened flora species identified in the region

SPECIES	LISTING		LIKELIHOOD OF OCCURRENCE
	TSC ACT	EPBC ACT	
<i>Paspalidium grandispiculatum</i>	V	V	Low likelihood – records of individuals were found 10km (Doubleduke vicinity) to the south of the study area. Habitat in study area is marginal. In addition, previous ecological surveys within study area unsuccessful to record any individuals

Threatened fauna searches

Database searches and a review of species considered likely to occur within the locality have identified a total of 13 threatened and/or migratory fauna species that have had a change in threat status since the preparation of the Moonimba Quarry Flora and Fauna Assessment. These changes include the listing of two previously unlisted threatened species along with changes to the threat status of 11 previously listed species. An overview of the listing changes are outlined in Table 3.2 below.

Of the 13 threat status changes to threatened and/or migratory fauna species, only two are considered to have a moderate or higher likelihood of occurrence within the study area. These species are the Greater Glider that has been listed as Vulnerable under the EPBC Act and the Dusky Woodswallow that has been listed as Vulnerable under the TSC Act. Consequently assessment of significances have been completed for these species (Appendix A).

Table 3.2 Changes in threatened fauna listings and species in the study area and region

SPECIES	LISTING		CHANGES SINCE 2014 REPORT	LIKELIHOOD OF OCCURRENCE IN STUDY AREA
	TSC ACT	EPBC ACT		
Greater Glider	-	V	Recently been listed as Vulnerable under EPBC Act (Threatened Species Scientific Committee 2016)	This species has records outside the study area to the west within Yarrungully State Conservation Area and adjoining vegetation. However, records are >20 years old and previous ecological surveys for arboreal mammals within the study area have not recorded the species. Despite this, the species is known to occur within the greater region and to utilise moist eucalypt forests with abundance hollows which is present within the study area. Due to potential habitat within the study area and connectivity to extensive native vegetation patches there is a moderate likelihood for the Greater Glider to occur within the study area.
White-bellied Sea-eagle	V	M	Listed as Vulnerable under the TSC Act (NSW Scientific Committee 2016) and has records within the locality outside the study area.	A review of the species habitat preference and the available habitat onsite identified there is a low likelihood of occurrence within the study area due to limited available habitat.
Dusky Woodswallow	V	-	Listed as Vulnerable under the TSC Act (NSW Scientific Committee 2016).	Despite no records within the study area, the species is known to occur along the coast of NSW and to utilise woodland habitat. There is a moderate likelihood of occurrence within the study area due to available habitat.
Regent Honeyeater	CE	CE	Changed listing from Endangered to Critically Endangered under the EPBC Act (Threatened Species Scientific Committee 2015).	There is a low likelihood of occurrence within the study area due to no recent (>10 years) records with in the locality of the study area. Although opportunistic foraging by vagrant individuals cannot be discounted.
Swift Parrot	E	CE	Changed listing from Endangered to Critically Endangered under the EPBC Act (Threatened Species Scientific Committee 2015).	There is a low likelihood of occurrence within the study area due to no recent (>10 years) records with in the locality of the study area. Although opportunistic foraging by vagrant individuals cannot be discounted.
Eastern Curlew	-	CE; M	Listed as Critically Endangered under the EPBC Act (Threatened Species Scientific Committee 2015)	Low likelihood of occurrence within the study area due to no available habitat.

SPECIES	LISTING		CHANGES SINCE 2014 REPORT	LIKELIHOOD OF OCCURRENCE IN STUDY AREA
	TSC ACT	EPBC ACT		
Curllew Sandpiper	E	CE; M	Now listed as Critically Endangered under the EPBC Act (Threatened Species Scientific Committee 2015)	Low likelihood of occurrence within the study area due to no available habitat.
Painted Honeyeater	V	V	Now listed as Vulnerable under the EPBC Act (Threatened Species Scientific Committee 2015)	Low likelihood of occurrence within the study area due to no available habitat.
Bar-tailed Godwit	-	V; M	Now listed as Vulnerable under the EPBC Act (Threatened Species Scientific Committee 2015)	Low likelihood of occurrence within the study area due to no available habitat.
Lesser Sand Plover	V	E; M	Now listed as Endangered under the EPBC Act (Threatened Species Scientific Committee 2016)	Low likelihood of occurrence within the study area due to no available habitat.
Greater Sand Plover	V	V; M	Now listed as Vulnerable under the EPBC Act (Threatened Species Scientific Committee 2016)	Low likelihood of occurrence within the study area due to no available habitat.
Great Knot	-	CE; M	Now listed as Critically Endangered under the EPBC Act (Threatened Species Scientific Committee 2016)	Low likelihood of occurrence within the study area due to no available habitat.
Red Knot	-	E; M	Now listed as Endangered under the EPBC Act (Threatened Species Scientific Committee 2016)	Low likelihood of occurrence within the study area due to no available habitat.

3.2 Native vegetation

The vegetation within and surrounding the 'eastern pit' was confirmed as Open forest (Blackbutt, Pink Bloodwood) (see Photo 1 & 2). This community corresponds to the Woolgoolga to Ballina Project equivalent vegetation type Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast. The vegetation extent of this community was confirmed to be consistent with the area documented in the Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014).



Photo 1 & 2: East Cell - Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast

In respect to the 'western pit', the vegetation within and surrounding the approved cell extension was confirmed as Open Forest (Blackbutt, Pink Bloodwood) and Open Forest (Smudgy Apple) (see Photo 3 & 4). In terms of W2B project equivalent vegetation community types Open Forest (Blackbutt, Pink Bloodwood) corresponds to Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast whilst Open Forest (Smudgy Apple) does not correspond to a vegetation type identified within the project boundary. Open Forest (Smudgy Apple) is consistent the NSW VIS Classification vegetation type Pink Bloodwood - Red Mahogany - Smudgy Apple shrubby open forest on sandstone of northern NSW North Coast Bioregion.

Of the vegetation types impacted by the approved quarry expansion under DA2015/0069, neither form part of any threatened ecological community under the TSC Act or EPBC Act. The project approved conditions of consent require native vegetation offsetting prior to any vegetation clearing (see Condition 11 and 12 as reproduced below).

Overall the observed native vegetation and subsequent species habitats were considered to be consistent with those documented in the 2014 Moonimba Quarry Flora and Fauna Assessment report.



Photo 3: West Cell - Blackbutt - bloodwood dry heathy open forest on sandstones of the northern North Coast



Photo 4: West Cell - Pink Bloodwood - Red Mahogany - Smudgy Apple shrubby open forest on sandstone of northern NSW North Coast Bioregion

4. IMPACTS

4.1 Threatened species, populations and ecological communities

The Moonimba Quarry Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014) confirmed the presence of the following threatened species and ecological communities from the study area;

- Two threatened flora species (Arrowhead Vine and Slender Milkvine) listed under the TSC Act were recorded within the study area. Habitat and specimens of these species were not recorded within the approved expansion areas.
- The endangered ecological community, Lowland Rainforest, was recorded from within the study area. This community was not recorded from within the approved quarry expansion areas.
- Thirteen threatened fauna species listed under the TSC Act were recorded from the study area. No additional threatened species were observed during the recent site inspection.

Project impacts were assessed for these threatened entities as part of DA2015/0069 approval. The project was considered unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitats. However, since the 2014 Moonimba Quarry Flora and Fauna Assessment report a number of species threat listing under both TSC Act and EPBC have been updated and as a result assessments of significance for all relevant species have been undertaken below (refer to Section 4.4 and Appendix A).

4.2 Migratory species

Database results identified 35 migratory species that have potential to occur within the locality of the study area. Of these, 6 species have records on Bionet Atlas within the locality and 3 species were recorded within the study area by Australian Wetland Consulting in 2014. The habitats within the study area are unlikely to constitute important habitat for any of the listed migratory species, due to the habitat present is unlikely to support significant proportions of the population of any migratory species nor are the habitats critical to any life stage of these species. Due to their mobile nature, the identified species are likely to utilise a number of habitat types within the locality and are known to be relatively common in associated coastal forest environments. The proposed temporary intensification of operations would not significantly impact any listed migratory species.

4.3 Hollow trees

Based on the 2014 Moonimba Quarry Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014) the density of habitat trees within the study area is relatively high – on average 10 hollow bearing trees per hectare and an approximate of 4445 hollow bearing trees occur within the study area. The removal of approximately 103 hollow bearing trees within the approved expansion area would only constitute a loss of 2.3% of hollow bearing trees available to hollow-dependent fauna (i.e. arboreal mammals and large forest owls). It is unlikely that the removal of 103 hollow bearing trees within the proposed expansion area would be a significant impact to threatened hollow-dependent species.

In terms of the existing hollow tree density, the study area estimate of 10 hollow bearing trees per hectare falls within the necessary hollow density required (6-13 hollows per hectare) to support hollow dependent fauna in NE NSW forests (Lindenmayer and Gibbons 2002).

With this understanding, the implementation and replacement of hollow bearing trees with nest boxes would be considered generally unnecessary and may lead to further disturbance and ongoing maintenance issues.

4.4 Assessments of Significance

This memo provides revised TSC Act and EPBC Act significance assessments based on the following changes since the 2014 report;

- Recent threatened species listings and threat status changes to recorded or moderate to higher likelihood of occurrence species
- Changes in vegetation clearing to comprise a single stage clearing event, as opposed to staged clearing as assessed and approved under the Moonimba Quarry EIS.

Significance assessments have been conducted for all recorded threatened species, populations, ecological communities and those species considered to have a moderate or higher likelihood of occurrence within the study area (Appendix A). Combined significance assessments have been conducted for groups of species that have similar life history and habitat requirements; e.g. threatened woodland birds, hollow-dependent microbats.

The significance assessments have been undertaken in accordance with the following published guidelines:

- Threatened species assessment guidelines – assessment of significance for TSC Act listed biodiversity (Department of Environment and Climate Change 2007)
- Significant Impact Guidelines 1.1 – Matters of National Environmental Significance for EPBC Act listed biodiversity (Department of the Environment 2013)
- Referral guidelines for species listed under the EPBC Act (Department of the Environment and Energy 2017).

The finding of the significance assessments (Appendix A) have drawn the following conclusions;

- The proposal is unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitat listed under the TSC Act.
- A Species Impact Statement is not required for this proposal.
- The proposal is unlikely to have a significant impact on matters of national environmental significance
- An EPBC Act referral of this proposal for consideration of a controlled action is not required.

5. RECOMMENDATIONS

The Moonimba Borrow Site are to be managed in accordance with the Approved *Woolgoolga to Ballina Pacific Highway Upgrade (Sections 3 to 11) Construction Environmental Management*

(CEMP) (Approved Project CEMP) and the associated Approved *Woolgoolga to Ballina Pacific Highway Upgrade Construction Flora and Fauna Management Plan (CFFMP)*, Appendix B2 of the CEMP (Approved Project CFFMP). The contractor will refer and implement all relevant mitigation measures outlined in the Approved Project CEMP and CFFMP.

The mitigation measures outlined in Table 5.1 are from the Approved Project CFFMP and are highlighted key measures that should be applied the Moonimba Borrow Site.

In addition the mitigation measures within the CFFMP the following measures are recommended to be implemented at the Moonimba Borrow Site:

- To reduce the potential for injury to resident fauna (especially macropods), speed limits along access roads and tracks should be limited to 40-50km/hr to reduce likelihood of road collision and road mortality. Warning signs along regularly used roads should be erected to warn road users of potential wildlife within the vicinity along road verges.
- While targeted surveys did not record nesting or roosting sites of the Powerful and Masked Owl within the proposed clearing footprint, pre-clearing surveys will help determine whether nesting is occurring within or near the proposed clearing footprint. In the event that a nest tree or roost tree is located and an active breeding pair are utilising the hollow, it must be clearly marked and a buffer of a minimum 50 m radius must be applied and clearly delineated. Clearing of identified roosting tree is recommended to be removed outside breeding season (March – September) and when individuals have vacated the nest.
- Revegetation areas required under DA2015/0069 are further examined to ensure compliance with conditions of approval and ensure DA operation is possible in a timely manner.
- Biodiversity offsets as outlined under DA2015/0069 should be undertaken and implemented as part of any modification approval

Table 5.1 Key mitigation measures outlined in the Approved CFFMP

IMPACT	APPROVED CFFMP ID	MITIGATION MEASURES
Removal of native vegetation	FF3	In the event that threatened species or threatened ecological communities are unexpectedly identified during construction the Unexpected Threatened Species/ TECs Finds Procedure (Appendix O) will be followed.
	FF6	The pre-clearing process will be consistent with Roads and Maritime Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects (RTA, 2011a) and include: <ul style="list-style-type: none"> • Pre-clearing surveys by an experienced ecologist for large bird nests, particularly for listed species such as the Black-necked Stork, Eastern Osprey, Square-tailed Kite and Little Eagle during the nesting and breeding season (July to December) and tree roosting (e.g. Southern Myotis) or cave dwelling bats in trees or existing culvert/bridge structures. If the species is present in or directly adjacent to the project footprint (including ancillary facilities), measures to manage any species be considered, if required. • Mapping the location of any threatened flora and/or fauna species, Threatened Ecological Communities and habitat. • Construction traffic will be restricted to defined access tracks, fenced prior to the start of construction and maintained until construction is complete.
	FF7	To prevent injury and mortality of fauna during the clearing of vegetation and drainage of farm dams, an experienced and licensed wildlife carer and/or ecologist will be present to capture and relocate fauna where required. Further details regarding fauna handling and vegetation clearing procedures are provided in the Roads and Maritime Biodiversity Guidelines (RTA, 2011a).
	FF8	Protective fencing to mark the limits of clearing (i.e. 'no-go' areas) surrounding the construction footprint will be installed and routinely inspected. The limits of clearing will be consistent with those verified in accordance with G40 2.4. The limits of clearing will be marked in accordance with the RMS Biodiversity Guidelines.
	FF17	Prior to construction, pre clearing surveys and inspections for endangered and threatened species shall be undertaken. The surveys and inspections, and any subsequent relocation of species, shall be undertaken under the guidance of a qualified ecologist. If incidental or unanticipated threatened flora and fauna finds are identified, work shall cease in the vicinity of the find to allow for an evaluation of an appropriate response (refer Appendix O in the CFFMP)
	FF35	A staged habitat removal process will be implemented consistent with the RMS Biodiversity Guidelines (RTA, 2011a).

IMPACT	APPROVED CFFMP ID	MITIGATION MEASURES
Aquatic impacts	FF46	All sediment and erosion control measures will be put in place during the construction process and may include sediment and erosion control curtains in the waterways to control turbidity generated during the construction and restoration process.
	FF47	No turbid water generated from the construction corridor or construction area is to be discharged to any waterway unless in accordance with relevant Environment Protection Licence conditions and developed in consultation with Environment Protection Agency and Department of Primary Industries (Fisheries).
Weed invasion	FF14	A weed management plan will be developed as part of the CEMP, in accordance with the Roads and Maritime Biodiversity Guidelines (RTA, 2011a) and the Introductory Weed Management Manual (Richards, 2004).
Invasion and spread of pathogens and disease	FF50	Measures to prevent the introduction and/or spread of pests and disease causing agents such as bacteria and fungi will be incorporated into the CEMP, in accordance with the Roads and Maritime Biodiversity Guidelines (RTA, 2011a).

6. CONCLUSION

The following threatened species and ecological communities occur within the study area;

- Two threatened flora species (Arrowhead Vine and Slender Milkvine) listed under the TSC Act were recorded within the study area. Habitat and specimens of these species were not recorded within the approved expansion areas.
- The endangered ecological community, Lowland Rainforest, was recorded from within the study area. This community was not recorded from within the approved quarry expansion areas.
- Thirteen threatened fauna species listed under the TSC Act were recorded from the study area. No additional threatened species were observed during the recent site inspection.

Project impacts were assessed for these threatened entities along with additional threatened species that were considered to have a moderate or higher likelihood of occurrence as part of DA2015/0069 approval. The project was considered unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitats.

Since the 2014 Moonimba Quarry Flora and Fauna Assessment report, a number of species threat listing under both TSC Act and EPBC have been updated and as a result these species have been given further consideration in terms of their likelihood of occurrence within the study area.

Given the current proposal will result in a single stage clearing event, revised TSC Act and EPBC Act significance assessments have been undertaken (Appendix A). These assessments have concluded that;

- In terms of TSC Act matters, the action proposed is considered unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitats. Given this, a Species Impact Statement is not required for this proposal (Appendix A).
- In terms of EPBC Act matters, the action proposed is unlikely to pose a significant effect on Matters on National Environmental Significance and as such a referral of this proposal for consideration as a controlled action is not required (Appendix A).

The Moonimba Borrow Site is to be managed in accordance with the Approved *Woolgoolga to Ballina Pacific Highway Upgrade (Sections 3 to 11) Construction Environmental Management (CEMP)* and the associated Approved *Woolgoolga to Ballina Pacific Highway Upgrade Construction Flora and Fauna Management Plan (CFFMP), Appendix B2 of the CEMP*. The contractor will refer and implement all relevant mitigation measures outlined in the Approved Project CEMP and CFFMP.

Whilst the proposal is considered unlikely to cause a significant impact on threatened biodiversity the additional recommendations outlined in section 5 should be implemented to minimise any residual biodiversity impact.

Regards,

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- Threatened Species Scientific Committee (2016). Approved Conservation Advice for *Petauroides volans* (Greater Glider). Canberra, Department of the Environment.

Appendix A Significance Assessments

APPENDIX A – SIGNIFICANCE ASSESSMENTS



1. VEGETATION COMMUNITIES

1.1 Lowland Rainforest

Status

Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion is listed as an Endangered Ecological Community under the TSC Act.

This community is within the definition of Lowland Rainforest of Subtropical Australia and is listed as Critically Endangered Ecological Community listed under the EPBC Act.

Description

Lowland Rainforest on Floodplain is a rainforest community which now occurs only as small remnants in scattered localities on the NSW north coast, with less than 1000ha in total thought to remain. Larger stands of the community typically have a dense canopy, which blocks most light from reaching the ground, creating cool, moist conditions within. Lowland Rainforest on Floodplain supports a rich diversity of plants and animals. Typical tree species in the community include figs (*Ficus macrophylla*, *F. obliqua* and *F. watkinsiana*), palms (*Archontophoenix cunninghamiana* and *Livistona australis*), Silky Oak (*Grevillea robusta*), Black Bean (*Castanospermum australe*) and Brush Cherry (*Syzygium australe*). Animals present include fruit-eating rainforest pigeons, Noisy Pitta, Brush-turkey, pademelons, flying foxes, the Land Mullet skink and rainforest snails.

Distribution

Lowland Rainforest on Floodplain generally occupies riverine corridors and alluvial flats with rich, moist silts often in subcatchments dominated by basic volcanic substrates. Major examples once occurred, and remnants remain, on the floodplains of the Tweed, Richmond, Clarence, Bellinger, Macleay, Hastings, Manning, and Hunter Rivers. Other minor river systems also support the community.

Threats

- Clearing and fragmentation of habitat for development and agriculture.
- Invasion of community by introduced weeds, particularly exotic vines and lantana.
- Degradation of habitat by fire.
- Degradation of habitat by grazing stock.
- Dumping of rubbish within rainforest remnants.

Specific impacts

No impacts to Lowland Rainforest threatened ecological community would occur due to the action proposed, with the closest quarry excavation works occurring approximately 1km from the community.

1.1.1 TSC Act assessment

In the case of a Threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

The action proposed will not directly remove any existing extent of Lowland Rainforest threatened ecological community, with the closest quarry excavation works occurring approximately 1km from the community. Ameliorative measures have been recommended to mitigate any indirect impacts to this community. Given this, the action proposed is unlikely to adversely affect the extent or substantially adversely modify the composition of Lowland Rainforest such that the local occurrence would be placed at risk of extinction.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed is unlikely to directly remove any existing extent of Lowland Rainforest threatened ecological community, with the closest quarry excavation works occurring approximately 1km from the community.

The action proposed is unlikely result in an area of habitat for Lowland Rainforest to become fragment or isolated from other areas of habitat.

Important habitat is unlikely be removed, modified, fragmented or isolated as a result of the proposed action that would result in the long-term survival of this community in the locality to be affected.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No listed critical habitats under the TSC Act occur within the Richmond Valley LGA.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plan has been prepared for Lowland Rainforest threatened ecological community under the TSC Act. In addition no threat abatement plans have relevance to the Lowland Rainforest threatened ecological community.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Clearing of native vegetation is listed as a key threatened process under the Threatened Species Conservation Act 1995. Clearing is defined as the destruction of a sufficient proportion of one or more

strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long term modification, of the structure, composition and ecological function of stand or stands. The proposed action will result in the clearing of native vegetation however given the nearest clearing will be approximately 1 km from this community it is unlikely that it will result in increased impacts of this key threatening process on Lowland Rainforest. Given this, the action proposed is unlikely to constitute or likely to result in the operation or increase a key threatened process on Lowland Rainforest or its habitat.

Conclusion

The action proposed will not result in the direct removal of Lowland Rainforest and is considered unlikely to adversely affect occurrence and composition of this community such that it would lead to the local occurrence becoming extinct. Further, given the avoidance of direct impacts and that indirect impact will be managed through the implementation of mitigation measures, the action proposed is unlikely to result in a long-term adverse effect on fragmentation, isolation, and modification of the community within the locality.

In light of the above assessment the action proposed is considered unlikely to lead to a significant impact on Lowland Rainforest or its habitat.

1.1.2 EPBC Act Significance Assessment

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **Reduce the extent of an ecological community**

No impacts to Lowland Rainforest threatened ecological community would occur due to the action proposed, therefore the action proposed will not reduce the extent of this community.

- **Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.**

No impacts to Lowland Rainforest threatened ecological community would occur due to the action proposed, therefore the action proposed will not fragment or increase fragmentation of this community.

- **Adversely affect habitat critical to the survival of an ecological community**

No impacts to Lowland Rainforest threatened ecological community would occur due to the action proposed, therefore the action proposed would not adversely affect habitat critical to the survival of this community.

- **Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.**

No impacts to Lowland Rainforest threatened ecological community would occur due to the action proposed, with the closest quarry excavation works occurring approximately 1km from the community. The action proposed will unlikely lead to a significant impact to abiotic factors associated with this threatened ecological community.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.**

No impacts to Lowland Rainforest threatened ecological community would occur due to the action proposed, with the closest quarry excavation works occurring approximately 1km from the community.

Therefore it is unlikely that the action proposed will cause a substantial change in species composition leading to a decline or loss of functionally of important species.

Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

No impacts to Lowland Rainforest threatened ecological community would occur due to the action proposed, with the closest quarry excavation works occurring approximately 1km from the community. Therefore it is unlikely that the action proposed will cause substantial reduction in the quality of this ecological community.

Interfere with the recovery of an ecological community

No impacts to Lowland Rainforest threatened ecological community would occur due to the action proposed and therefore will not interfere with the recovery of this community.

Conclusion

No impacts to Lowland Rainforest threatened ecological community would occur due to the action proposed, with the closest quarry excavation works occurring approximately 1km from the community. Therefore it is unlikely that the action proposed will cause significant impacts to this threatened ecological community.

2. FLORA

2.1 Threatened Rainforest Flora

Tinospora tinosporoides (Arrowhead Vine) is listed as Vulnerable under the TSC Act. Whereas, *Belvisia mucronata* (Needle-leaf Fern) and *Marsdenia longiloba* (Slender Marsdenia) is listed as Endangered species under the TSC Act. *Marsdenia longiloba* (Slender Marsdenia) is also listed as Vulnerable under the EPBC Act. These species have been assessed together as they share similar habitat requirements, threats that affect their recovery, and potential impacts as result of the action proposed. The habitat and ecology of the threatened rainforest flora is summarised in the below table (Table 2.1).

Table 2.1 Threatened rainforest flora

SCIENTIFIC NAME	TSC ACT	EPBC ACT	HABITAT AND DISTRIBUTION	THREATS
<i>Tinospora tinosporoides</i>	V		North from the Richmond River in north-east NSW, where it is locally common in some parts of its range. Also recorded from a single location in south-east Queensland. Found in wetter subtropical rainforest, including littoral rainforest, on fertile, basalt-derived soils.	<ul style="list-style-type: none"> • Clearing and fragmentation of habitat for development, agriculture, and roads. • Risk of local extinction because populations are small at some locations. • Grazing and trampling by domestic stock. • Fire. • Invasion of habitat by introduced weeds. • Accidental damage to plants when cutting introduced vines during bush regeneration.
<i>Belvisia mucronata</i>	E		In Australia, this species is restricted to Queensland and NSW. In NSW, it is known from only five locations on the far north coast, north from Evans Head. Forms small clumps on trees or rocks in dry rainforest or along creeks in moist open forest. Occurs in low numbers at all sites.	<ul style="list-style-type: none"> • Fire. • Forestry activities. • Risk of local extinction due to low numbers. • Weed invasion, particularly Lantana.

SCIENTIFIC NAME	TSC ACT	EPBC ACT	HABITAT AND DISTRIBUTION	THREATS
<i>Marsdenia longiloba</i>	E	V	Scattered sites on the north coast of NSW north from Barrington Tops. Also occurs in south-east Queensland. Subtropical and warm temperate rainforest, lowland moist or open eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops.	<ul style="list-style-type: none"> • Loss and fragmentation of habitat through land clearing for agriculture. • Loss and fragmentation of habitat through land clearing for urban development. • Invasion of habitat by introduced weeds. • Grazing and trampling of plants by cattle. • Disturbance of habitat and loss of individuals as a result of forestry activities. • Risk of local extirpation because populations are small. • At risk from the use of herbicides in weed control activities. • Roadside populations are at risk from road works.

Specific impacts

The action proposed will not result in any disturbance or loss of any rainforest habitat or riparian areas associated with the occurrence of *Tinospora tinosporoides*, *Belvisia mucronata* or *Marsdenia longiloba*.

2.1.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed action will not result in any direct disturbance or loss of any rainforest or riparian habitat associated with the occurrence of *Tinospora tinosporoides*, *Belvisia mucronata* or *Marsdenia longiloba*. Therefore it is unlikely that the action proposed will have an adverse effect on the life cycle of any of the mentioned species to the point that a local population would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

No threatened flora populations occur within the Richmond Valley LGA.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed will not result in any direct disturbance or loss of any rainforest or riparian habitat associated with the occurrence of *Tinospora tinospoides*, *Belvisia mucronata* or *Marsdenia longiloba*. Therefore the action proposed is unlikely to remove, modify, fragment or isolate important habitat for these species in the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No listed critical habitats under the TSC Act occur within the Richmond Valley LGA.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been prepared for any of the mentioned threatened flora species under the TSC Act. The action proposed is unlikely to result in disturbance or loss of any rainforest or riparian habitat associated with the mentioned species.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The action proposed would be consistent with one key threatening processes under the TSC Act, being clearing of native vegetation. The action proposed would impact 9.5ha of open sclerophyll forest however in regards to the mentioned threatened flora species, the action proposed is unlikely to result in disturbance or loss of any rainforest or riparian habitat associated with the occurrence of *Tinospora tinospoides*, *Belvisia mucronata* or *Marsdenia longiloba*. Given this, the action proposed is unlikely to constitute or result in the operation or increase a key threatened process on Lowland Rainforest or its habitat.

Conclusion

The action proposed is unlikely to result in disturbance or loss of any rainforest or riparian habitat associated with the occurrence of *Tinospora tinospoides*, *Belvisia mucronata* or *Marsdenia longiloba*. Therefore it is unlikely that the action proposed will have a significant impact of these species or their habitat.

3. FAUNA

3.1 Giant Barred Frog

Status

The Giant Barred Frog (*Mixophyes iteratus*) is listed as Endangered under both the TSC Act and EPBC Act.

Habitat and Distribution

Terrestrial species which occurs in rainforests, Antarctic beech or wet sclerophyll forests. Feeds on insects and smaller frogs (Cogger, 2000). The species is associated with permanent flowing drainages, from shallow rocky rainforest streams to slow-moving rivers in lowland open forest. It is not known to utilise still water areas (NSW Scientific Committee, 1999). More prevalent at lower altitudes and in larger streams than its congeners, although has been recorded up to 1000 metres asl. (NSW National Parks and Wildlife Service, 1999c).

Distributed along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains. Declines appear to have occurred at the margins of the species' range. Northern NSW, particularly the Coffs Harbour-Dorrigo area, is a stronghold.

Threats

- Clearance of riparian vegetation
- Degradation of habitat due to exotic weeds.
- Reduction in water quality or alterations to flow patterns.
- Inadequate protection of riparian habitat during forestry activities.
- Infections of the fungal pathogen *Batrachochytrium dendrobatidis* that causes chytridiomycosis.
- Predation of individuals and disturbance of habitat or destruction of eggs by feral pigs.
- Damage to riparian habitats from grazing and physical disturbance by domestic stock.
- Small population sizes and loss of genetic variation.

Specific impacts

The Giant Barred Frog is likely to be found within rainforest communities and associated streams within the study area. The action proposed would unlikely disturb any potential habitat for the Giant Barred Frog.

3.1.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Potential habitat associated with Giant Barred Frog (lowland rainforest) will unlikely be impacted by the action proposed. Implementation of water and sediment mitigation measures associated with the quarry will reduce any indirect impacts associated with runoff from operations. It is unlikely that the action proposed will have an adverse effect on the life cycle of Giant Barred Frog in that the local population would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

Within the study area, the action proposed is unlikely to disturb or impact areas of potential breeding habitat associated with rainforest and riparian areas. The action proposed will result in the removal of 9.5 ha of open forest vegetation that is considered to provide marginal foraging habitat for the Giant Barred Frog. This marginal habitat is unlikely to provide important habitat to the long-term survival of the species in the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of the Office of Environment and Heritage. No critical habitat has been listed for this species. No areas within the study area are considered critical to the survival of the Giant Barred Frog.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A national recovery plan for Stream Frogs of South-east Queensland, in which Giant Barred Frog is included, has identified a number of recovery actions for the species. The Office of Environment and Heritage has assigned the Giant Barred Frog species as Landscape management species under the *Saving our Species* program. The Office of Environment and Heritage has identified a number of management actions for the recovery for this species (Table 3.1).

Table 3.1 Recovery actions for Giant Barred Frog

Action*	Relevance to project
Protection and rehabilitation of the riparian habitat of the Giant Barred frog: weed removal, planting of overstorey species and the removal (or reduced density) of stock if necessary. Education of land owners and managers of the importance of maintaining riparian habitat and the integration of habitat protection into land management regulations.	Riparian areas within the study area will be retained and mitigation measures will be implemented to reduce any potential indirect impacts associated with the action proposed.

*The above recovery actions do not include actions which are related to state or regional wide actions.

The proposed action is unlikely to substantially contribute to or interfere with the implementation of these recovery strategies.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to the Giant Barred Frog, the following two key threatening processes under the TSC Act are considered unlikely to result in the operation of, or increase the impact of;

- Infection of frogs by amphibian chytrid causing the disease chytridiomycosis
- Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish)
- The propose action will be subject to ameliorative measures that will mitigation any potential impacts of these key threatening processes on potential habitat for the Giant Barred Frog.

Conclusion

The action proposed would unlikely impact any potential habitat (Lowland Rainforest and riparian habitat) associated with the Giant Barred Frog. With the implementation of water management mitigation measures any potential indirect impacts associated with runoff and sedimentation from the action proposed is unlikely to lead to a significant impact to the Giant Barred Frog. The action proposed is unlikely lead to a significant impact on the Giant Barred Frog or its habitat.

3.1.2 EPBC Act significance assessment

The Giant Barred Frog is listed as Endangered under the EPBC Act and it can be considered to be declining within the study area and the wider locality. This species is therefore assessed using the threatened species criteria of the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013). Under the EPBC Act, population of a species is defined as:

- a geographically distinct regional population, or collection of local populations; or
- a population, or collection of local populations, that occurs within a particular bioregion.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will result in one or more of the following:

Will the action lead to a long-term decrease in the size of a population of a species?

Potential habitat associated with Giant Barred Frog (lowland rainforest) will not be directly impacted or disturbed due to the action proposed and therefore it is unlikely that the action proposed will lead to a long-term decrease in the size of the local population.

Will the action reduce the area of occupancy of the species?

The action proposed will not directly impact or disturb habitat associated with the Giant Barred Frog, therefore the action proposed will unlikely reduce the area of occupancy of the species.

Will the action fragment an existing population into two or more populations?

The action proposed will not directly impact or disturb habitat associated with the Giant Barred Frog, therefore the action proposed will unlikely fragment any existing population into two or more.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for this species. No areas within the study area are considered critical to the survival of the Giant Barred Frog. The action proposed will unlikely adversely affect habitat critical to the survival of the Giant Barred Frog.

Will the action disrupt the breeding cycle of a population?

The action proposed will not directly impact or disturb breeding habitat associated with the Giant Barred Frog, therefore the action proposed will unlikely disrupt the breeding cycle of the local population.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The action proposed will not directly impact or disturb habitat associated with the Giant Barred Frog, therefore the action proposed will unlikely reduce the quality of habitat of the species in which it is likely to decline.

Will the action result in invasive species that are harmful to an Endangered species becoming established in the Endangered species' habitat?

It is unlikely that invasive species (such as introduced predators) that are potentially harmful to the Giant Barred Frog would become further established as a result of the project.

Will the action introduce disease that may cause the species to decline?

No. It is unlikely that disease would be increased by the action.

Will the action interfere with the recovery of the species?

Due to the action proposed not directly impacting or disturbing habitat associated with the Giant Barred Frog it will not significantly interfere with the recovery of the species.

Conclusion

The action proposed will not directly impact or disturb habitat associated with the Giant Barred Frog, it is unlikely that the action proposed would significantly impact this species.

3.2 Spotted-tailed Quoll

Status

The Spotted-tailed Quoll (*Dasyurus maculatus*) is listed as Vulnerable under the TSC Act and Endangered under the EPBC Act.

Habitat and Distribution

Spotted-tailed Quoll occur in a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline (Belcher, 2003). Preferred habitat for Spotted-tailed Quoll includes dry and moist sclerophyll forests where they nest in include hollow-bearing trees, fallen logs, burrows, small caves, rock crevices, boulder-fields and rocky-cliff faces and will feed in nearby cleared areas (Edgar and Belcher, 1998).

The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common (NSW National Parks and Wildlife Service, 1999a).

Threats

- Loss, fragmentation and degradation of habitat.
- Competition with introduced predators such as cats and foxes.
- Deliberate poisoning, shooting and trapping, primarily in response to chicken predation.
- Roadkill.

Specific impacts

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest for Spotted-tail Quoll. Habitat removal will occur around the edges of the two existing quarry pits.

3.2.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The action proposed will impact 9.5ha of potential habitat for the Spotted-tail Quoll. Approximately 468ha of potential habitat is available within the study area, the removal of 9.5ha of potential habitat represents about 2% of potential habitat within the study area. This species is highly mobile utilising a large home range of between 350-3,500ha and as such it is considered unlikely that the impact of 9.5ha (loss of 2% of potential habitat) will have a significantly adverse effect upon a local population of Spotted-tailed Quoll such that it is likely to be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**

- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed will impact 9.5ha of potential habitat for the Spotted-tailed Quoll. The removal of 9.5ha of potential habitat is unlikely to significantly increase fragmentation or isolation for this species within the locality. The majority of the study area would still provide sufficient potential habitat for the species including connectivity to large extents of native vegetation to the south and west. The removal of 9.5ha of potential habitat would represent a loss of 2% within the study area although the majority of potential habitat would still remain (approximately 468ha). Given this, the proposed action is unlikely to remove, modify, fragment or isolate important habitat for the Spotted-tailed Quoll such that the long-term survival of the species within the locality is adversely affected.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of the Office of Environment and Heritage. No critical habitat has been listed for this species. No areas within the study area are considered critical to the survival of the Spotted-tailed Quoll.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been prepared for Spotted-tailed Quoll under the TSC Act. The Office of Environment and Heritage has assigned the Spotted-tailed Quoll species as Landscape management species under the *Saving our Species* program. The Office of Environment and Heritage has identified a number of management actions for the recovery for this species (Table 3.2). The action proposed will not significantly interfere with any of the recovery actions for this species.

Table 3.2 Recovery actions for Spotted-tailed Quoll

Action*	Relevance to project
Conserve old-growth forest stands and other areas of known habitat under perpetual, funded conservation agreements such as BioBanking agreements, conservation property vegetation plans or inclusion in the conservation reserve system.	Relevant. Biobanking and offsetting of habitat will be undertaken.
Monitor significant spotted-tailed quoll populations to investigate the impact of fox and wild dog baiting.	Not relevant.
Modify poultry runs and aviaries based on best-practice guidelines.	Not relevant.
Incorporate methods to reduce the numbers of spotted-tailed quolls killed at sections of roads where road kills are frequently reported. Assess the effectiveness of different mitigation methods.	Not relevant.

*The above recovery actions do not include actions which are related to state or regional wide actions.

The proposed action is unlikely to substantially contribute to or interfere with the implementation of these recovery strategies.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

Clearing of native vegetation is listed as a key threatened process under the Threatened Species Conservation Act 1995. Clearing is defined as the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long term modification, of the structure, composition and ecological function of stand or stands. The proposed action will result in the clearing of native vegetation however it is unlikely that will result in increased impacts of this key threatening process on potential habitat for the Spotted-tailed Quoll. The action proposed is unlikely to give rise to other listed key threatened processes.

In addition and specific to the Spotted-tailed Quoll, the following two key threatening processes have the potential to adversely impact on this species;

- Predation by the European Red Fox *Vulpes vulpes*
- Predation by the Feral Cat *Felis catus*

The proposed action will be subject to ameliorative measures that will assist in the mitigation any potential impacts of these key threatening processes on potential habitat for the Spotted-tailed Quoll. Given this the proposed action is unlikely to result in the operation of or increase the impact of these key threatening process to the Spotted-tailed Quoll or its habitat.

Conclusion

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest. Majority of habitat to be impacted occurs around the existing two quarry pits within the study area. The removal of 9.5ha of potential habitat will represent a 2% loss of potential habitat within the study area (approximately 468ha of potential habitat in the study area). The removal of this potential habitat is unlikely to significantly increase fragmentation or isolate any patches of important habitat for this species. In light of the above is unlikely that the action proposed will significantly impact the Spotted-tailed Quoll or its habitat.

3.2.2 EPBC Act significance assessment

The Spotted-tailed Quoll is listed as Endangered under the EPBC Act and it can be considered to be declining within the study area and the wider locality. This species is therefore assessed using the threatened species criteria of the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013). Under the EPBC Act, population of a species is defined as:

- a geographically distinct regional population, or collection of local populations; or
- a population, or collection of local populations, that occurs within a particular bioregion.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will result in one or more of the following:

Will the action lead to a long-term decrease in the size of a population of a species?

The action proposed will impact 9.5ha of potential habitat for the Spotted-tailed Quoll. While habitat in the study area has the potential to be used by this species, majority of habitat to be impacted will consist of habitat surrounding the current two disturbed quarry pits. The removal of this habitat will not significantly increase fragmentation or isolate any existing habitat patches. The action proposed impact area represents a relatively small area (approx. 2%) of potential habitat of locally occurring resources (approximately 468ha within the study area) that would be accessible to this species. Any

identified population of Spotted-tailed Quoll in the area would not be restricted to habitat contained within the impact area or the study area, as this species has a large home range. As there is similar foraging and breeding habitat that occurs within the locality, it is therefore unlikely that the action proposed will result in a long-term decline in the size of the population.

Will the action reduce the area of occupancy of the species?

The action proposed will impact 9.5ha of potential habitat within the study area. Due to the project's relatively small disturbance area (approximately 2% of available habitat) surrounding the two existing quarry pits, the proposed action would disturb relative small areas of marginal habitat. The relatively small areas of potential habitat represent a small component of locally occurring resources that would be accessible to this species (approximately 468ha within study area), as this species has a large home range (350–3,500 ha) and is mobile. Therefore, the removal of about 9.5ha of potential habitat is unlikely to reduce the area of occupancy for the Spotted-tailed Quoll.

Will the action fragment an existing population into two or more populations?

Habitat connectivity is unlikely to be affected by the project. The majority of the impact area occurs around the current two open quarry pits. Approximately 9.5ha of potential habitat is likely to be affected by the action proposed which represent 2% of available habitat in the study area. As the impact area is largely confined to areas surrounding the existing quarries it would not further fragment or isolate any existing population into two or more.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for the Spotted-tailed Quoll to date. The relatively small area of potential habitat likely to be affected represents a small component (approximately 2%) of locally occurring resources that would be accessible to this species. Therefore, the removal of about 9.5ha of potential habitat would not be considered critical to the survival of this species.

Will the action disrupt the breeding cycle of a population?

It is estimated that approximately 9.5ha of potential habitat would be affected by the action proposed. The study area has the potential contain den sites for this species in the form of rock crevices, small rock caves and large fallen timber. However, the field investigations did not find any breeding habitat within the impact area and therefore it is unlikely that the action proposed will remove or impact upon any den or sheltering habitat for this species. In addition, approximately 468ha of potential habitat and breeding habitat would still be accessible for individuals within the study area. Therefore, the removal of about 9.5ha of potential habitat is unlikely to disrupt the breeding cycle of a population.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The action proposed would remove approximately 9.5ha of potential habitat for this species. The study area has approximately 468ha of potential habitat for this species which would still be accessible. This species is known to have a large home range in which to hunt its prey species and the impact area would represent a small portion (approximately 2%) of this accessible habitat. Therefore, the proposed action is unlikely to cause the Spotted-tailed Quoll to decline.

Will the action result in invasive species that are harmful to an Endangered species becoming established in the Endangered species' habitat?

It is unlikely that invasive species (such as introduced predators) that are potentially harmful to the Spotted-tailed Quoll would become further established as a result of the project.

Will the action introduce disease that may cause the species to decline?

No. It is unlikely that disease would be increased by the action.

Will the action interfere with the recovery of the species?

A recovery plan has not been prepared for the Spotted-tailed Quoll. Due to the small extent of habitat (9.5ha) likely to be affected by the proposed action, the action proposed is unlikely to interfere with the recovery of this species.

Conclusion

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest. Majority of habitat to be impacted occurs around the existing two quarry pits within the study area. The removal of 9.5ha of potential habitat will represent a 2% loss of accessible habitat within the study area (approximately 468ha of potential habitat in the study area). It is unlikely that the action proposed will significantly impact the Spotted-tailed Quoll.

3.3 Pale-headed Snake

Status

The Pale-headed Snake (*Hoplocephalus bitorquatus*) is listed as Vulnerable under the TSC Act.

Habitat and Distribution

A partly arboreal, nocturnal species found in a range of habitats from rainforest and wet sclerophyll forest to the drier eucalypt forests of the western slopes. Feeds largely on frogs and lizards. A patchy distribution from north-east Queensland to the north-eastern quarter of NSW. In NSW it has historically been recorded from as far west as Mungindi and Quambone on the Darling Riverine Plains, across the north-west slopes, and from the north coast from Queensland to Sydney. A small number of historical records are known for the New England Tablelands from Glenn Innes and Tenterfield; however, the majority of records appear to be from sites of relatively lower elevation (Cogger, 2000).

Threats

- Clearing and fragmentation of habitat.
- Forestry practices which result in loss of old or dead trees.
- Too frequent burning for fuel reduction or grazing management which destroys old and dead trees and removes understorey vegetation.
- Illegal collection of snakes from the wild.
- Disturbance to riparian habitat from the installation and maintenance of easements.

Specific impacts

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest, including 103 hollow-bearing trees. Habitat removal will occur around the edges of the two existing quarry pits.

3.3.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The action proposed will impact 9.5ha of potential habitat and 103 hollow-bearing trees for Pale-headed Snake. Approximately 449ha of potential habitat occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for this species. Based on the 2014 Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014) the density of hollow bearing trees within the study area is relatively high – on average 10 hollow trees per hectare and an approximate of 4445 hollow bearing trees occur within the study area. The removal of approximately 103 habitat trees within the approved expansion area would only constitute a loss of 2.3% of hollow trees available to this species. It is therefore unlikely that the action proposed would have an adverse effect on the life cycle of this species in which the local population would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest. In addition, 103 hollow-bearing trees will be impacted by the action proposed. The removal of 9.5ha of habitat and 103 hollow-bearing trees is unlikely to significantly increase fragmentation or isolation for this species. The majority of the study area would still provide sufficient habitat (including approximately 4445 hollow-bearing trees) for the species including connectivity to large extents of native vegetation to the south and west. The removal of 9.5ha of potential habitat would only represent a loss of approximately 2% of habitat and extensive accessible habitat would still remain (approximately 449ha). It is unlikely that the impact of 9.5ha of potential habitat would reduce the long-term survival of the species within the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of the Office of Environment and Heritage. No critical habitat has been listed for this species. No areas within the study area are considered critical to the survival of the Pale-headed Snake.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been prepared for Pale-headed Snake under the TSC Act. The Office of Environment and Heritage has assigned the Pale-headed Snake as Landscape management species under the *Saving our Species* program. The Office of Environment and Heritage has identified a number of management actions for the recovery for this species (Table 3.3). The action proposed is unlikely to significantly interfere with any of the recovery actions for this species.

Table 3.3 Recovery actions for Pale-headed Snake

Action*	Relevance to project
Undertake plantings of suitable hollow-bearing trees (e.g. red gum, coolabah, black box) in riparian and floodplain areas where habitat has been lost or fragmented. Target planting to increase connectivity and buffer areas of existing old-growth woodland habitat.	Relevant. Habitat restoration and replanting will take place in rehab areas in which suitable hollow-bearing species will be planted.

Action*	Relevance to project
Erect suitably designed nest-boxes (microbat/glider style) in locations lacking tree hollows (e.g. young stands), and in areas in or close to known riparian habitat, to provide shelter for the species. Ensure that nest boxes are monitored regularly to evaluate their uptake and effectiveness.	Not relevant. Due to the high density of hollow-bearing trees within the study area it would not be considered 'lacking in tree hollows'.
Raise awareness in and work with utility companies and their contractors to ensure that any disturbance due to easements (e.g. power lines) such as clearing or pruning trees or removing burls is done sensitively, to minimise the loss of tree hollows and maintain connectivity between known habitat patches.	Not relevant.

*The above recovery actions do not include actions which are related to state or regional wide actions.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to Pale-headed Snake, the action proposed is consistent with three key threatening processes under the TSC Act:

- clearing of native vegetation
- loss of hollow-bearing trees
- removal of dead wood and trees.

The extent of native vegetation clearing and habitat removal associated with the action proposed is considered relatively small 9.5ha of habitat. Although the project will represent the loss of potential foraging and nesting habitat, such habitat would only be a small component of locally occurring resources (approximately 2%) accessible to these species.

Removal of 103 hollow-bearing trees will represent approximately a loss of 2% of available hollow-bearing trees within the study area and slightly increase the impact of this key threatening process.

Conclusion

The action proposed would impact 9.5ha of potential habitat and 103 hollow-bearing trees for the Pale-headed Snake. Due to the proposed impact occurring around the margins of the existing quarries it is unlikely that existing habitat would be significantly fragmented or isolated. In addition the impact of 9.5ha of potential habitat and 103 hollow-bearing trees would represent a relatively small area (approximately 2%) of accessible local resources. It is therefore unlikely that the action proposed would significantly impact this species or its habitat.

3.4 Black-necked Stork

Status

The Black-necked Stork (*Ephippiorhynchus asiaticus*) is listed as Endangered under the TSC Act.

Habitat and Distribution

Widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas). In NSW, the species becomes increasingly uncommon south of the Clarence Valley, and rarely occurs south of Sydney. Since 1995, breeding has been recorded as far south as Bulahdelah. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. Usually forage in water 5-30cm deep for vertebrate and invertebrate prey. Eels regularly contribute the greatest biomass to their diet, but they feed on a wide variety of animals, including other fish, frogs and invertebrates (such as beetles, grasshoppers, crickets and crayfish). (Office of Environment & Heritage, 2014).

Threats

- Powerlines, especially close to wetlands or over floodplains
- Modification or degradation of wetlands through changes in natural water flows
- Loss of wetland habitat through clearing and draining for development.
- Loss of key habitat as a result of wetland drainage for flood mitigation and agricultural development.
- Degradation of wetland habitats through pollution.
- Loss of paddock trees used for nesting.
- Degradation of wetlands as a result of salinity.

Specific impacts

The action proposed would not significantly disturb or impact habitat for the Black-necked Stork. Opportunistic foraging habitat in the form of dams and small water bodies would still be retained within the study area.

3.4.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Floodplain wetlands (i.e. swamps, billabongs, watercourses large dams) provide key habitat for the Black-necked Stork in NSW. Within the study area available habitat (i.e. small dams and water bodies) would unlikely act as important foraging habitat but likely be opportunistically used for foraging within the locality. The action proposed will not directly disturbed or significantly impact habitat for the Black-necked Stork. Therefore the action proposed is unlikely to have an adverse effect of the life cycle of the Black-necked Stork in which the local population would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed would not significantly disturb or impact habitat for the Black-necked Stork. The habitat within the study area provides opportunistic foraging habitat for the Black-necked Stork and is not considered to be significant for the long-term survival of Black-necked Stork as it is not used for breeding. Furthermore the Black-necked Stork is a highly mobile species and would be able to access other areas of suitable habitat within the study area and greater locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of the Office of Environment and Heritage. No critical habitat has been listed for this species. No areas within the study area are considered critical to the survival of the Black-necked Stork.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been prepared for Black-necked Stork under the TSC Act. The Office of Environment and Heritage has assigned the Black-necked Stork species as Partnership management species under the *Saving our Species* program. The Office of Environment and Heritage has identified a number of management actions for the recovery for this species. The action proposed will not significantly interfere with any of the recovery actions for this species.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to the Black-necked Stork, the project is not consistent with any key threatening processes under the TSC Act.

Conclusion

The action proposed would not significantly disturb or impact habitat for the Black-necked Stork. The habitat within the study area provides opportunistic foraging habitat and is not considered to be significant for the long-term survival of Black-necked Stork as it is not used for breeding. The action proposed is unlikely to significantly impact this species or its habitat.

3.5 Arboreal Mammals

Brush-tailed Phascogale (*Phascogale tapoatafa*), Squirrel Glider (*Petaurus norfolcensis*), Koala (*Phascolarctos cinereus*) and Yellow-bellied Glider (*Petaurus australis*) are listed as a Vulnerable species under the *Threatened Species Conservation Act 1995*. The Koala and Greater Glider (*Petauroides volans*) is also listed as Vulnerable under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These species have been assessed together as they generally share similar habitat requirements, threats that affect their recovery, and potential impacts as result of the action proposed. The habitat and ecology of the threatened arboreal mammals is summarised in the below table (Table 3.4).

Table 3.4 Habitat and distribution of arboreal mammals

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Brush-tailed Phascogale	V		Largely arboreal it occurs in a range of habitats which have reliable rainfall (500-2000mm), but has preference for open dry sclerophyll forest on ridges (up to 600 m alt) with little/sparse ground cover. It nests in tree hollows and feeds at dusk on arthropods and small vertebrates (Strahan, 1995).	<ul style="list-style-type: none"> Loss and fragmentation of habitat. Loss of hollow-bearing trees. Predation by foxes and cats. Competition for nesting hollows with the introduced honeybee.
Squirrel Glider	V		The Squirrel Glider is sparsely distributed along the east coast and immediate inland districts from western Victoria to north Queensland. In NSW it is found in dry sclerophyll forest and woodland but not found in dense coastal ranges, inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. It is associated with mixed tree species stands with a shrub or Acacia midstorey. It requires abundant tree hollows for refuge and nest sites and feeds on gum of acacias, eucalypt sap and invertebrates (NSW National Parks and Wildlife Service, 1999b).	<ul style="list-style-type: none"> Habitat loss and degradation. Fragmentation of habitat. Loss of hollow-bearing trees. Loss of understorey food resources. Inappropriate fire regimes Reduction in food resources due to drought. Mortality due to entanglement on barbed wire. Occupation of hollows by exotic species. Mortality due to collision with vehicles. Predation by exotic predators

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Koala	V	V	<p>The Koala occurs along the east coast of Australia and extends into Woodland, Mulga and River Red Gum forests west of the Great Dividing Range. The range of the Koala covers all such suitable areas of NSW. The Koala inhabits eucalypt woodlands and forests. The diet is generally restricted to Eucalypt leaves, although on occasion, non-Eucalypt foliage is eaten. The foliage of <i>Eucalyptus haemastoma</i>, <i>Eucalyptus tereticornis</i>, <i>E. robusta</i>, <i>E. punctata</i>, <i>E. moluccana</i>, and <i>E. resinifera</i> are some of the primary and secondary food tree species for Koalas occurring in the Central Coast Koala management area. Koalas use a wide variety of tree sizes, and do not preferentially use large or tall trees in NSW forests, although this has been listed as a habitat preference in areas where trees are generally small, stunted or nutrient deprived. Individual home ranges range from one to two ha in high quality habitat, to around 100 ha in more arid country where territories are usually discrete (Strahan and Van Dyck 2008) (Department of Environment and Climate Change, 2008a).</p>	<ul style="list-style-type: none"> • human-induced climate change, especially drought • loss, modification and fragmentation of habitat • predation by feral and domestic dogs • intense fires that scorch or kill the tree canopy • road kills.
Yellow-bellied Glider	V		<p>The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources (Office of Environment and Heritage, 2016).</p>	<ul style="list-style-type: none"> • Loss and fragmentation of habitat. • Loss of hollow-bearing trees. • Loss of feed trees.

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Greater Glider		V	The Greater Glider has a restricted distribution in eastern Australia, from the Windsor Tableland in north Queensland to central Victoria, with an elevated range from sea level to 1200m above sea level. The species is largely restricted to eucalypt forests and woodlands, with a diet comprising of eucalypt leaves and occasional flowers. It is found in abundance in montane eucalypt forest with relatively old trees and an abundance of hollows. It also favours forests with a diversity of eucalypts to cater for seasonal variation in food abundance (Department of the Environment, 2015).	<ul style="list-style-type: none"> — Habitat loss (through clearing, clear-fell logging and the destruction of senescent trees due to prescribed burning) and fragmentation — Inappropriate fire regimes — Forestry practices and logging — Loss of hollow-bearing trees

Specific impacts

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest and remove 103 hollow-bearing trees. Habitat removal will occur around the edges of the two existing quarry pits.

3.5.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The action proposed will impact 9.5ha of potential habitat for arboreal mammals, including 103 hollow-bearing trees. Approximately 468ha of potential habitat for arboreal mammals occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Based on the 2014 Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014) the density of habitat trees within the study area is relatively high – on average 10 habitat trees per hectare and an approximate of 4445 habitat trees occur within the study area. The removal of approximately 103 habitat trees within the impact area would only constitute a loss of 2.3% of habitat trees available to these species.

In regards to Koala, the action proposed would impact 9.5ha of low quality koala habitat where primary feed trees were found to be in irregular occurrence. The study area would still retain links to approximately 468ha of potential habitat in good quality condition. The loss of 9.5ha of potential habitat represents a loss of 2% of available habitat for Koala.

It is therefore unlikely that the action proposed would have an adverse effect on the life cycle of these species in which the local populations would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest. In addition, 103 hollow-bearing trees will be impacted by the action proposed. The removal of 9.5ha of habitat and 103 hollow-bearing trees would not significantly increase fragmentation or isolation for the mentioned species. The majority of the study area would still provide sufficient habitat (including hollow-bearing trees) for these species including connectivity to large extents of native vegetation to the south and west. The removal of 9.5ha of potential habitat would only represent a loss of approximately 2% of habitat and extensive accessible habitat would still remain (approximately 449ha). It is unlikely that the impact of 9.5ha of potential habitat would reduce the long-term survival of the species within the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of Department of Environment & Heritage. There are currently four listed critical habitats in NSW. No critical habitat has been listed for any of the mentioned species. Given this, the action proposed is unlikely to have an adverse effect on critical habitat for the mentioned species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been prepared for Brush-tailed Phascogale, Squirrel Glider or Greater Glider to-date under the TSC Act. In the interim, the Office of Environment and Heritage has assigned these species as Landscape management species under the *Saving our Species* program. However, with the implementation of habitat restoration the action proposed would not significantly interfere with the site management actions outlined for these species.

A recovery plan has been prepared for the Koala under the TSC Act (Department of Environment and Climate Change, 2008b). The Department of Environment and Climate Change have established seven recovery objectives to help recover this species, which include:

- To conserve koalas in their existing habitat;
- To rehabilitate and restore koala habitat and populations;
- To develop a better understanding of the conservation biology of koalas;
- To ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale;
- To manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care;

- To manage over-browsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat;
- To coordinate, promote the implementation, and monitor the effectiveness of the NSW Koala Recovery Plan across NSW.

Within each objective a number of recovery actions have been established. Based on the action proposed it is likely that the project would be inconsistent with the second objective as it will add incrementally to the loss of potential Koala habitat. Due to the impact area displaying relatively low quality habitat likely to be affected by the action proposed and the abundance of potential habitat within the study area and locality, the action proposed is not likely to interfere with the objectives or actions for recovery for the Koala.

A recovery plan has been prepared for Yellow-bellied Glider under the TSC Act. National Parks and Wildlife have identified five objectives with 13 priority action statements to help recover this species (NSW National Parks and Wildlife Service, 2003).

- Co-ordinate the recovery of the Yellow-bellied Glider in NSW;
- Encourage and assist in improving the protection and management of the Yellow-bellied Glider and its habitat;
- Identify and monitor significant populations of the species;
- To facilitate strategic research into the ecology of the Yellow-bellied Glider that is relevant to its conservation;
- To increase community awareness of the Yellow-bellied Glider and encourage community involvement in its conservation.

The action proposed is unlikely to adversely affect any of these recovery objectives or actions for Yellow-bellied Gliders.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to arboreal mammals, the action proposed is consistent with two key threatening processes under the TSC Act:

- clearing of native vegetation
- loss of hollow-bearing trees (excluding Koala)

The extent of native vegetation clearing and habitat removal associated with the action proposed is considered relatively small (9.5ha of habitat). Although the project will represent the loss of potential foraging and nesting habitat, such habitat would only be a small component of locally occurring resources (approximately 2%) accessible to these species.

Removal of 103 hollow-bearing trees will represent approximately a loss of 2% of available hollow-bearing trees within the study area. Due to the high density of hollow-bearing trees within the study area it is unlikely that the removal of 103 hollow-bearing trees would be significant.

Conclusion

The action proposed will impact 9.5ha of potential habitat for arboreal mammals, including 103 hollow-bearing trees. Approximately 468ha of potential habitat for arboreal mammals occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Similarly approximately 103 habitat trees within the impact area would only constitute a loss of 2.3% of habitat trees available to hollow dependent species. Based on the relative small extent of habitat to be impacted and the retention and accessible habitat within the study area it is unlikely that the action proposed would have a significant impact on arboreal mammals or their habitats.

3.5.2 EPBC Act significance assessment

The Koala and Greater Glider is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

Is this part of an important population?

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

In regards to the Greater Glider, any individuals found within the study area would unlikely be considered as an 'important population' as they are unlikely act as a key source population for breeding or maintain genetic diversity and are not near the limit of the species range. In addition, based on extensive field surveys and limited recent historical records have been found in the greater locality, suggesting the habitat within the impact area is unlikely important for any local population.

In regards to the Koala and based on findings by Australian Wetland Consulting, the proposed action would not remove a large area (>20ha) of critical habitat for Koala, the density of Koala is likely to be low as dominated preferred tree species do not occur within impact area and as a result any potential individuals found within the study area would not be considered part of an important population.

Lead to a long-term decrease in the size of an important population of a species

N/A both Koala and Greater Glider not considered part of important population.

Reduce the area of occupancy of an important population of the species

N/A both Koala and Greater Glider not considered part of important population.

Fragment an existing important population into two or more populations

N/A both Koala and Greater Glider not considered part of important population.

Adversely affect habitat critical to the survival of a species

No critical habitat is listed for both species under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment, 2013).

Due to the low density of both Greater Glider and Koala activity with the locality and within the study area, it is unlikely that the action proposed will effect habitat critical to the survival of both species.

Disrupt the breeding cycle of an important population

N/A both Koala and Greater Glider not considered part of important population.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The action proposed will impact 9.5ha of potential habitat for these species. Approximately 468ha of potential habitat for both species occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Therefore, the proposed action is unlikely to cause a decrease in the availability of habitat in which would cause a decline in both species.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Koala would become further established as a result of the project.

Introduce disease that may cause the species to decline

No. It is not likely that disease would be increased by the action.

Will the action interfere with the recovery of the species?

No recovery plan has been produced for Greater Glider, due to the relative small extent of habitat to be impact (9.5ha) and the extensive available habitat within the study area (468ha) it is unlikely that the proposed action will interfere with the recovery of the species.

The National Koala Conservation and Management Strategy (Department of the Environment, 2009) identifies a number of recovery actions for Koala's, the project will not interfere significantly with any of the identified recovery actions.

The NSW Recovery plan for the Koala (Garnett and Crowley, 2000) addresses the need for further ecological research on the species and the conservation and protection of habitat and identification of specific breeding requirements.

Specific objectives of the Koala recovery plan (Menkhorst et al., 1999) include:

- conserving koalas in their existing environment;
- rehabilitating and restoring koala habitat and populations;
- developing a better understanding of the conservation biology of koalas;
- ensuring the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale;
- managing captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care;
- managing over browsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat; and
- coordinating, promoting of implementation, and monitoring of the effectiveness of the NSW Koala Recovery Strategy across NSW.

Based on the removal of potential habitat, as discussed above, it is likely that the project would be in conflict with the second objective above to a small extent, by not improving habitat for the Koala. However, the habitat to be removed is low quality with irregular scattered feed tree species in the

study area. Due to the limited and largely low quality habitat likely to be affected by the action proposed (9.5ha of potential habitat) and the abundance of similar, and potential habitat in the study area (468ha), the action proposed is not likely to interfere with the recovery of the this species.

Conclusion

The proposed action will impact 9.5ha of potential habitat for both Koala and Greater Glider. Approximately 468ha of potential habitat for both species occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Based on the low density of primary Koala feed trees in the study area and the limited records for both Koala and Greater Glider it is unlikely that the impact area acts as important habitat. It is unlikely that the proposed action would have a significant impact on these species.

3.6 Woodland Birds

Little Lorikeet (*Glossopsitta pusilla*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*), Brown Treecreeper (*Climacteris picumnus victoriae*), Glossy Black-cockatoo (*Calyptorhynchus lathami*) and Dusky Woodswallow (*Artamus cyanopterus*) are listed as a Vulnerable species under the *Threatened Species Conservation Act 1995*. These species have been assessed together as they generally share similar habitat requirements, threats that affect their recovery, and potential impacts as result of the action proposed. The habitat and ecology of the threatened forest birds is summarised in the below table (Table 3.5).

Table 3.5 Habitat and distribution of forest birds

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Little Lorikeet	V		The Little Lorikeet is a small green lorikeet with black bill and red patch on forehead and throat. The underside is yellow-green. Immatures are duller with less red on face and brown bill. Found in forests, woodland, treed areas along watercourses and roads. Forages mainly on flowers, nectar and fruit. Found along coastal east Australia from Cape York in Queensland down east coast and round to South Australia. Uncommon in southern Victoria (Higgins, 1999).	<ul style="list-style-type: none"> • Extensive clearing of woodlands for agriculture has significantly decreased food for the lorikeet. • Small scale clearing, destroys habitat and foraging sites. • Loss of hollow bearing trees has reduced nest sites, and increased competition with other native and exotic species for nest sites. • Competition with the introduced Honeybee for both nectar and hollows.
Grey-crowned Babbler	V		The Grey-crowned Babbler is found mainly in rural districts where it predominantly lives in roadsides and private land (Schulz 1991). Suitable habitats are usually abundant with leaf litter and debris; often dominated by eucalypts including box and ironbark species, partly-cleared woodland, acacia shrubland and adjoining farmland (Higgins, 1999).	<ul style="list-style-type: none"> • Loss, degradation and fragmentation of woodland habitat • degradation and loss of important habitat components (woody debris) • Invasion of weeds, including exotic perennial grasses. • Inappropriate fire regimes • Aggressive exclusion from Noisy Miner • Nest predation

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Brown Treecreeper	V		Found in eucalypt woodlands and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts. Nesting occurs in tree hollows (Office of Environment and Heritage, 2011).	<ul style="list-style-type: none"> • Historical loss of woodland, forest and mallee habitats as a result of agriculture, forestry, mining and residential development. • Fragmentation of woodland and forest remnants. • Ongoing degradation of habitat, particularly the loss of tree hollows and fallen timber from firewood collection and overgrazing. • Loss of ground litter from compaction and overgrazing. • Inappropriate forestry management practices. • Loss of understorey habitat. • Competition from invasive weeds. • Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Glossy Black-cockatoo	V		The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods. Feeds almost exclusively on the seeds of several species of she-oak (<i>Casuarina</i> and <i>Allocasuarina</i> species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites (Office of Environment & Heritage, 2015).	<ul style="list-style-type: none"> • Reduction of suitable habitat through clearing for development. • Decline of hollow bearing trees over time due to land management activities. • Excessively frequent fire • Decline in extent and productivity of sheoak foraging habitat due to feral herbivores. • Decline in extent and productivity of sheoak foraging habitat caused by moisture stress due to climate change. • Degradation of foraging habitat and reduced regeneration of sheoak stands due to grazing by domestic stock. • Loss of foraging habitat due to slashing/underscrubbing. • Habitat infestation by weeds
Dusky Woodswallow	V		The Dusky Woodswallow is widespread in eastern, southern and southwestern Australia. In NSW, it is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. Often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. Also recorded in shrublands and heathlands and various modified habitat, including regenerating forest; very occasionally in moist forest or rainforests(Higgins and Peter, 2002).	<ul style="list-style-type: none"> • Apparent decline has been attributed to declining habitat • Poor regeneration of open forest and woodland habitats due to habitat removal and modification • Aggressive exclusion by Noisy Miner • Inappropriate fire regimes.

Specific impacts

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest and remove 103 hollow-bearing trees (associated with Glossy Black-cockatoo and Brown Treecreeper). Habitat removal will occur around the edges of the two existing quarry pits.

3.6.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The action proposed will impact 9.5ha of potential habitat for forest birds, including 103 hollow-bearing trees. Approximately 449ha of potential habitat for forest birds occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Based on the 2014 Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014) the density of habitat trees within the study area is relatively high – on average 10 habitat trees per hectare and an approximate of 4445 habitat trees occur within the study area. The removal of approximately 103 habitat trees within the impact area would only constitute a loss of 2.3% of habitat trees available to hollow-dependent species (i.e. Glossy Black-cockatoo and Brown Treecreeper). It is therefore unlikely that the action proposed would have an adverse effect on the life cycle of these species in which the local populations would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest. In addition, 103 hollow-bearing trees will be impacted by the action proposed. The removal of 9.5ha of habitat and 103 hollow-bearing trees would not significantly increase fragmentation or isolation for the mentioned species due to their ability to be highly mobile. The majority of the study area would still provide sufficient habitat (including hollow-bearing trees) for these species including connectivity to large extents of native vegetation to the south and west. The removal of 9.5ha of potential habitat would only represent a loss of approximately 2% of habitat and extensive accessible habitat would still remain (approximately 449ha). It is unlikely that the impact of 9.5ha of potential habitat would reduce the long-term survival of these species within the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of Department of Environment & Heritage. There are currently four listed critical habitats in NSW. No critical habitat has been listed for any of the mentioned species. Given this, the action proposed is unlikely to have an adverse effect on critical habitat for the mentioned species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been developed for the mentioned species, as produced under the TSC Act. In the interim however, the Office of Environment and Heritage has identified landscape management actions to help recover forest birds. The project is unlikely to cause significant impacts with any management actions, however, removal of vegetation will breach some recovery actions including: retention of existing vegetation and retention of dead timber on the ground and retention of protected woodland from habitat clearing. However, as part of the mitigation measures, recommended actions will be put in place to alleviate the breaches of recovery actions, these will include:

- retention of existing vegetation where possible;
- salvage of dead timber from project area into adjacent habitat to provide ground habitat;
- control of weeds and exotic flora within retained vegetation;
- implement buffer zones around vegetation stands where possible; and
- revegetation and habitat restoration in disturbed areas

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to forest birds, the action proposed is consistent with three key threatening processes under the TSC Act:

- clearing of native vegetation
- removal of dead wood and dead trees
- loss of hollow-bearing trees (associated with Glossy Black-cockatoo and Brown Treecreeper)

The extent of native vegetation clearing and habitat removal associated with the action proposed is considered relatively small (9.5ha of habitat). Although the project will represent the loss of potential foraging and nesting habitat, such habitat would only be a small component of locally occurring resources (approximately 2%) accessible to these species.

Removal of 103 hollow-bearing trees will represent approximately a loss of 2% of available hollow-bearing trees within the study area. Due to the high density of hollow-bearing trees within the study area it is unlikely that the removal of 103 hollow-bearing trees would be significant.

Conclusion

The action proposed will impact 9.5ha of potential habitat for forest birds, including 103 hollow-bearing trees. Approximately 449ha of potential habitat for forest birds occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Similarly approximately 103 habitat trees within the impact area would only constitute a loss of 2.3% of habitat trees available to hollow dependent species. Based on the relative small extent of habitat to be impacted and the retention and accessible habitat within the study area it is unlikely that the action proposed would have a significant impact on forest birds.

3.7 Large Forest Owls

Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*) and Barking Owl (*Ninox connivens*) are listed as a Vulnerable species under the *Threatened Species Conservation Act 1995*. These species have been assessed together as they share similar habitat requirements, threats that affect their recovery, and potential impacts as result of the action proposed. The habitat and ecology of the large forest owls is summarised in the below table (Table 3.6).

Table 3.6 Habitat and Distribution of large forest owls

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Powerful Owl	V		The Powerful Owl is the largest owl in Australasia. It is a typical hawk-owl, with staring yellow eyes and no facial-disc (Garnett and Crowley, 2000). It is a sedentary species with a home range of approximately 1000 hectares it occurs within open eucalypt, Casuarina or Callitris pine forest and woodland. It often roosts in denser vegetation including rainforest of exotic pine plantations. Generally feeds on medium-sized mammals such as possums and gliders but will also eat birds, flying-foxes, rats and insects. Prey are generally hollow dwelling and require a shrub layer and owls are more often found in areas with more old trees and hollows than average stands (Garnett and Crowley, 2000).	<ul style="list-style-type: none"> • Fragmentation and loss of suitable woodland habitat. • Loss of hollow-bearing trees and changes in forest structure. • Disturbance during the breeding period. • High fire frequency. • Road kills. • Secondary poisoning • Predation of fledglings by foxes, dogs and cats
Masked Owl	V		Occurs within a diverse range of wooded habitats including forests, remnants and almost treeless inland plains. This species requires large-hollow bearing trees for roosting and nesting and nearby open areas for foraging. They typically prey on terrestrial mammals including rodents and marsupials but will also take other species opportunistically. Also known to occasionally roost and nest in caves (Garnett and Crowley, 2000).	<ul style="list-style-type: none"> • Loss of mature hollow-bearing trees • Clearing of habitat for grazing, agriculture, forestry or other development. • A combination of grazing and regular burning is a threat, through the effects on the quality of ground cover for mammal prey, particularly in open, grassy forests. • Secondary poisoning from rodenticides. • Being hit by vehicles.

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Barking Owl	V		The Barking Owl occurs in dry sclerophyll woodland. In the south-west it is often associated with riparian vegetation while in the south-east it generally occurs on forest edges. It nests in large hollows in live eucalypts, often near open country. It feeds on insects in the non-breeding season and on birds and mammals in the breeding season (Garnett and Crowley, 2000).	<ul style="list-style-type: none"> • Clearing and degradation of habitat • Inappropriate forest harvesting practices that remove old, hollow-bearing trees • Firewood harvesting resulting in the removal of fallen logs and felling of large dead trees. • Too-frequent fire leading to degradation of understorey vegetation • Disturbance of nesting and excessive disturbance of foraging by inappropriate use of call-playback surveys

Specific impacts

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest and remove 103 hollow-bearing trees. Habitat removal will occur around the edges of the two existing quarry pits.

3.7.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The action proposed will impact 9.5ha of potential habitat for large forest owls, including 103 hollow-bearing trees. Approximately 449ha of potential habitat for forest birds occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Based on the 2014 Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014) the density of habitat trees within the study area is relatively high – on average 10 habitat trees per hectare and an approximate of 4445 habitat trees occur within the study area. The removal of approximately 103 habitat trees within the impact area would only constitute a loss of 2.3% of habitat trees available to large forest owls. It is therefore unlikely that the action proposed would have an adverse effect on the life cycle of these species in which the local populations would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest. In addition, 103 hollow-bearing trees will be impacted by the action proposed. The removal of 9.5ha of habitat and 103 hollow-bearing trees would not significantly increase fragmentation or isolation for the mentioned species due to their ability to be highly mobile. The majority of the study area would still provide sufficient habitat (including hollow-bearing trees) for these species including connectivity to large extents of native vegetation to the south and west. The removal of 9.5ha of potential habitat would only represent a loss of approximately 2% of habitat and extensive accessible habitat would still remain (approximately 449ha). It is unlikely that the impact of 9.5ha of potential habitat would reduce the long-term survival of these species within the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of Department of Environment & Heritage. There are currently four listed critical habitats in NSW. No critical habitat has been listed for any of the mentioned species. Given this, the action proposed is unlikely to have an adverse effect on critical habitat for the mentioned species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A recovery plan listing a number of recovery actions has been prepared for Large Forest Owls (Department of Environment and Conservation, 2006), in which Barking Owl is not included, however it shares similar ecological characteristics to the species listed. The overall objective of the NSW Large Forest Owl Recovery Plan is to ensure that the large forest owl species persist in the wild in NSW in each region where they presently occur. No threat abatement plans have been prepared for these threatened species. The Office of Environment and Heritage has assigned this species as Landscape management species under the *Saving our Species* program with a number of recovery actions for these species. The action proposed will not interfere significantly with any of the management actions within the Large Forest Owl Recovery Plan and is consistent with the recovery actions under *Saving our Species* program.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to large forest owls, the action proposed is consistent with two key threatening processes under the TSC Act:

- clearing of native vegetation

- loss of hollow-bearing trees

The extent of native vegetation clearing and habitat removal associated with the action proposed is considered relatively small (9.5ha of habitat). Although the project will represent the loss of potential foraging and nesting habitat, such habitat would only be a small component of locally occurring resources (approximately 2%) accessible to these species.

Removal of 103 hollow-bearing trees will represent approximately a loss of 2% of available hollow-bearing trees within the study area. Due to the high density of hollow-bearing trees within the study area it is unlikely that the removal of 103 hollow-bearing trees would be significant. The impacts to large forest owls and nesting will be managed by undertaking pre-clearing surveys.

Conclusion

The action proposed will impact 9.5ha of potential habitat for large forest owls, including 103 hollow-bearing trees. Approximately 449ha of potential habitat for owls occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Similarly approximately 103 habitat trees within the impact area would only constitute a loss of 2.3% of habitat trees available to owls. Based on the relative small extent of habitat to be impacted and the retention and accessible habitat within the study area it is unlikely that the action proposed would have a significant impact on large forest owls.

3.8 Macropods

Rufous Bettong (*Aepyprymnus rufescens*) and Red-legged Pademelon (*Thylogale stigmatica*) are listed as a Vulnerable species under the *Threatened Species Conservation Act 1995*. These species have been assessed together as they share similar habitat requirements, threats that affect their recovery, and potential impacts as result of the action proposed. The habitat and ecology of macropods is summarised in the below table (Table 3.7).

Table 3.7 Habitat and Distribution of threatened macropods

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Rufous Bettong	V		From Cooktown in north Queensland, to north-east NSW, where it occurs east of the Dividing Range. In Queensland, it still occurs on both sides of the Great Divide. Found in a variety of forest types from wet sclerophyll to dry open woodland, where grass tussocks or fallen timber are present. Also known to occupy a mosaic of open forest and grasslands. It appears to prefer a more open forest structure, with a sparse shrub layer and a diverse ground cover. Builds nests in grass tussocks and under logs. Strongly associated with dry sclerophyll forest particularly those dominated by Spotted Gum (NSW National Parks and Wildlife Service, 1999c).	<ul style="list-style-type: none"> • Changes to the grassy understorey by inappropriate burning and grazing. • Competition from rabbits. • Predation by feral cats and foxes, whose numbers appear to increase when dingoes are reduced through baiting. • Loss of habitat through clearing, logging and collection of fallen timber. • Poor knowledge of the species' abundance and distribution in the western parts of its range.

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Red-legged Pademelon	V		Restricted to the coastal and subcoastal strip of eastern Australia, from the tip of Cape York in north Queensland, south to the Hunter Valley, just north of Newcastle in NSW. Populations are confined mainly to areas of high rainfall. Macrohabitat is coastal and sub-coastal rainforests and wet sclerophyll forest. Dense understorey and ground cover is important. Ecotones between open and closed forest are favoured. Open areas are used for foraging while areas of dense ground cover / understorey provide areas for shelter and protection from predators (NSW National Parks and Wildlife Service, 1999c).	<ul style="list-style-type: none"> • Damage to habitat by feral pigs and domestic stock. • Loss of habitat through land clearing. • Predation by feral cats and foxes. • Frequent burning of understorey reducing shrub layer, particularly at forest margins. • Feral dogs and dingos. • Clearing and degradation of habitat providing cover; generally occurs on private properties adjacent to reserves. • Removal of wild dogs and dingoes potentially exposes pademelons to other threats (competition from other macropod species / fox predation) due to removal of top order predator.

Specific impacts

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest for Rufous Bettong. Habitat removal will occur around the edges of the two existing quarry pits. In regards to Red-legged Pademelon, the action proposed will not impact any potential habitat (i.e. lowland rainforest) associated with the species.

3.8.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The action proposed will impact 9.5ha of potential habitat for the Rufous Bettong. Approximately 449ha of potential habitat is available within the study area, the removal of 9.5ha of potential habitat represents only 2% of habitat to be impacted. This species is highly mobile and would still be able to utilise the remaining habitat in the study area, it is considered unlikely that the impact of 9.5ha (loss of 2% of potential habitat) will have a significantly adverse effect upon local Rufous Bettong populations that it is likely to be placed at risk of extinction.

In regards to the Red-legged Pademelon, the action proposed will not impact any potential habitat associated with this species (i.e. Lowland Rainforest) or surrounding this habitat. Therefore it is unlikely that the action proposed will have a significantly adverse effect upon local populations that it is likely to be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest for Rufous Bettong. Habitat removal will occur around the edges of the two existing quarry pits. In regards to Red-legged Pademelon, the action proposed will not impact any potential habitat (i.e. lowland rainforest) associated with the species.

The removal of 9.5ha of habitat would not significantly increase fragmentation or isolation for this species. The majority of the study area would still provide sufficient habitat for the species including connectivity to large extents of native vegetation to the south and west. The removal of 9.5ha of potential habitat would only represent a loss of 2% of habitat and extensive accessible habitat would still remain (approximately 449ha). It is unlikely that the impact of 9.5ha of potential habitat would reduce the long-term survival of the Rufous Bettong within the locality.

In regards to the Red-legged Pademelon, the action proposed will not impact any potential habitat associated with this species (i.e. Lowland Rainforest) or surrounding this habitat. Therefore it is unlikely that the action proposed will reduce the long-term survival of the Red-legged Pademelon within the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of the Office of Environment and Heritage. No critical habitat has been listed for both species. No areas within the study area are considered critical to the survival of the either Rufous Bettong or Red-legged Pademelon.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been prepared for either the Rufous Bettong or Red-legged Pademelon under the TSC Act. The Office of Environment and Heritage has assigned the Red-legged Pademelon as Landscape management species under the *Saving our Species* program. The Office of Environment

and Heritage has identified a number of management actions for the recovery for this species (Table 3.2).

The Department of Environment and Conservation has assigned 17 priority actions to help in the recovery of the Rufous Bettong within NSW. The action proposed is unlikely to have an adverse effect any of these recovery actions. This action proposed is unlikely to significantly affect the recovery of any local population of the species.

The action proposed will not significantly interfere with any of the recovery actions for either the Rufous Bettong or Red-legged Pademelon.

Table 3.8 Recovery actions for Red-legged Pademelon

Action*	Relevance to project
Conduct bush regeneration in degraded habitat to progressively replace lantana understorey with native rainforest vegetation.	Not relevant.
Implement monitoring of wallabies as well as fox activity at a selection of sites where wild dog control is known to occur / not occur. Monitor activity using motion-sensor cameras and sand-pads to evaluate impacts of predator control on populations.	Not relevant.

*The above recovery actions do not include actions which are related to state or regional wide actions.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

Threatening process means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. Key threatening processes are listed under the TSC Act.

With respect to Rufous Bettong and Red-legged Pademelon, the project is consistent with one KTP:

- clearing of native vegetation.

None of these KTPs are likely to significantly affect either species in the locality, as the action proposed will not impact any potential habitat associated with Red-legged Pademelon and the action proposed would only impact 2% of available potential habitat for Rufous Bettong.

Conclusion

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest for Rufous Bettong. Habitat removal will occur around the edges of the two existing quarry pits. In regards to Red-legged Pademelon, the action proposed will not impact any potential habitat (i.e. lowland rainforest) associated with the species. The removal of 9.5ha of potential habitat will represent a 2% loss of accessible habitat within the study area (approximately 449ha of potential habitat in the study area). The removal of habitat will not significantly increase fragmentation or isolate any patches of habitat. It is unlikely that the action proposed will significantly impact the either Rufous Bettong or Red-legged Pademelon.

3.9 Microbats

Threatened microchiropteran bats have been assessed together as they generally share similar habitat requirements, threats that affect their recovery, and potential impacts as result of the project. Threatened microchiropteran bats considered for this impact assessment are:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Eastern Freetail Bat (*Micronomus norfolkensis* (syn. *Mormopterus norfolkensis*))
- Little Bentwing Bat (*Miniopterus australis*)
- Hoary Wattled Bat (*Chalinolobus nigrogriseus*).

These species have been assessed as a guild because of their similarity in habitat usage and habits, which are described in

Table 3.9 Habitat and Distribution of threatened microbats

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Eastern False Pipistrelle	V		Usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings (Churchill, 2008).	<ul style="list-style-type: none"> • Disturbance to winter roosting and breeding sites. • Loss of roosting habitat, primarily hollow-bearing eucalypts. • Loss and fragmentation of foraging habitat, particularly extensive areas of continuous forest and areas of high productivity.
Yellow-bellied Sheathtail Bat	V		The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	<ul style="list-style-type: none"> • Disturbance to roosting and summer breeding sites. • Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions. • Loss of hollow-bearing trees; clearing and fragmentation of forest and woodland habitat. • Pesticides and herbicides may reduce the availability of insects, or result in the accumulation of toxic residues in individuals' fat stores.

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Greater Broad-nosed Bat	V		The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically it forages at a height of 3-6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow-flying insects and small vertebrates. It generally roosts in tree hollows but has also been found in the roof spaces of old buildings (Churchill, 2008).	<ul style="list-style-type: none"> • Disturbance to roosting and summer breeding sites. • Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions. • Loss of hollow-bearing trees. • Pesticides and herbicides may reduce the availability of insects, or result in the accumulation of toxic residues in individuals' fat stores. • Changes to water regimes are likely to impact food resources, as is the use of pesticides and herbicides near waterways.
Eastern Freetail Bat	V		Thought to live in Sclerophyll forest and woodland. Small colonies have been found in tree hollows or under loose bark. It feeds on insects above the forest canopy or in clearings at the forest edge (Churchill, 2008).	<ul style="list-style-type: none"> • Loss of hollow-bearing trees. • Loss of foraging habitat. • Application of pesticides in or adjacent to foraging areas. • Artificial light sources spilling onto foraging and/or roosting habitat • Large scale wildfire or hazard reduction burns on foraging and/or roosting habitat.

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Little Bentwing Bat	V		<p>Feeds on small insects beneath the canopy of well timbered habitats including rainforest, Melaleuca swamps and dry Sclerophyll forests. Roosts in caves and tunnels and has specific requirements for nursery sites. Distribution becomes coastal towards the southern limit of its range in NSW. Nesting sites are in areas where limestone mining is preferred (Strahan, 1995).</p>	<ul style="list-style-type: none"> • Disturbance of colonies, especially in nursery or hibernating caves, may be catastrophic. • Destruction of caves that provide seasonal or potential roosting sites. • Pesticides on insects and in water consumed by bats bio accumulates, resulting in poisoning of individuals. • Predation from foxes, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges. • Predation from feral cats, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges • Hazard reduction and wildfire fires during the breeding season. • Large scale wildfire or hazard reduction can impact on foraging resources.

Common Name	TSC Act	EPBC Act	Habitat and distribution	Threats
Hoary Wattled Bat	V		Widely distributed across northern Australia although absent from the arid centre. In north east NSW it extends from Port Macquarie in the south, north to the Queensland border. The species has been recorded as far west as Armidale and Ashford. In NSW the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat. Roosts in hollows and rock crevices.	<ul style="list-style-type: none"> • Clearing and fragmentation of dry forest and woodland habitat through clearing for agriculture and development. • Loss of tree hollows for roosting and maternity sites from forest management favouring younger stands of trees. • Loss of hollow-bearing trees used for roosting and maternity sites as a result of too-frequent burning for grazing and forestry management activities. • Pesticides on insects and in water consumed by bats bio accumulates, resulting in poisoning of individuals. The use of pesticides also reduces available insect food sources.

Specific impacts

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest, including 103 hollow-bearing trees. Habitat removal will occur around the edges of the two existing quarry pits. The action proposed would not impact any caves or potential cave roosting sites.

3.9.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The action proposed will impact 9.5ha of potential habitat and 103 hollow-bearing trees for hollow-dependent bats. The action proposed would not impact any caves or potential cave roosting sites for cave-dwelling bats (i.e. Little Bentwing). Approximately 468ha of potential habitat occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for this species. Based on the 2014 Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd, 2014) the density of habitat trees within the study area is relatively high – on average 10 habitat trees per hectare and an approximate of 4445 habitat trees occur within the study area. The removal of approximately 103 habitat trees within the approved expansion area would only constitute a loss of 2.3% of habitat trees available to this species. It is therefore unlikely that the action proposed would have an adverse effect on the life cycle of this species in which the local population of any of the mentioned threatened microbats would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed will impact 9.5ha of potential habitat in the form of open sclerophyll forest. In addition, 103 hollow-bearing trees will be impacted by the action proposed. The action proposed would not impact any caves or potential cave roosting sites for cave-dwelling bats (i.e. Little Bentwing). The removal of 9.5ha of habitat and 103 hollow-bearing trees would not significantly increase fragmentation or isolation for this species. The majority of the study area would still provide sufficient habitat (including hollow-bearing trees) for the species including connectivity to large extents of native vegetation to the south and west. The removal of 9.5ha of potential habitat would only represent a loss of approximately 2% of habitat and extensive accessible habitat would still remain (approximately 468ha). It is unlikely that the impact of 9.5ha of potential habitat would reduce the long-term survival of any of the mentioned species within the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of Department of Environment & Heritage. There are currently four listed critical habitats in NSW. No critical habitat has been listed for any of the mentioned species. Given this, the action proposed is unlikely to have an adverse effect on critical habitat for the mentioned species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

The Office of Environment and Heritage has assigned these species to the Landscape or Partnership species management stream under the *Saving our Species* program (Office of Environment and Heritage, 2017). No priority sites have been identified within the study area or within the locality for any of the mentioned species. The Office of Environment and Heritage has identified a number of management actions for the recovery of these species.

The action proposed is unlikely to have an adverse effect on any of these recovery actions with the exception of vegetation removal around possible roost sites (approximately 103 hollow-bearing trees). Based on the 2014 Flora and Fauna Assessment (Australian Wetlands Consulting Pty Ltd,

2014) the density of habitat trees within the study area is relatively high – on average 10 habitat trees per hectare and an approximate of 4445 habitat trees occur within the study area. The removal of approximately 103 habitat trees within the approved expansion area would only constitute a loss of 2.3% of habitat trees available to hollow-dependent microbats. It is unlikely that the removal of 103 habitat trees within the proposed expansion area would be a significant impact to threatened hollow-dependent species and to the recovery of these species.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to threatened microbats, the action proposed is consistent with three key threatening processes under the TSC Act:

- clearing of native vegetation
- removal of dead wood and dead trees
- loss of hollow-bearing trees

The extent of native vegetation clearing and habitat removal associated with the action proposed is considered relatively small (9.5ha of habitat). Although the project will represent the loss of potential foraging and roosting habitat, such habitat would only be a small component of locally occurring resources (approximately 2%) accessible to these species.

Removal of 103 hollow-bearing trees will represent approximately a loss of 2.3% of available hollow-bearing trees within the study area. Due to the high density of hollow-bearing trees within the study area it is unlikely that the removal of 103 hollow-bearing trees would be significant.

Conclusion

The action proposed will impact 9.5ha of potential habitat for microbats, including 103 hollow-bearing trees. Approximately 468ha of potential habitat for microbats occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Similarly approximately 103 habitat trees within the impact area would only constitute a loss of 2.3% of habitat trees available to hollow dependent species. Based on the relative small extent of habitat to be impacted and the retention and accessible habitat within the study area is it unlikely that the action proposed would have a significant impact on forest birds.

3.10 Grey-headed Flying-fox

Status

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under both the TSC Act and EPBC Act.

Habitat and Distribution

The Grey-headed Flying is endemic to Australia and presently occurs along the east coast from Maryborough in Queensland to Melbourne, Victoria (Department of the Environment and Heritage, 2003). This species is also occasionally found west of the Great Dividing Range to the western slopes of NSW and QLD. At any one time, the majority of animals only occupy a small proportion of this entire range (NSW National Parks and Wildlife Service, 2001). The Grey-headed Flying-fox utilises subtropical and temperate rainforests, tall sclerophyll forests, woodlands, heaths, swamps and mangroves, as well as urban gardens and fruit crops for foraging (Churchill, 2008, NSW National Parks and Wildlife Service, 2001).

This species is considered an important pollinator and seed disperser of native trees, as they forage on the nectar and pollen of eucalypts, angophoras, melaleucas and banksias, as well as fruit of rainforest trees and vines (NSW National Parks and Wildlife Service, 2001, Van Dyck and Strahan, 2008). While the majority of foraging events occur within 20 km of their day roost, some individuals will disperse and commute up to 50 km (Van Dyck and Strahan, 2008).

Grey-headed Flying-foxes are highly mobile and as the availability of native fruits, nectar and pollen varies over time and throughout their range, they respond to this by migrating between camps up and down the east coast, sometimes travelling hundreds of kilometres (NSW National Parks and Wildlife Service, 2001). When migration occurs they do not move as a colony, but as individuals or small groups resulting in the intermixing of sub-populations (Churchill, 2008). The population concentrates in May and June in northern NSW and Queensland where animals exploit winter-flowering trees such as Swamp Mahogany, Forest Red Gum and Paperbark, dispersing south during the summer (Department of the Environment and Heritage, 2003).

Grey-headed Flying-fox roost in large colonies of up to tens of thousands and may be shared with Little Red Flying-fox and Black Flying-fox (Churchill, 2008). Camps are generally located in gullies with dense vegetation (such as mangrove, rainforest, Melaleuca and Casuarina), close to water and generally located within 20 km of a regular food source (NSW National Parks and Wildlife Service, 2001). Site fidelity to camps is high with some camps in NSW used for over a century (NSW National Parks and Wildlife Service, 2001). These bats usually return annually to particular camps for rearing young (NSW National Parks and Wildlife Service, 2001).

Threats

- loss of foraging habitat
- disturbance of roosting sites
- unregulated shooting
- electrocution on powerlines.

Specific impacts

The action proposed will impact 9.5ha of potential foraging habitat in the form of open sclerophyll forest. Habitat removal will occur around the edges of the two existing quarry pits. No roost camps or potential roost camps will be impacted by the action proposed.

3.10.1 TSC Act significance assessment

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The action proposed will impact 9.5ha of potential foraging habitat in the form of open sclerophyll forest. The habitat to be impact would act as foraging habitat in the form of blossoming eucalypts and native fruiting trees. Although the action proposed will represent the loss of potential foraging habitat, the action proposed area would only be a small component of locally occurring resources that would be accessible to these species (approximately 468ha of potential habitat will be retained in the study area). No roost camps or potential roost camps will be impacted by the action proposed. Thus, the action proposed is not considered likely to impact the Grey-headed Flying-fox such that a viable local population would be placed at a significant risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

In relation to the habitat of a Threatened species, population or ecological community:

- **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

The action proposed will impact 9.5ha of potential foraging habitat in the form of open sclerophyll forest. Habitat removal will occur around the edges of the two existing quarry pits. No roost camps or potential roost camps will be impacted by the action proposed. The removal of 9.5ha of foraging habitat would not significantly increase fragmentation or isolation for the Grey-headed Flying-fox species due to their ability to be highly mobile. The majority of the study area would still provide sufficient habitat for the species including connectivity to large extents of native vegetation to the south and west. The removal of 9.5ha of potential habitat would only represent a loss of approximately 2% of habitat and extensive accessible habitat would still remain (approximately 468ha). It is unlikely that the impact of 9.5ha of potential habitat would reduce the long-term survival of the species within the locality.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers to those areas of land listed in the Register of Critical Habitat kept by the Chief Executive Officer of Department of Environment & Heritage. There are currently four listed critical habitats in NSW. No critical habitat has been listed for the Grey-headed Flying-fox. Given this, the action proposed is unlikely to have an adverse effect on critical habitat for this species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan has been prepared for Grey-headed Flying-fox under the TSC Act. The Office of Environment and Heritage has identified a number of management actions for the recovery for this species (Table 3.10). The action proposed will have relevance to one recovery action, being increasing the extent and viability of foraging habitat that is productive during winter and spring, by removing potential foraging habitat. However mitigation measures regarding habitat restoration will be undertaken in areas where foraging habitat it impacted. Despite this, the impact of 9.5ha of potential habitat would only represent a loss of approximately 2% of habitat and extensive accessible habitat would still remain (approximately 468ha). Therefore the action proposed is unlikely to significantly interfere with any of the recovery actions for this species.

Table 3.10 Recovery actions for Grey-headed Flying-fox

Action*	Relevance to project
Increase the extent and viability of foraging habitat for the Grey-headed Flying-fox that is productive during winter and spring through dedicated habitat creation and restoration using guides published by OEH (in preparation).	Some relevance. Removal of potential foraging habitat, however habitat restoration will be undertaken.
Negotiate agreements with landholders, particularly in-perpetuity covenants or stewardship agreements that promote the protection and retention of high quality foraging habitat and roost sites for grey-headed flying-foxes.	Not relevant. Action proposed doesn't contain vital foraging habitat or any roosts
Rehabilitate degraded flying-fox roost sites through weed management, planting new roost trees, managing understorey vegetation to maintain suitable microclimate conditions, establishing buffers between roost camps and nearby human settlements to minimise conflict.	Not relevant.
Conduct dedicated engagement programs in communities affected by flying-fox roost sites, building the capacity of all stakeholders to engage in the process of decision-making and developing camp management plans. Provide information about mitigating the impacts of flying-foxes on nearby residences and businesses such as strategic vegetation management, and structural modifications like double-glazing, air conditioning and shade cloths.	Not relevant.
Distribute public education materials to land managers and local community groups working with contentious flying-fox roost sites highlighting species status, reasons for being in urban areas, reasons for decline etc.	Not relevant.
Develop site-based heat stress response protocols for camps likely to be affected by heat stress events. Protocols should be based on best practice guidelines (http://www.environment.nsw.gov.au/animals/flying-fox-heat.htm), and should be implemented by licensed fauna rehabilitators. Data should be recorded to inform future management of heat stress events (http://www.environment.nsw.gov.au/resources/animals/150725-flying-fox-heat-data.docx).	Not relevant.

*The above recovery actions do not include actions which are related to state or regional wide actions.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

With respect to Grey-headed Flying-fox, the action proposed is consistent with three key threatening processes under the TSC Act:

- clearing of native vegetation

The extent of native vegetation clearing and habitat removal associated with the action proposed is considered relatively small in terms of the available habitat for these species within the surrounding landscape, although it is considered to be an incremental loss of suitable habitat locally.

Conclusion

The action proposed will impact 9.5ha of potential habitat for Grey-headed Flying-fox. Approximately 468ha of potential habitat for Grey-headed Flying-fox occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Based on the relative small extent of habitat to be impacted and the retention and accessible habitat within the study area it is unlikely that the action proposed would have a significant impact on Grey-headed Flying-fox.

3.10.2 EPBC Act significance assessment for Grey-headed Flying-fox

The Grey-headed Flying-fox is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

Is this part of an important population?

Grey-headed Flying-foxes occur across a range of wooded habitats where their favoured food, eucalypt blossom occurs. They set up roosting camps in association with blossom availability, which are usually situated in dense vegetation and associated with water. Grey-headed Flying-foxes can migrate up to 75 km north during the winter and during this time young flying-foxes establish camps.

A small roosting camp was observed 6.5km from the study area along the Richmond River near Woodburn, individuals from this camp would be expected to foraging within the study area. The study area does not contain suitable habitat for roosting camps and such habitat does not occur within its close vicinity. Therefore, a population of Grey-headed Flying-fox in the study area is not considered to be important, as no roost sites would be affected by the project.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

Lead to a long-term decrease in the size of an important population of a species

Not applicable. Grey-headed Flying-fox occurring in the in the study area is not part of an important population.

Reduce the area of occupancy of an important population of the species

Not applicable. Grey-headed Flying-fox occurring in the in the study area is not part of an important population.

Fragment an existing important population into two or more populations

Not applicable. Grey-headed Flying-fox occurring in the in the study area is not part of an important population.

Adversely affect habitat critical to the survival of a species

No critical habitat is listed for this species under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The action proposed would impact 9.5ha of suitable foraging habitat for this species. As this species is highly mobile, with individuals foraging up to 50 km from roost sites, suitable foraging resources would be accessed in the locality. In addition, approximately 468ha of potential habitat for Grey-headed Flying-fox occurs within the study area, the removal of 9.5ha of potential habitat would represent only a loss of approximately 2% of habitat for these species. Therefore, this would not meet the above criteria.

Disrupt the breeding cycle of an important population

Not applicable. Grey-headed Flying-fox occurring in the in the study area is not part of an important population.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

No. The project would only affect 9.5 ha of suitable foraging habitat for this species. As this species is known to forage up to 50 km from roost sites, the action proposed is not likely to significantly affect the availability of quality habitat for this species.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

It is not likely that invasive species (such as introduced predators) that are harmful to the Grey-headed Flying-fox would become further established as a result of the action proposed.

Introduce disease that may cause the species to decline

No. There are no known diseases that are likely to increase in the area as a result of the action proposed.

Interfere with the recovery of the species

Based on the relative small extent of habitat to be impacted, the retention and accessible habitat within the study area and no roost camps are located in the vicinity of the study area is it unlikely that the action proposed would interfere with the recovery of this species.

Conclusion

The Grey-headed Flying-fox frequents habitats that contain eucalypt blossom and native fruits such as figs, which are their favoured foods. The study area contains a number of eucalypt dominated

communities, these include those that are utilised by this species. A small amount of potentially suitable foraging habitat (9.5ha) will be affected by the action proposed, although this is unlikely to be significant to local populations, due to the abundance of similar and greater quality foraging habitat elsewhere within the study area (469ha) and in the wider locality. There were no Grey-headed Flying-fox camps within the study area or its vicinity, but there are camps in the wider region. Therefore habitat attributes occurring within the study area are not considered important to the long-term survival of the Grey-headed Flying-fox.

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Appendix B EPBC Search



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 03/02/17 13:21:47

[Summary](#)

[Details](#)

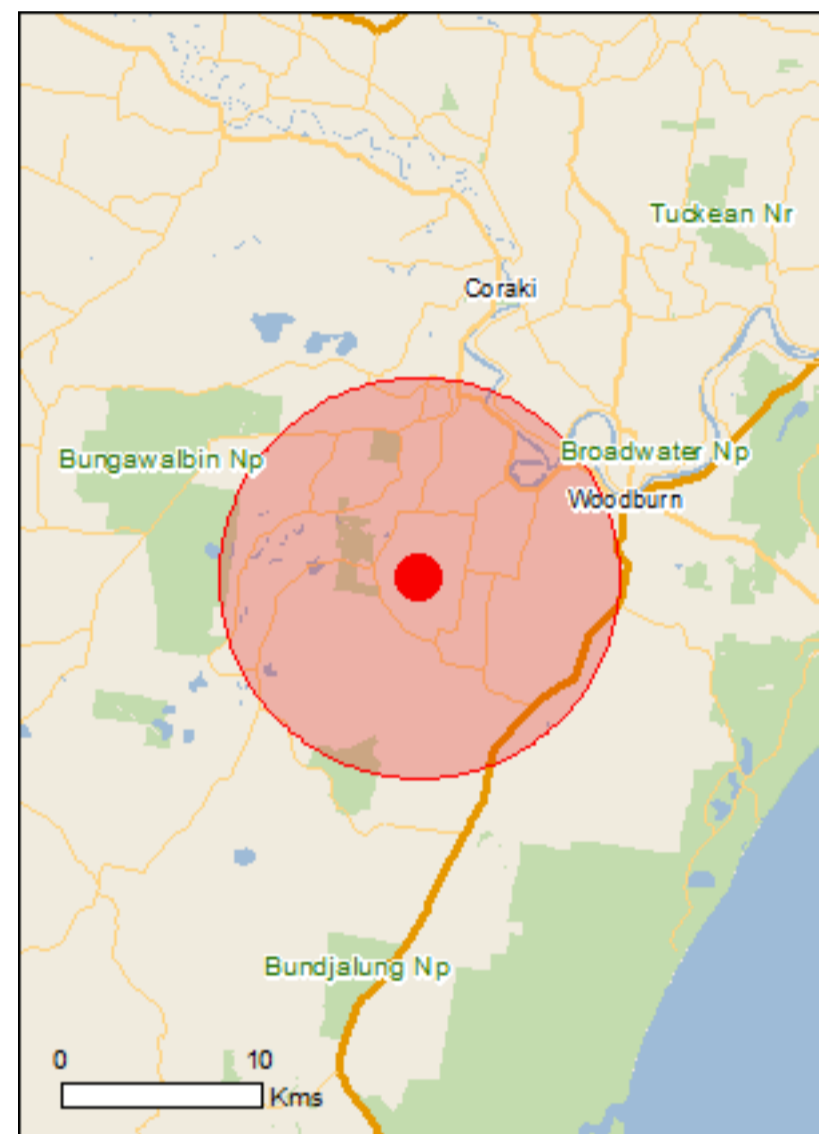
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	60
Listed Migratory Species:	35

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	40
Whales and Other Cetaceans:	1
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	8
Regional Forest Agreements:	1
Invasive Species:	37
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[[Resource Information](#)]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area

Listed Threatened Species

[[Resource Information](#)]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Nannoperca oxleyana Oxleyan Pygmy Perch [64468]	Endangered	Species or species habitat likely to occur within area
Frogs		
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat may occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat known to occur within area
Insects		

Name	Status	Type of Presence
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat may occur within area
Plants		
Allocasuarina defungens Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat may occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Desmodium acanthocladum Thorny Pea [17972]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus glaucina Slaty Red Gum [5670]	Vulnerable	Species or species habitat likely to occur within area
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat likely to occur within area
Hibbertia marginata [21970]	Vulnerable	Species or species habitat likely to occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat known to occur within area
Marsdenia longiloba Clear Milkvine [2794]	Vulnerable	Species or species habitat may occur within area
Ochrosia moorei Southern Ochrosia [11350]	Endangered	Species or species habitat likely to occur within area
Owenia cepiodora Onionwood, Bog Onion, Onion Cedar [11344]	Vulnerable	Species or species habitat likely to occur within area
Paspalidium grandispiculatum a grass [10838]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
Prostanthera palustris Swamp Mint-bush [66703]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area

Reptiles

Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Saiphos reticulatus Three-toed Snake-tooth Skink [88328]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[[Resource Information](#)]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [[Resource Information](#)]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area

Whales and other Cetaceans [\[Resource Information \]](#)

Name	Status	Type of Presence
Mammals		
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Bungawalbin	NSW
FMA's in CASINO	NSW
Jackywalbin	NSW
Pyrocarpa	NSW
Tabbimoble Swamp	NSW
UNE Special Management Zone No1	NSW
Yarringully	NSW
Yarringully	NSW

Regional Forest Agreements [\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species

Name	Status	Type of Presence
Vulpes vulpes Red Fox, Fox [18]		habitat likely to occur within area Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Reptiles		

Name	Status	Type of Presence
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands	<u>[Resource Information]</u>
Name	State
Lower Bungawalbin Catchment Wetland Complex	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-29.10358 153.24819

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

APPENDIX F VEGETATION PLAN

Source: Moonimba Quarry Flora and Fauna Assessment, Appendix 4, Moonimba Quarry EIS)

Newmans Quarry, Woodburn

Figure 3.1 Vegetation Plan

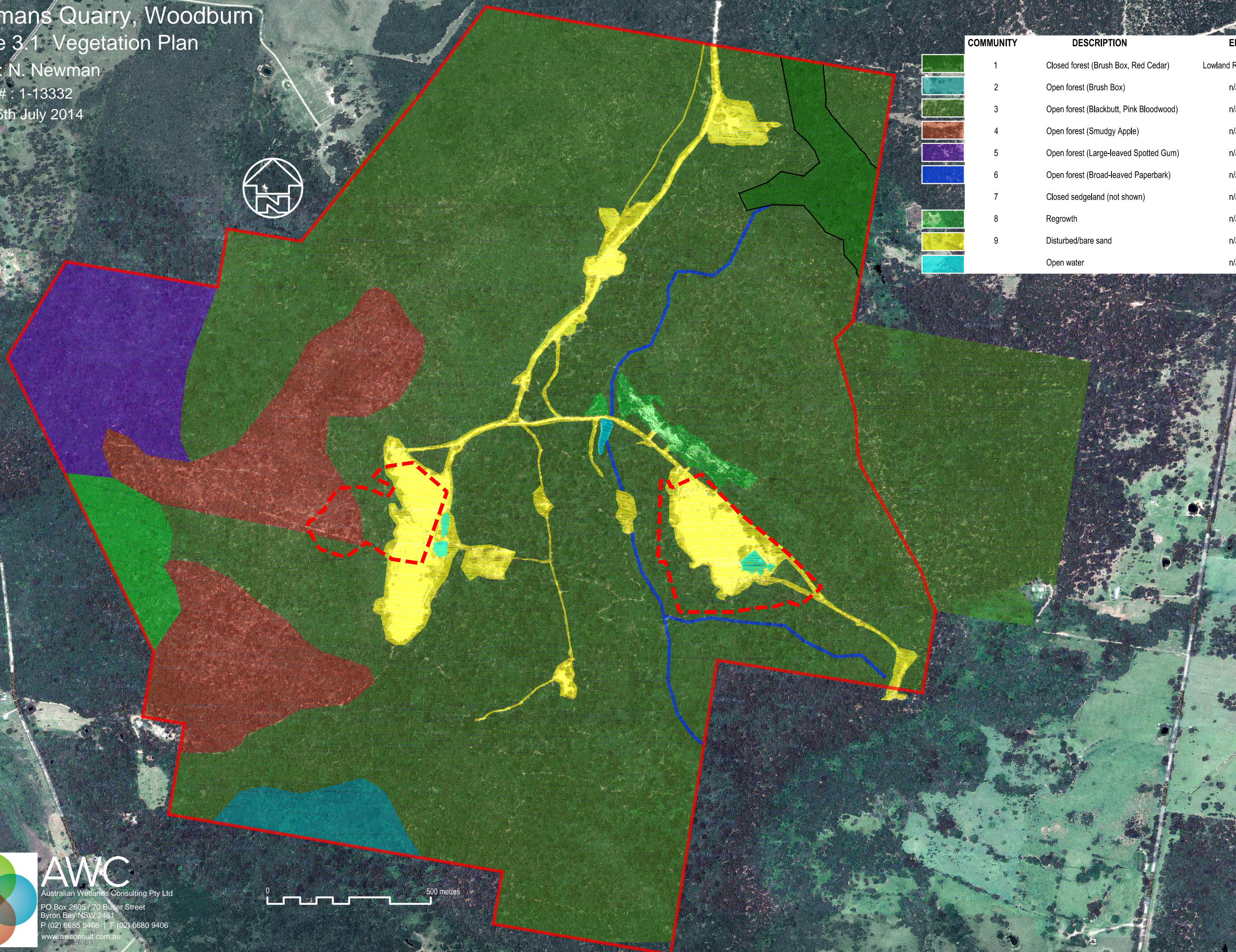
Client : N. Newman

Project # : 1-13332

Date: 25th July 2014



COMMUNITY	DESCRIPTION	EEC
1	Closed forest (Brush Box, Red Cedar)	Lowland Rainforest
2	Open forest (Brush Box)	n/a
3	Open forest (Blackbutt, Pink Bloodwood)	n/a
4	Open forest (Smudgy Apple)	n/a
5	Open forest (Large-leaved Spotted Gum)	n/a
6	Open forest (Broad-leaved Paperbark)	n/a
7	Closed sedgeland (not shown)	n/a
8	Regrowth	n/a
9	Disturbed/bare sand	n/a
	Open water	n/a



APPENDIX G THREATENED FAUNA

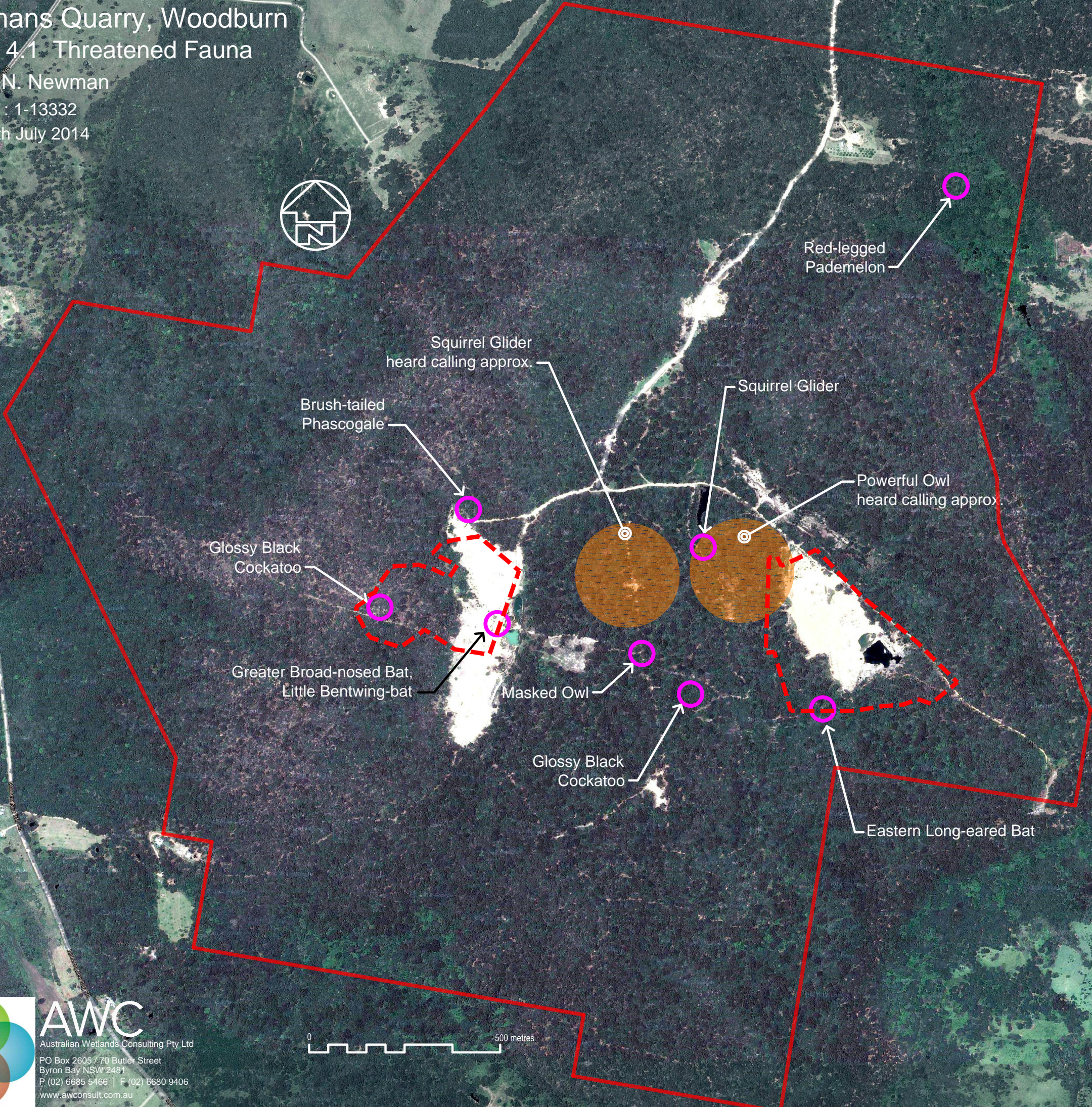
Source: Moonimba Quarry Flora and Fauna Assessment, Appendix 4, Moonimba Quarry EIS

Newmans Quarry, Woodburn

Figure 4.1 Threatened Fauna

Client : N. Newman
Project # : 1-13332
Date: 25th July 2014

Threatened Fauna



APPENDIX H

GROUNDWATER REVIEW MEMO

TO:	Chris Greenaway – Sustainability and Environment Manager	FUNCTION:	Environment
FROM:	Kelly-Jane Wallis – Hydrogeologist	FUNCTION:	Environment
CC:	Georgia Harney	DATE:	8 June 2017
REF:		NO. OF PAGES:	11
SUBJECT:	W2B Moonimba Borrow Site - Groundwater Review		

Abstract/Summary

This review of the groundwater systems present in the vicinity of the Moonimba Borrow Site indicates that there are poor aquifer systems operating in vicinity of the site. A groundwater regime of low permeability and storage capacity exists below the Borrow Site in the Walloon Coal Measures and potentially a perched aquifer system occurs in the Kangaroo Creek Sandstone, the material to be quarried.

This review concludes that the activities of the Moonimba Borrow Site will not have a meaningful impact on the permanent groundwater levels and water quality, and existing beneficial uses of groundwater in the area.

Background

The Woolgoolga to Ballina Pacific Highway Upgrade, herein referred to as ‘the approved project’, involves upgrading approximately 155 km of highway to four-lane dual-carriageway road between Woolgoolga and Ballina on the NSW north coast.

Pacific Complete on behalf of Roads and Maritime Services (RMS) is preparing a Modification Report for the Woolgoolga to Ballina Pacific Highway Upgrade (W2B) for the use of the Moonimba Quarry, known to the project as Moonimba Borrow Site, situated in Bungawalbin, NSW.

The Moonimba Borrow Site is situated approximately 15km south-west of Woodburn. It resides to the west of Portion C of the W2B project. Split between two pits, the site will operate with a total excavation area of 21 hectares. This is consistent with the excavation area given consent under a 2015 Development Application (DA) for an expansion of the existing quarry. Pacific Complete is proposing to intensify the extraction rate at the site to one million tonnes (1,000,000 tonnes), which is equivalent to 400,000m³ of aggregate per annum to provide sufficient material to complete the W2B.

This memo has been prepared as supporting documentation for the Modification Report and considers the potential for local and regional impacts to the groundwater regime in the Moonimba Borrow Site area such that existing bore water users and groundwater dependant ecosystems might be adversely affected.

Previous work

In 2014 Novoplan, on behalf of Newman’s Quarry & Landscape Supplies, completed an EIS for the Moonimba Quarry expansion project which was to increase the sandstone quarry annual output limit from 30,000 to 90,000 m³/year from two larger extraction sites totalling 21 ha in area (Novoplan, 2014). As part of this EIS, a Soil and Water Management Plan was prepared within the scope of the Operational Plan of Management (Greg Alderson & Associates, 2014).

The Moonimba Quarry EIS identified two registered groundwater bores within 2 km of quarry area (one on the quarry’s property), and one registered groundwater bore within 5 km of the quarry area (Figure 1). The licensed bore on the property, GW305748, was constructed in 2006 and presents the

water bearing zone from 74 m to 90 m below the ground (or RL 20 to 4 m AHD (Australian Height Datum)). The second water license identified within 2 km of the quarry, GW053626, is located to the south west of the site and is an excavation to 2 m depth, covering an area greater than 100 m² and was constructed in 1981 for stock, irrigation and domestic purposes, according to the groundwater works summary.

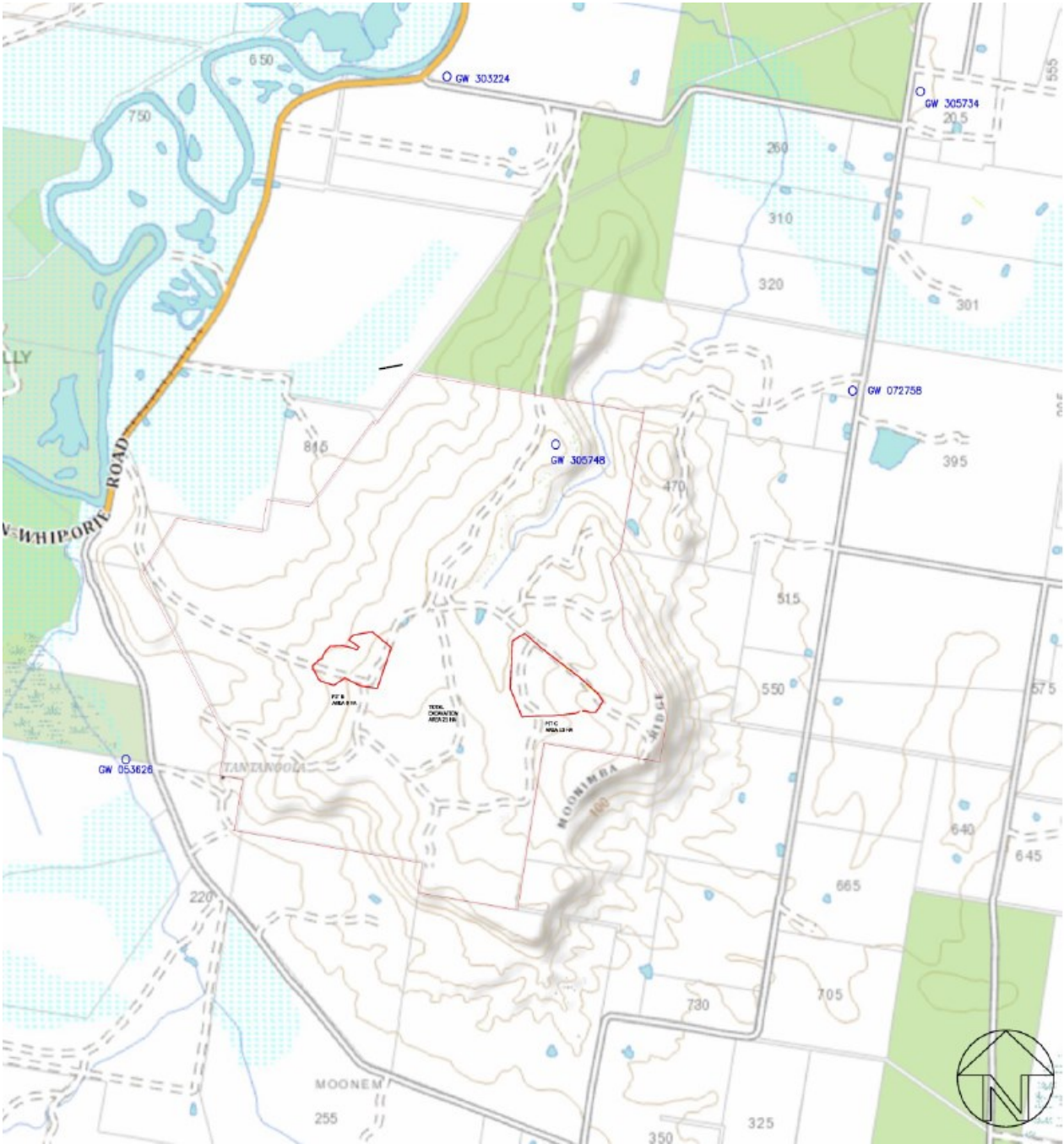


Figure 1 – Location of Licensed Groundwater bores and wells identified in the EIS (Moonimba Borrow Pit Sites shown in red outline)

The Moonimba Quarry EIS determined that the intersection of groundwater at the site is not expected. The proposed floor elevation of the quarry within the western pit was approximated to be 75 m AHD with sediment basins constructed at approximately 73 m AHD, whilst the eastern quarry pit floor was estimated to have a higher elevation at approximately 100 m AHD.

Quarterly groundwater monitoring was recommended for GW305748 (Sample 5, GDA 94 56 524607 E 6781463N) to establish baseline levels as part of the licensing conditions and audits for the following parameters (in addition to those required under the NSW EPA License):

- pH;
- oil and grease
- suspended solids
- biodegradable oxygen demand (BOD)
- turbidity

The EIS noted that during times of prolonged rainfall events, a perched water table may occur due to the slow movement of water through the sandstone bedrock. It also describes that there may be fractures in the rock profile which, at times, may become saturated as rainfall penetrates the subsurface. However, it is not expected that groundwater would be encountered on the site during normal conditions due to the shallow soils that promote run-off and restricts recharge to depth.

Location and characteristics

Moonimba Borrow Site is located at Lot 193 DP 755603, Boggy Creek Road, Bungawalbin, approximately 10 km southwest of the township of Woodburn. The quarry site consists of two excavation areas (the western pit, Pit B, and the eastern pit, Pit C), access track and associated infrastructure. The quarry's current conditions of consent (DA 127/95) are for the extraction of up to 30,000 m³/year. The quarry has additional consent (DA 2015.0069) for the extraction of up to 90,000 m³/year over a period of 25 years across the following two pit areas:

- Pit B (8 ha) to the west with depths of extraction extending to approximately 75 m AHD, and
- Pit C (13 ha) to the east with depths of extraction extending to 100-105 m AHD.

The consent however has not been activated.

Pacific Complete's proposal is to extract sandstone at a rate of 400,000 m³ per year over a period of 2 years. The extraction depths, as well as extraction areas, are to remain the same as those detailed in the Development Application DA2015.0069 as detailed above.

Hydrogeology

The Moonimba Borrow Site is located within the Clarence-Moreton Basin which is an extensive sediment basin in north east New South Wales and southern Queensland. The local groundwater flow systems present at and surrounding the Moonimba Borrow Pit site includes:

- the Koukandowie Formation,
- Walloon Coal Measures,
- Kangaroo Creek Sandstone (potentially present as a perched aquifer system), and
- Quaternary alluvial aquifer in the low lying areas. A geological map of the site is presented in Figure 2.

Koukandowie formation

The Lower Jurassic Koukandowie formation is the upper unit of the Marburg Subgroup and outcrops over a small area to the South East of the Borrow Site. The formation consist of interbedded

quartzose-feldspathic-lithic sandstone, siltstone, claystone and minor coal. The Koukandowie formation has three members: the Heifer Creek Sandstone Member, the Ma Ma Creek Member and the Towallum Basalt of which the Heifer Creek Sandstone outcrops to the south east of the site. It has a low permeability and is considered as a low permeability aquifer or an aquitard (Rassam et al., 2014).

Walloon Coal Measures

Overlying the Koukandowie formation is the Jurassic age Walloon Coal Measures which outcrops at the base of the mountain ridge. The Walloon Coal Measures consists of a thin-bedded, claystone, shale, siltstone, lithic and sublithic to feldspathic arenites, coal seams and minor limestone. They have a maximum thickness of 700 m and are often considered as an aquitard on a regional scale due to their low permeability and storage capacity (Rassam et al., 2014).

The Maclean Sandstone, which represents the upper part of the Walloon Coal Measures, is a thick-bedded, crossbedded, feldspathic to lithic arenite with thin pebbly conglomeratic lenses and minor siltstone lenses with minor coal. The Maclean Sandstone is considered as a low permeability aquifer, aquitard or aquiclude (Doig and Stanmore, 2012).

Kangaroo Creek Sandstone

The Jurassic Kangaroo Creek Sandstone, the material to be quarried, is composed of quartz arenite with minor quartz and lithic conglomerate. This member is a fluvial channel sandstone which is characteristically thick to very thin bedded with high-angle crossbedding. Following burial, fluids present in the rock caused extra dissolved silica to precipitate out onto the existing sand grains filling in voids (recrystallisation of quartz) and created the Kangaroo Creek Sandstone. This feature causes the sandstone to act as a confined aquifer or aquitard (Parsons Brinckerhoff, 2011) and have poor hydraulic connection outside of a limited area adjacent to the outcrop (Doig and Stanmore, 2012).

Groundwater within the Kangaroo Creek Sandstone bedrock aquifer is present within the fracture overprint affecting the rockmass, and typically occurs locally as a shallow perched aquifer (predominantly in the regolith developed at the surface) where it is most active following heavy or prolonged rainfall. This perched groundwater system is anticipated to be a surficial and ephemeral system, with limited hydraulic connection to the deeper bedrock groundwater system at depth, and, is predominantly sustained by direct rainfall recharge and characterised by a variable horizontal flow pattern.

Alluvial aquifer

The alluvial aquifer consists of Quaternary alluvial deposits of sand, silt, clay and gravel as well as some residual and colluvial deposits. It is an unconfined water table aquifer which is likely to host local groundwater resources that are predominantly sustained by direct rainfall recharge and variable horizontal flow.

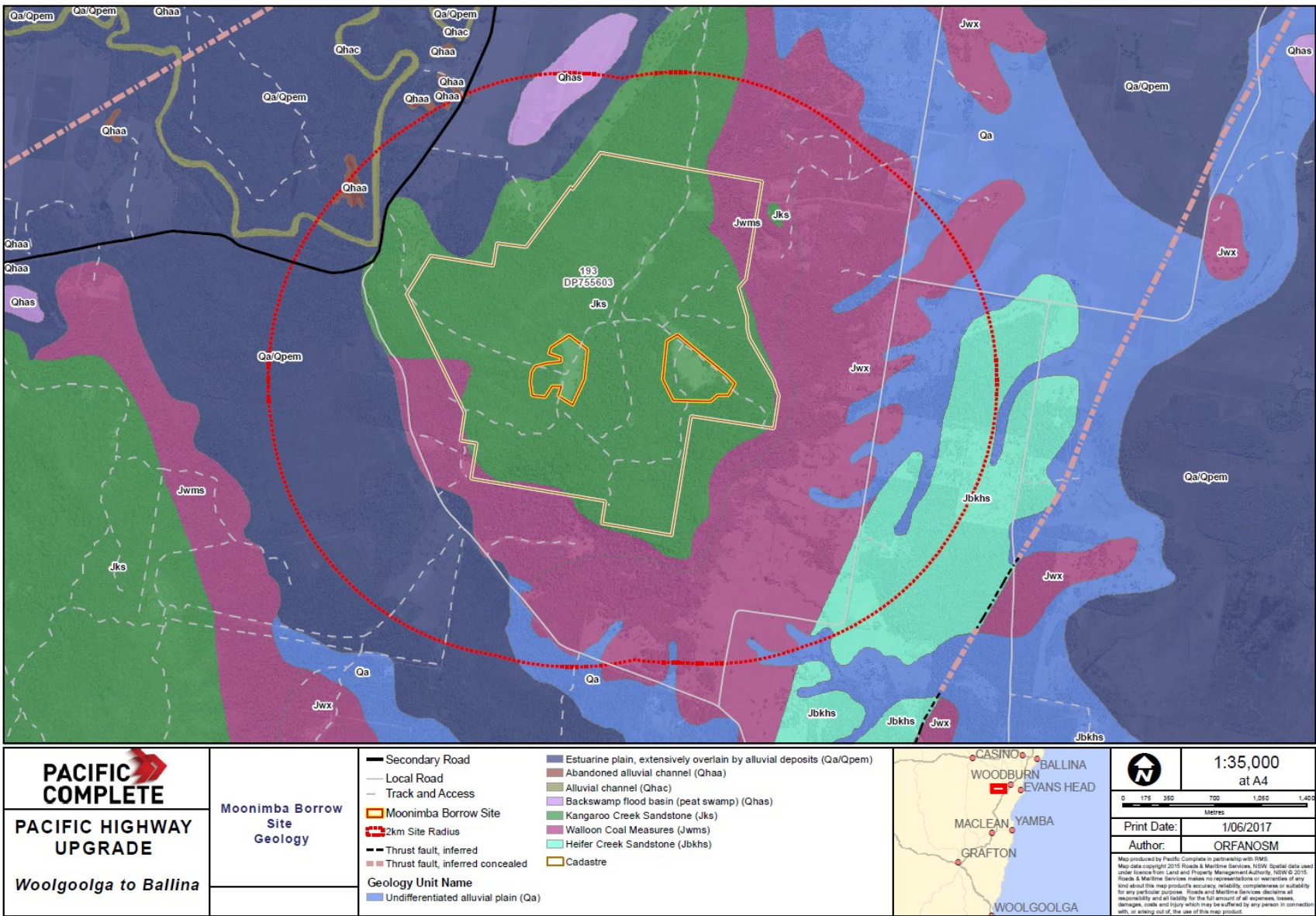


Figure 2 – Geology map of Moonimba Borrow Site

Site groundwater levels

The depth to groundwater at GW305748 at the time of drilling was 66 m below ground level (bgl) (33 m AHD) whilst the minimum final floor depth at west and east pits are approximately 75 and 100 m AHD respectively. Since the water table in the deeper bedrock is likely to be located below the level of the proposed pit floor, it is therefore unlikely to be intersected by the quarry pit activities. As such, it is anticipated that negligible direct impact will be caused to this aquifer by the proposed quarrying activities.

Groundwater may occur locally as a perched aquifer within the Kangaroo Creek Sandstone after heavy or continuous rainfall and is anticipated to be a shallow system (within 1-5 m, bgl) of short duration after direct rainfall recharge. Pondered water has been observed at site over time, this pondered water may also be a source of a temporary perched aquifer. However, as mentioned in the Moonimba Quarry EIS, a perched aquifer is not expected to be present at the Borrow Site during normal conditions.

Beneficial uses

Groundwater users

Registered bores located within a 2 km radius of the Moonimba Borrow Site area are shown on Figure 3 and their corresponding bore cards are attached. Details of the three registered bores within a 2 km of the quarry pits with current water licences are provided in Table 1:

- License *GW053626* (100 m² excavation to 2 m depth) was identified in the Moonimba Quarry EIS as a registered groundwater user within 2 km of the Borrow Site however this water license has lapsed and therefore is not licensed for use.

Groundwater license *GW305748* is located on the same lot number as the Borrow Site and, like the Borrow Site, is the property of the Newman's. The bore is constructed through sandstone and shale from a depth of 4.5 to 60 m and sandstone from 60 to 90 m depth. The groundwater level was recorded at a depth of 66 m bgl (33 m AHD) at the time of drilling (and, as such, is considered indicative). This bore is inferred to target groundwater resources available in the Walloon Coal measures. This bore is owned by the quarry owner and is unlikely to be affected by activities at the Moonimba Borrow Site.

- Groundwater bores *GW032869* and *GW301828* are located over 1.5 km distance from the pits, at lower elevations, and are both shallow bores and are not anticipated to be affected by activities at the Moonimba Borrow Site.

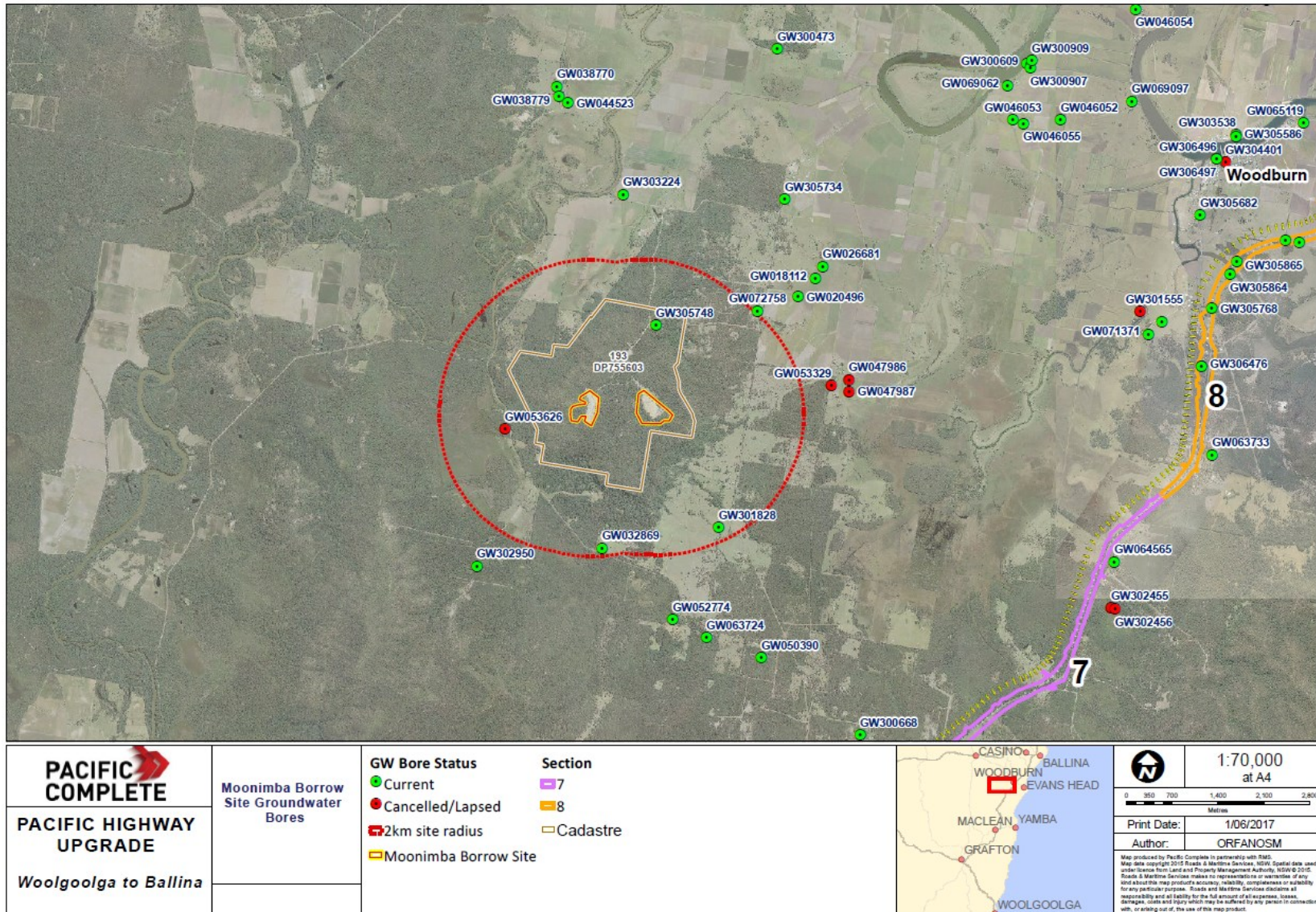


Figure 3 - Register groundwater bores within vicinity of Moonimba Borrow Site showing the license status and a 2 km buffer around the site (DPI-Water, Pinneena database)

Table 1 Details of active groundwater licences within 2 km of the Moonimba Borrow Site

DPI Water registration number	Distance to pits (m)	Purpose	Bore Depth (m)	SWL (m bgl)	aquifer zone (m bgl)	Aquifer geology	Yield (L/s)	Elevation (m AHD)
GW305748	1009	Stock/Domestic	90	66.0	74.0-90.0	Sandstone, shale	1.20	99
GW032869	1885	Stock	15.8	4.6	14.0-15.5	Shale, Coal	0.63	28
GW301828	1791	Stock/Domestic	24.3	12.0	22.0-24.3	Blue Shale and Coal Bands	1.20	24

SWL: - Standing water level; m bgl – metres below ground level; na - not available; m AHD – metres Australian Height Datum

Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are also beneficial users of groundwater. The GDE Atlas (BOM, 2017) categorises GDEs into three classes:

- Ecosystems that rely on the surface expression of groundwater – this includes all the surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs
- Ecosystems that rely on the subsurface presence of groundwater – this includes all vegetation ecosystems
- Subterranean ecosystems – this includes cave and aquifer ecosystems

Within a 2 km radius of the Moonimba Borrow Site, five types of ecosystems were identified that rely on the *subsurface presence of groundwater* with these being Lowland Red Gum winter flowering, Paperbark, Lowlands Grey Box, Clarence Lowlands Spotted Gum and Sub-Tropical and Warm Temperate Rainforest (Figure 4). These GDEs have a low to high potential for groundwater interaction.

A search of the GDE atlas also identified that Bungawalbin Creek and associated floodplain wetlands rely on the surface expression of groundwater (Figure 4) and have a low to high potential for groundwater interaction.

Activities at the Moonimba Borrow Site are not anticipated to affect the local and regional surface, nor subsurface, expressions of groundwater. All GDEs that rely on surface expressions of groundwater are associated Bungawalbin Creek and the floodplain areas of Bungawalbin Creek.

GDEs that rely on subsurface expressions of groundwater are expected to occur within localised water bearing zones typically characterised by localised recharge-in/recharge-out processes associated with rainfall infiltration. Limited reductions to the ground-water flow flux to the downgradient side of the site can be anticipated. Since the immediate surroundings of the Borrow Site area lacks any threatened/ endangered communities potentially sustained by groundwater, this constraint to groundwater recharge is not considered to pose a meaningful ecological impact. As such, and given the distance from the quarry pits, activities on site are unlikely to present a risk of adversely affecting GDEs.

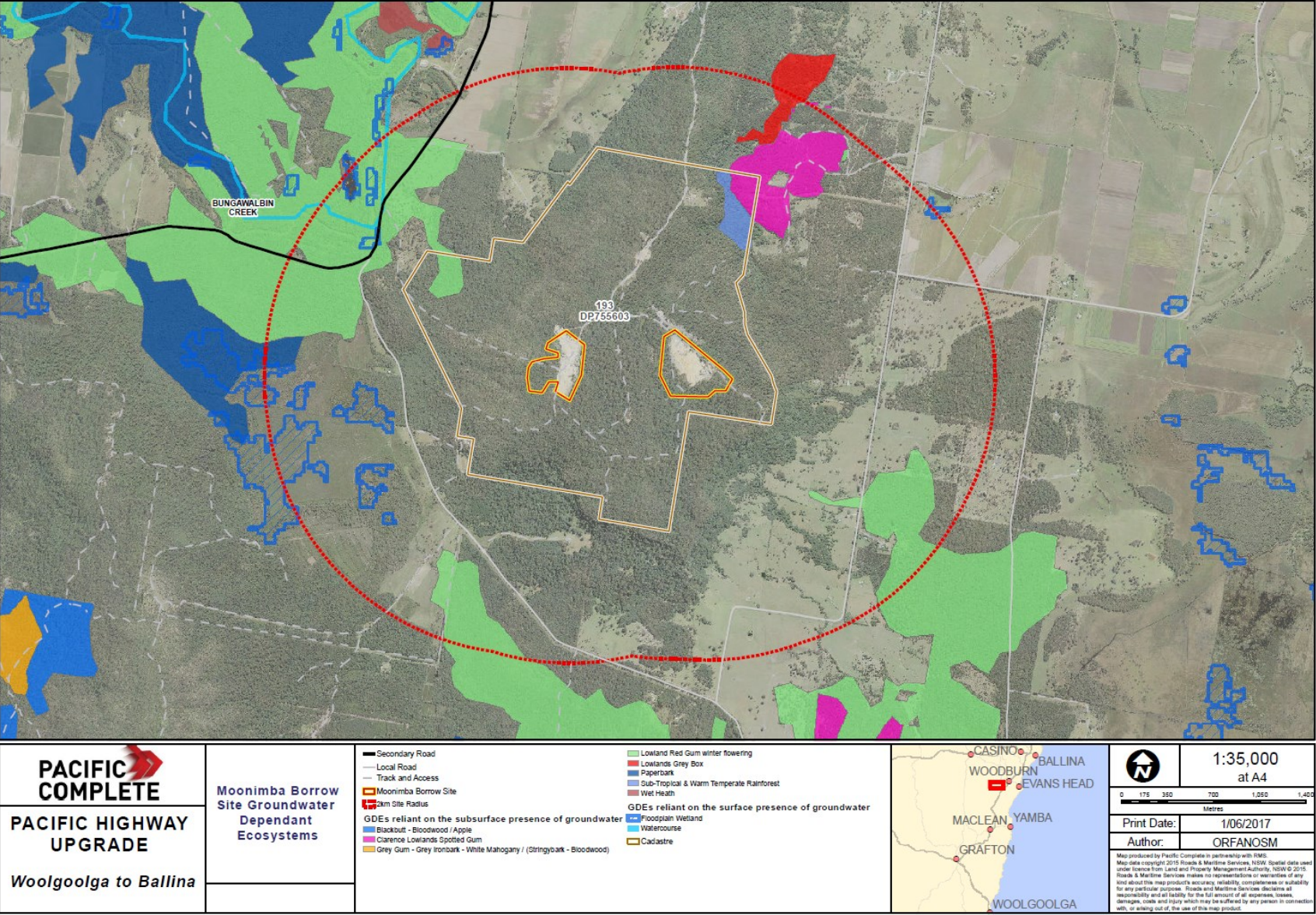


Figure 4 – Groundwater dependant ecosystems within vicinity of Moonimba Borrow Site

Groundwater monitoring requirements

The legislative requirements applicable to groundwater in this project are set out in the State Environment Planning Policy (SEPP) (Mining Petroleum Production and Extractive Industries) 2007 in Section 14 which details natural resource management and environmental management. To assess the legislative requirements falling under the SEPP, the 2015 DA was referred to:

- NSW Office of Water
- Environmental Protection Authority

These organisations provided conditions of approval, none of which are related to groundwater.

The current groundwater assessment indicates that quarry activities will not have a meaningful impact on the permanent groundwater levels and water quality, and existing beneficial uses of groundwater in the area.

Based on the above, the recommendation made in the EIS to monitor groundwater at GW305748 on a quarterly basis has been withdrawn.

Recommendations

The following recommendations should be considered for management of groundwater at the Moonimba Borrow Site:

- In the unlikely event that the Moonimba Borrow Site does encounter a permanent water table in the bedrock, and penetrates this water table, to a depth in excess of 5 m, a review of management measures shall be undertaken, and these will include re-evaluation of the groundwater impact and return of captured water (inflows) to local drainages after treatment in an appropriate sedimentation pond (to capture suspended solids).

Conclusions

This review of the groundwater systems present in the vicinity of the Moonimba Borrow Site indicates that they are dominated by poor aquifer units, presenting low groundwater fluxes, limited rainfall recharge and gradient profiles which mimic the topography in a muted fashion. The following possible groundwater regimes are identified (from shallow to deep):

- Alluvial aquifer - unconfined aquifer on the plain (not located beneath the Site)
- A perched water aquifer in the Kangaroo Creek Sandstone, the material to be quarried, which is anticipated to be a shallow system (within 1-5 m bgl) of short persistence (ephemeral) following direct rainfall recharge, and is not expected to be present at the Borrow Site during normal conditions.
- The Koukandowie formation - a low permeability aquifer or an aquitard, located beneath the Kangaroo Creek Sandstone
- The Maclean Sandstone of the Walloon Coal Measures - low permeability aquifer, aquitard or aquiclude located at depth.

On the basis of this analysis, the quarrying activities proposed for the Moonimba Borrow Site are considered to have no meaningful impact on beneficial groundwater users, for the following primary reasons:

- (a) Few groundwater users are located close to the site. The closest water bore to the quarry pits is owned by the quarry, at 1 km distance from the pit, and, two other groundwater licences that are located close to 2 km of the Moonimba Borrow pit locations, which are located at lower elevations, are shallow bores (<25 m depth), tap into different aquifer units, and are not anticipated to be affected by quarrying activities proposed for the Moonimba Borrow Site.

- (b) the minimum elevation of the base of the Borrow pits (75 m AHD) is above the interpreted permanent local water level (about 33 m AHD), is therefore unlikely to be intersected or meaningfully impacted (in terms of restricted recharge) by the proposed borrow pit activities.
- (c) The perched groundwater system present in the Kangaroo Creek Sandstone (in the regolith) is a shallow and ephemeral system, and is predominantly sustained by direct rainfall recharge and variable horizontal flow. The occurrence of a perched aquifer is not expected to occur under normal conditions and would be of short duration. The underlying Kangaroo Creek Sandstone fracture aquifer system is of low permeability and unsaturated to depth (above).

This review therefore concludes that the proposed activities of the Moonimba Borrow Site will not have a meaningful impact on the groundwater levels and water quality, and existing beneficial groundwater users in the area, both water users and GDEs. Based on this, together with there being no conditions of approval related to groundwater, groundwater monitoring is not recommended.

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**APPENDIX I AHIMS EXTENSIVE SEARCH SITE
LIST REPORT**



SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
13-1-0034	Ngimboug Cave Moonim Valley;Moonimba Range;	AGD	56	525200	6779800	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	
	Contact									Recorders Harry Creamer
13-1-0145	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			Permits
	Contact Mr.Laure Wlison									Recorders Claude McDermott,Damien Hofmeyer
13-1-0199	Robinsons Quarry 1	GDA	56	524786	6779976	Open site	Valid	Modified Tree (Carved or Scarred) : 1		Permits
	Contact									Recorders Everick Heritage Consultants Pty Ltd

Report generated by AHIMS Web Service on 05/04/2017 for Christopher Serrano for the following area at Lot : 193, DP:DP755603 with a Buffer of 1000 meters. Additional Info : Due dilligence. Number of Aboriginal sites and Aboriginal objects found is 3

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

APPENDIX J

ABORIGINAL HERITAGE MEMO



Moonimba Quarry Rockshelter and Ngimboung Cave, Moonimba Range

Short Report

Navin Officer Heritage Consultants Pty Ltd

July 2017

Introduction

Navin Officer Heritage Consultants (NOHC) on behalf of Pacific Complete and Roads and Maritime Services completed a desktop assessment and a survey to locate a previously recorded site, Ngimboung Cave (AHIMS ID 13-1-0034), as a precautionary exercise prior to the intensification of quarrying at the Moonimba Quarry, known for the purpose of the Woolgoolga to Ballina Pacific Highway Upgrade as the Moonimba Borrow Site.

A heritage assessment and full survey for the expansion of the Moonimba Quarry has previously been completed by Everick Heritage Consultants (Everick 2014). One new site, a culturally modified tree, was identified in the Everick assessment. As Ngimboung Cave was mapped outside of the study area no site inspection took place as part of the 2014 assessment.

During NOHC's survey, the quarry owner, Noel Newman, directed NOHC to a previously unrecorded rockshelter. This rockshelter has been named the Moonimba Quarry Rockshelter for the purposes of this assessment.

NOHC was also asked to complete a desktop study and survey of the Moonimba Forbidden Place (13-1-0145). In 2014, Everick Consultants described the Moonimba Forbidden Place (13-1-0145). The report included the following:

One of the sites (AHIMS Site ID 13-1-0145) was classified as restricted. Everick contacted the OEH and site recorder Mr Claude McDermott regarding this site. Mr McDermott advised that the restricted site was the Moonimba Forbidden Place, a Ceremonial Site and Story Feature which was recorded during a joint oral history project between the Bandjalang Peoples and the Parks and Wildlife group titled 'The use of the landscape and natural features for Cultural Practices by the Bandjalang People'. While the location of the site as recorded on AHIMS was disclosed to the Consultant, no further information was obtained, as the data generated by the project was restricted to the Bandjalang Peoples and the Parks and Wildlife Group Land Managers. As illustrated in Figure 4, the site is located less than 400m from the boundary of one of the proposed quarry pits. An access track is also immediately within the vicinity of the site. Everick consulted with Bogal LALC regarding the site, neither Mr Lance Manton (Bogal LALC CEO) nor Sites Officer (Bogal LALC Sites Officer) had any cultural knowledge of the site, or the associated dreaming story.

This site has restricted access on AHIMS. The process for finding the relevant information has been undertaken by Everick. NOHC do not believe any further information other than what is included in the report can be obtained.

Background

The Ngimboung Cave was originally recorded in 1977. The cave was described as:



embedded into the southern walls of a granite [sandstone] outcrop that rises approximately 188 metres above sea level...the cave is of natural feature which is embedded into the rock face...the entrance to the cave is approximately 4 metres from ground level with an opening of approximately 2/3 metre in diameter (Figure 1).

The recorder was unable to enter the cave and, as such, there is no recorded description of its interior. The cave is listed as a mythological/ceremonial site on the AHIMS register.



Figure 1: Original photograph of the cave from the 1977 AHIMS site card

Aboriginal Consultation

Phone and email contact to Bogal LALC was made to advise them of the assessment being completed and invite a representative to participate in the field survey. An initial email and phone call was made on the 14 July 2017.

On the 18 July 2017, a follow up phone call was made. Bogal LALC was advised of the assessment. Bogal LALC indicated that no representatives were available to participate in the survey but advised that the LALC had no concerns with NOHC completing the ground truthing exercise.

NOHC Fieldwork Personnel

Nicola Hayes and Julia Maskell (NOHC archaeologists) undertook the survey on 19 July 2017.

Results

The Ngimboung Cave

The Ngimboung Cave was not able to be re-found during this assessment. An area of the sandstone escarpment where the cave is likely situated was surveyed, however, this area was severely overgrown and the exact recorded location of the Ngimboung Cave could not be reached (Figures 2 and 3).



The Ngimboung Cave was recorded in 1977 with the following AGD coordinates:

Zone 56 525200.6779800

These coordinates convert to GDA:

Zone 56 525303.6779989

The cave is mapped to be located on Lot 215 DP755603 (Figure 4), an adjacent property to the Moonimba Borrow Site that is located on Lot 193 DP755603. The location of the cave relative to the NOHC's end survey point on the escarpment is mapped in Figure 5. The sketch map provided with the AHIMS site card also corresponds roughly to this location.



Figure 2: The general location of the sandstone escarpment



Figure 3: The general location of the sandstone escarpment, severely overgrown

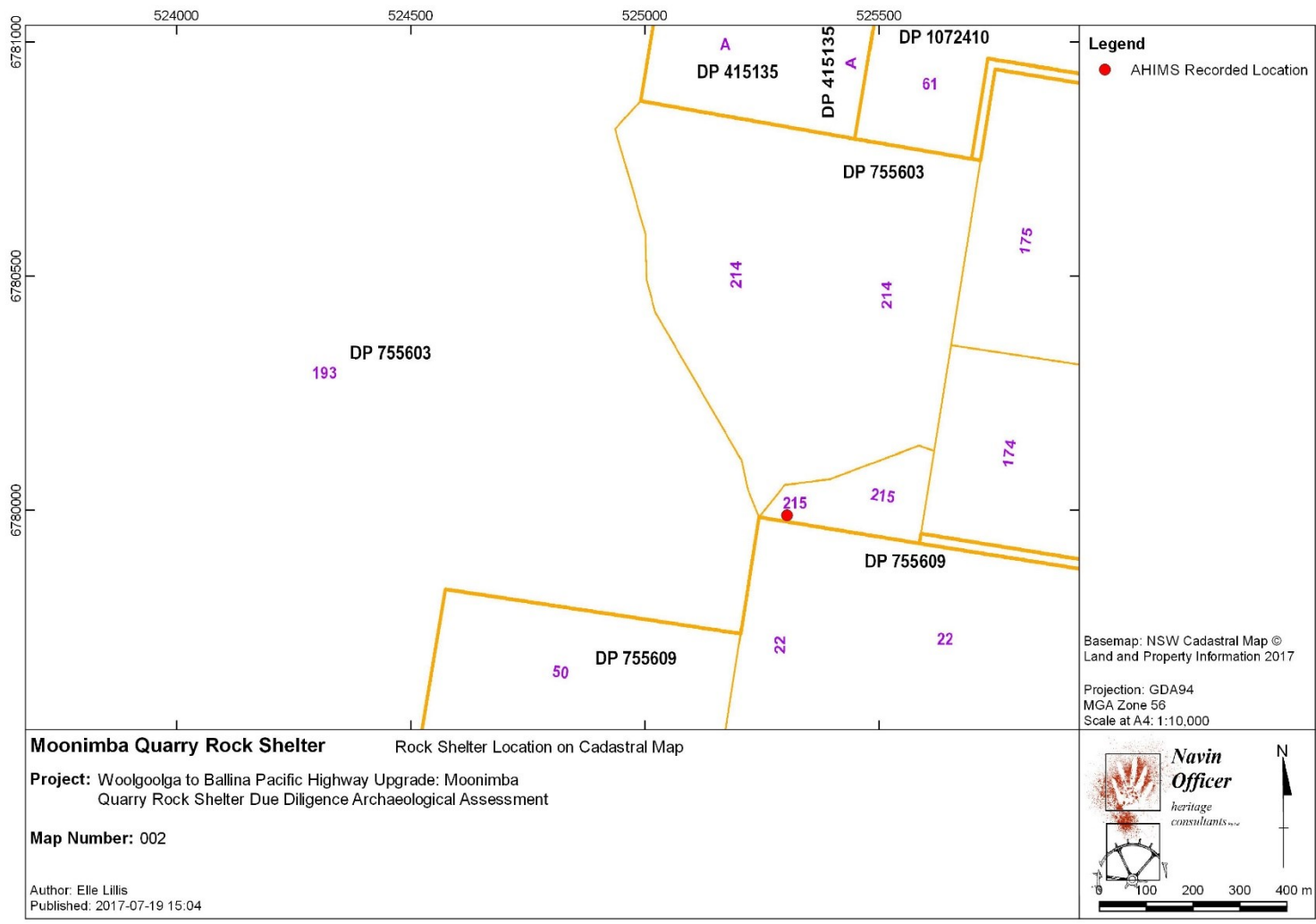


Figure 4: AHIMS recorded location of Ngimbourg Cave on a cadastral basemap showing approximate location

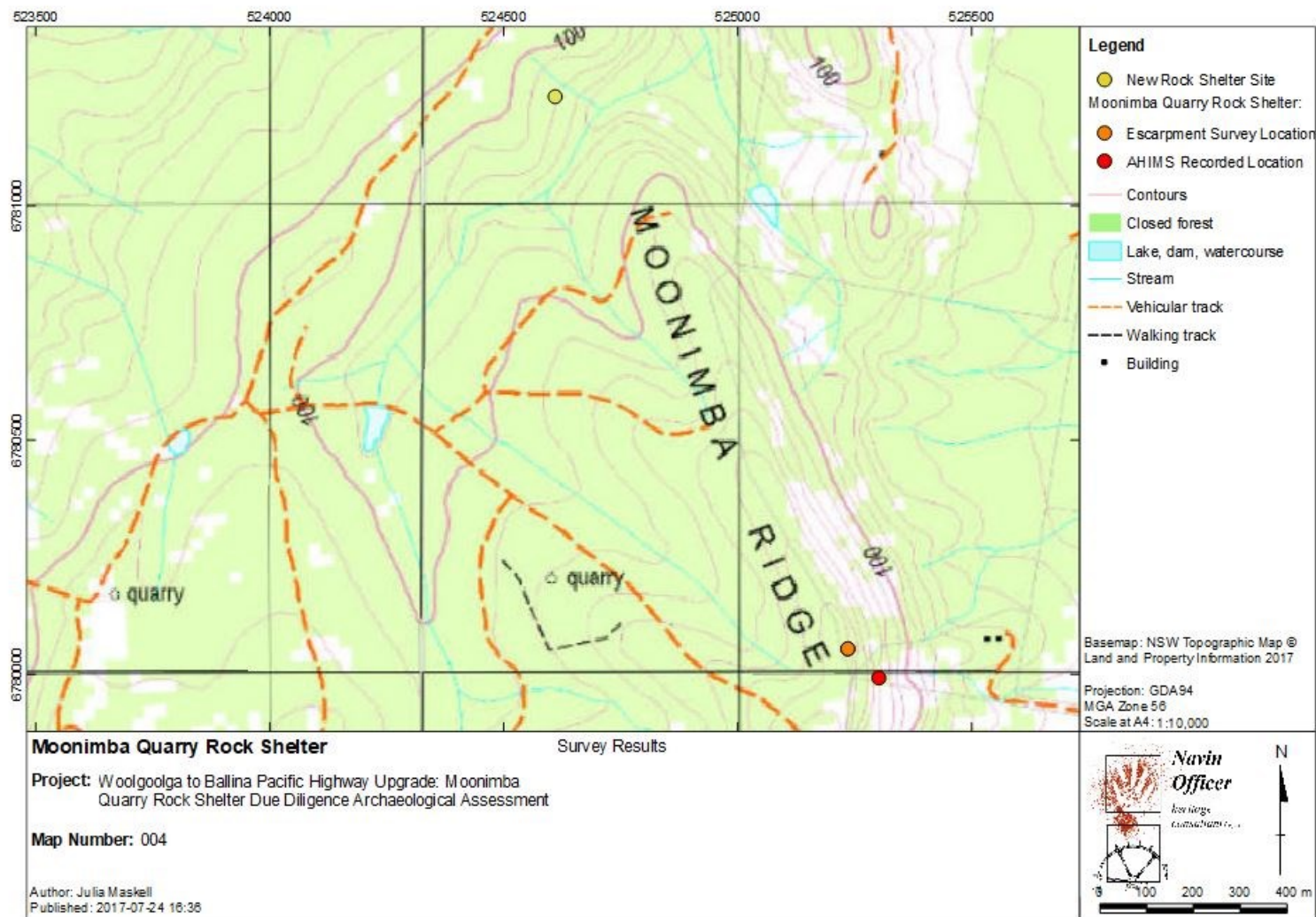


Figure 5: AHIMS recorded location of Ngimboung Cave and NOHC survey point



Moonimba Quarry Rockshelter

GDA Zone 56 524611.6781232

The Moonimba Quarry Rockshelter is a previously unrecorded Aboriginal site (refer to Figure 5). The site is located on the south-western side of an unnamed creek 800 metres north of the quarry borrow pit. The rockshelter is approximately 45 metres in length and approximately 4 metres wide, with an overhang of approximately 3 metres. The height of the shelter varies between approximately 2 and 7 metres (Figure 6).



Figure 6: Moonimba Quarry Rockshelter looking south

The base of the shelter is a rock shelf at both the northern and eastern ends. A deposit of guano, bat excrement, of an unknown depth is present in the middle of the shelter. This deposit is approximately 10 x 4 metres and potential archaeological deposit (PAD) could exist below to an unknown depth (Figure 7). There is significant rock fall at the entrance to the shelter and it is also possible that PAD could be present below this rock fall.

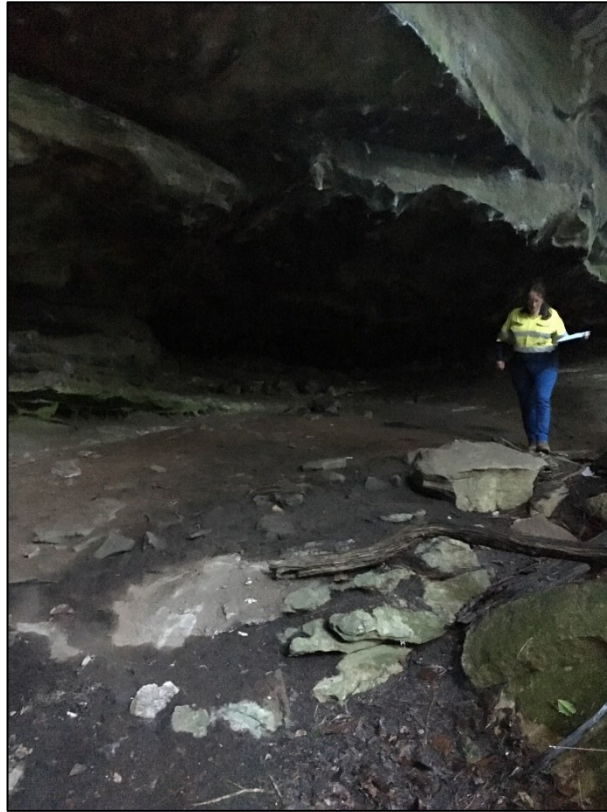


Figure 7: Moonimba Quarry Rockshelter with rock shelf and guano visible, looking north west

The shelter includes a number of painted and drawn graphics, including names and initials, and two figurative motifs. Most of the graphics have been created using a wet white pigment. There are also drawn orange initials ('BT'). Some of the initials appear to have been scratched into the rock face.

The two motifs have been applied using a wet white pigment. The consistent width of the constituent linear and infill elements indicate that the pigment has been applied with a brush approximately 20 to 25mm in width. The colour and consistency of the white pigment appears to be the same as that used to delineate at least two of the 'graffiti' names in the shelter, 'J.HAYNES' and N.HUNT' (Figure 8). It is considered likely that the names and the two figurative motifs are similar in age.

Considerable organic growth (such as a lichen or algae), is evident across some of the white pigment surfaces. Based on the type, condition and technique of application, it is hypothesised that the two figurative motifs may date from the mid twentieth century.

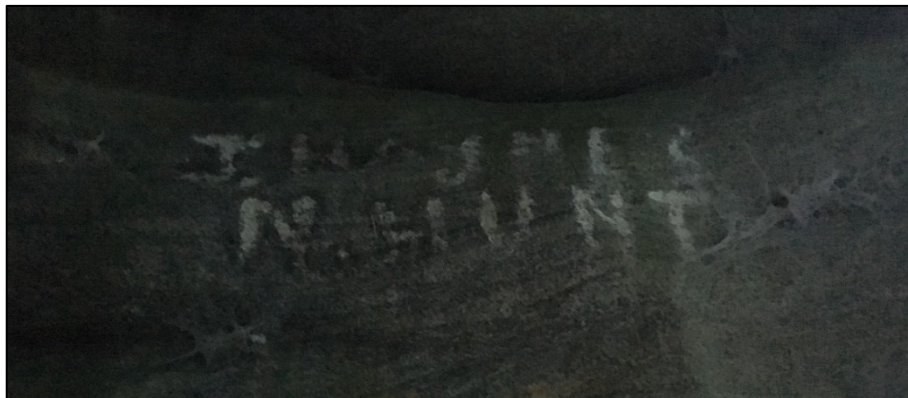


Figure 8: Moonimba Quarry Rockshelter with 'graffiti' examples



The two figurative motifs resemble a 'view from above' lizard and a side-on view of an anthropomorphic figure holding a spear (Figures 9 and 10). The lizard motif comprises simple linear limbs appended to continuous linear outlined body, tail and head, with dotted infill, including two eyes. Two short rays extend from the top of the head and resemble antennae. The anthropomorph is similarly constructed with simple linear limbs and feet attached to a linear outline body and head. The body includes a parallel linear angled infill, which is bisected by a central vertical line, resembling an 'X-Ray' style ribs and backbone. The round head outline contains three dashes which resemble eyes and a nose. Each of these motifs include stylistic elements which are characteristic, in a generalised manner, of Aboriginal rock art and of some modern Aboriginal painting. However, as a whole these motifs are not stylistically consistent with examples from Aboriginal rock art precincts across northern and central NSW.

In summary, the rock art in this shelter displays some stylistic traits which are evident in modern Aboriginal art, however the overall character of the motifs is inconsistent with pre-European Aboriginal, rock art traditions from surrounding regions. It is considered probable that these motifs date from the twentieth century. In the absence of information from the original creators of these motifs, it is possible to argue that they have been made to resemble Aboriginal art, based on a modern appreciation of popular Aboriginal art styles.



Figure 9: The two figurative motifs captured with torch lighting



Figure 10: The two figurative motifs captured with electronic flash

Conclusion

The Ngimboung Cave was not able to be re-found. The escarpment where the cave is located is severely overgrown and the mapped location was not able to be reached by the survey team. The cave appears to be mapped outside of the quarry property boundary, approximately 420 metres east of the quarry borrow pit and the coordinates provided from the AHIMS search correlate to the sketch map in the site card.

A new Aboriginal site, the Moonimba Quarry Rockshelter, was recorded by this assessment, 800 metres north of the quarry borrow pit. The shelter includes a number of painted and drawn graphics, including names and initials, and two figurative motifs. It is considered probable that these motifs date from the twentieth century. The shelter has a rock shelf floor at the northern and southern ends with guano deposit in the middle of the shelter. Potential archaeological deposit may be present below the guano deposit, but the depth of any deposit is not able to be determined.

Both the Ngimboung Cave and the Moonimba Quarry Rockshelter appear to be located well outside the quarry area.

Recommendations

1. A copy of this report should be provided to the Bogal LALC for their records.
2. The Moonimba Quarry Rockshelter should be registered on AHIMS as an Aboriginal site.
3. If any impacts to either the Moonimba Quarry Rockshelter or the Ngimboung Cave are planned a full cultural heritage assessment would be required. This would include the implementation of the NSW *Aboriginal cultural heritage consultation requirements for proponents 2010*. The results of the full cultural heritage assessment would then need to be documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR).
4. If impacts cannot be avoided it will be necessary to apply for an Aboriginal Heritage Impact Permit (AHIP) prior to commencement of ground disturbance activities.



References

Everick Heritage Consultants Pty Ltd 2014 Cultural Heritage Assessment for the Moonimba Quarry.
Report to Newmans Quarry and Landscaping Pty Ltd.

APPENDIX K
ASSESSMENT

AIR QUALITY IMPACT



global environmental solutions

Woolgoolga to Ballina Pacific Highway Upgrade
Moonimba Borrow Site
Air Quality Impact Assessment

Report Number 610.16962-R01

20 June 2017

Roads & Maritime Services
c/o Pacific Complete
21 Prince Street
GRAFTON NSW 2460

Version: v1.0

Woolgoolga to Ballina Pacific Highway Upgrade

Moonimba Borrow Site

Air Quality Impact Assessment

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This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Pacific Complete. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.16962-R01-v1.0	20 June 2017	Ali Naghizadeh	K Lawrence	K Lawrence
610.16962-R01-v0.1	01 June 2017	Ali Naghizadeh	K Lawrence	DRAFT

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1 INTRODUCTION

Pacific Complete on behalf of Roads and Maritime Services (RMS) is preparing a modification report for the Woolgoolga to Ballina Pacific Highway Upgrade project (W2B) for the use of the Moonimba Quarry, known to the project as Moonimba Borrow Site (the project site), situated in Bungawalbin, NSW. This Air Quality Impact Assessment (AQIA) will form part of this modification report.

Pacific Complete is proposing to intensify the annual extraction rate at the site to one million tonnes (1,000,000 tonnes), which is equivalent to 400,000 m³ of aggregate per annum, to provide sufficient material to complete the W2B project. The purpose of this AQIA is to predict the highest levels of identified air pollutants that could result from the added industrial activity at the project site and compare these predictions with those of the existing operations. Air quality impacts from the existing operations were assessed in the 2014 *Newman's Quarry Expansion Air Quality Impact Assessment* prepared by ENVIRON Australia Pty Ltd for Newman's Quarry and Landscaping Pty Ltd (hereafter, the 2014 AQIA). For the purpose of this study, it has been assumed that emissions from the existing operations are similar to what was predicted in the 2014 AQIA.

Moonimba Borrow Site is situated approximately 10 km south-west of Woodburn. It resides to the west of Portion C of the W2B project. Split between two pits, the site will operate with a total excavation area of 21 hectares (ha).

An Environmental Impact Statement (EIS) prepared by RMS for the Woolgoolga to Ballina Pacific Highway Upgrade (RMS, 2012), considered the potential air quality impact from the construction of the W2B project through a qualitative air quality assessment. This assessment did not identify air quality as a key issue for the W2B project and found that while there was potential for sensitive receptors to be affected by fugitive dust emissions, any negative impacts could be avoided through appropriate mitigation. These mitigation measures will be adopted for the proposed Moonimba Borrow Site.

It is noted that the Moonimba Borrow Site was not identified in the 2012 EIS as a borrow site to provide material for the construction of the project and was therefore not assessed at the time. The assessment criteria adopted by the 2012 EIS have also since been updated by the NSW Environment Protection Authority (EPA) (NSW EPA, 2017). This AQIA adopts the current assessment criteria.

This AQIA has been prepared in accordance with the EPA document '*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*' (NSW EPA, 2017), hereafter referred to as 'The Approved Methods'. This assessment involves the modelling of local meteorology and the dispersion of potential emissions from the project site to predict the level of impact that may be experienced in the surrounding environment. The sections of this report where the requirements of the Approved Methods are met are as follows:

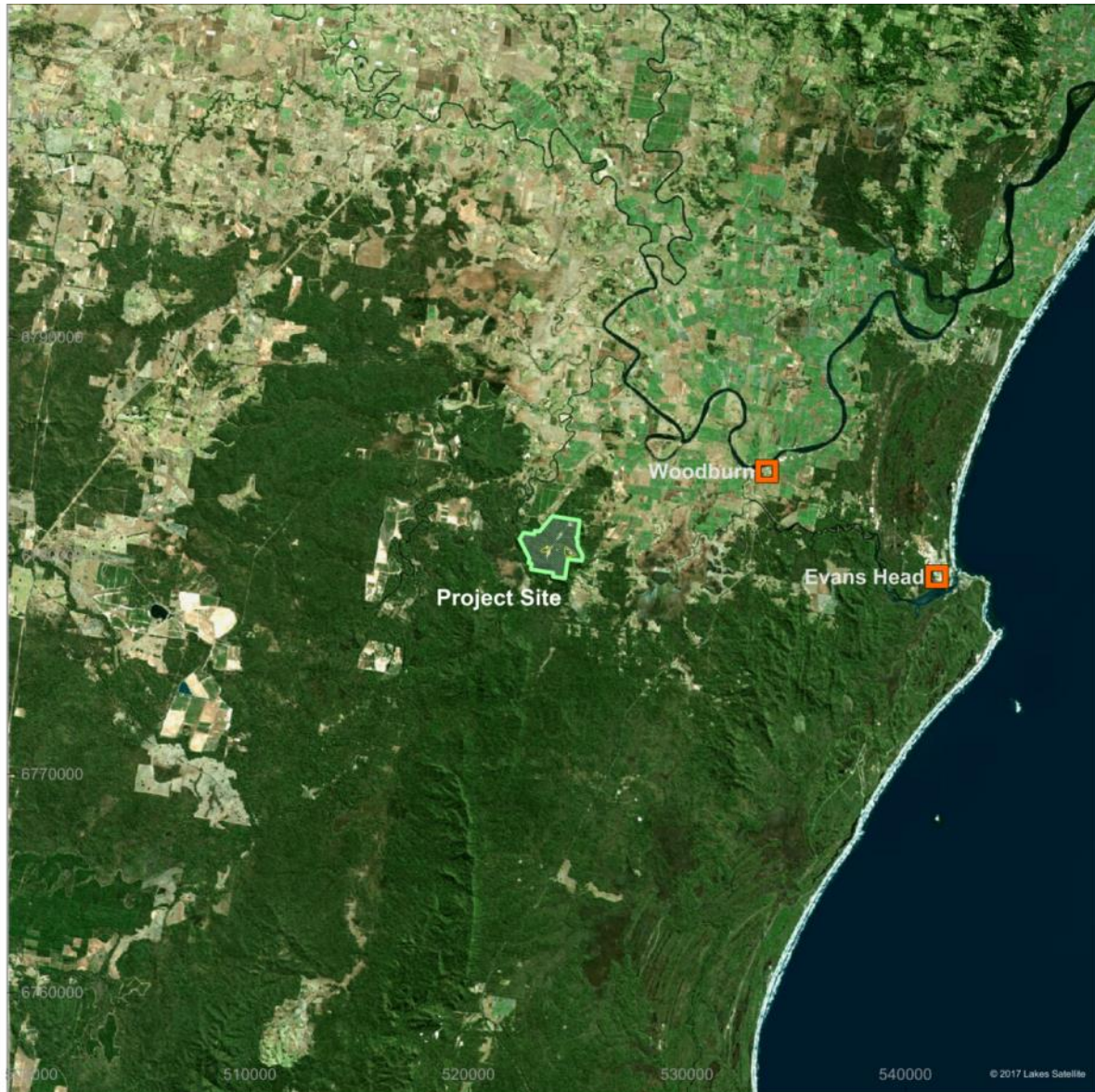
- Description of local topographic features and sensitive receptor locations (**Section 3**).
- Establishment of air quality assessment criteria (**Section 4**).
- Analysis of climate and dispersion meteorology for the region (**Section 5**).
- Description of existing air quality environment (**Section 6**).
- Compilation of a comprehensive emissions inventory for the existing and proposed activities (**Section 7**).
- Completion of atmospheric dispersion modelling and analysis of results (**Section 8**).
- Preparation of an air quality impact assessment report comprising the above.

2 PROJECT OVERVIEW

2.1 Project locality

The project site is situated in the Northern Rivers region of north-eastern New South Wales, located about 10 km south west of Woodburn, 5 km south of the Richmond River at Swan Bay and 17 km inland due east from the Pacific Ocean at Evans Head. It resides to the west of Portion C of the W2B project. **Figure 1** illustrates the location of the project site.

Figure 1 Location of the project site



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Project Number:	610.16962
Location:	Richmond Valley, NSW
Other Information:	
Projection:	GDA 1994 MGA Zone 55
Date:	14/06/2017



Pacific Complete
Moonimba Borrow Site
Air Quality Impact Assessment

Project Location

2.2 Project description

The existing Borrow Site operation operates under Development Consent 127/1995 which allows a maximum extraction of 30,000 m³ per annum. The Borrow Site operation extracts sand and sandstone by blasting and excavation. Pacific Complete is proposing to intensify the extraction rate at the site to 400,000 m³ per annum to provide sufficient material to complete the W2B project. The project site consists of two pits namely the Eastern Pit and the Western Pit.

The operations on the project site will generally involve:

- Clearing of vegetation;
- Removal and stockpiling of topsoil and overburden;
- Off-site transport of overburden;
- Removal of raw material by drilling and blasting;
- Crushing and screening of raw material in mobile processing plants and stockpile products;
- Off-site transport of overburden; and
- Importation of fill for use in rehabilitation of the project site.

It is proposed to extract a total of 800,000 m³ of aggregate in two years. In order to achieve this, it is proposed to open 21 hectares of land (total area of the two pits) and commence quarrying in the two pits as soon as approval is granted. As such, mobile processing plants will be used on-site and stockpiling of overburden and product will be carried out at various locations within the two pits.

The project site is accessed from Boggy Creek Road via a 1.6 km dedicated paved road which has been constructed to Council's requirements pursuant to consent 127/95. The paved road ends at the boundary of the project site, from which point an unpaved access road continues south for 1.4 km to a fork from which one road heads to the Eastern Pit, and the other to the Western Pit.

A description of the activities for the first and second year of operation at the project site is presented in **Table 1**. **Figure 2** illustrates the layout of the project site.

Table 1 Description of operations at the project site

Description	Year 1	Year 2
Process	Removal of topsoil	Removal of raw material
	Placement of topsoil in extracted areas	Drilling and Blasting
	Removal of overburden	Processing of raw material in mobile screening and crushing plants
	Removal of raw material	Loading of product to trucks for off-site transportation
	Drilling and Blasting	Importation of fill material
	Processing of raw material in mobile screening and crushing plants	
	Loading of product and overburden to trucks for off-site transportation	
	Importation of fill material	
Operating hours	7 am to 6 pm Monday to Friday	7 am to 6 pm Monday to Friday
	8 am to 5 pm Saturday	8 am to 5 pm Saturday

Figure 2 Project site layout



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Project Location



3 PROJECT SETTING

3.1 Sensitive receptors

Sensitive receptors are locations where the general population can be adversely impacted by exposure to pollution from the atmospheric emissions. These locations include hospitals, schools, day care facilities and residential housing.

The project site is situated in a rural environment surrounded by farming properties and nature reserves. A number of non-project related residential dwellings are situated in the area surrounding the project site. A list of existing sensitive receptor points identified in the immediate vicinity of the project site is provided in **Table 2**, along with the respective distances of each of these receptor points to the site boundary and the proposed extraction boundary. **Figure 3** illustrates the location of the surrounding receptors in relation to the project site. Concentrations of particulate matter have been assessed at each of these receptors, for relevant averaging periods as discussed in **Section 4**. The identified sensitive receptors are the same as those identified in the 2014 AQIA. The numbering used in the 2014 AQIA has been used in this assessment in order to facilitate comparison between the predicted results of the proposed operations to the existing operations as presented in the 2014 AQIA. It is noted that sensitive receptor R36 is the owner/operator's dwelling.

Figure 3 Location of the identified sensitive receptors



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Sensitive Receptors

Table 2 Details of identified sensitive receptors

Receptor ID	Location (m, UTM)		Distance (m) from nearest proposed extraction boundary	Elevation (m, AHD)
	Easting	Northing		
R1	526,627	6,783,408	3,660 / NE	27
R2	526,316	6,783,160	3,285 / NE	26
R3	526,504	6,783,156	3,400 / NE	30
R4	526,627	6,783,073	3,400 / NE	19
R5	526,392	6,783,005	3,220 / NE	17
R6	526,394	6,782,855	3,090 / NE	11
R7	526,664	6,782,802	3,210 / NE	18
R8	526,631	6,782,697	3,120 / NE	18
R9	526,625	6,782,609	3,040 / NE	18
R10	526,121	6,782,390	2,550 / NE	9
R11	526,197	6,781,687	2,050 / NE	13
R12	526,183	6,781,599	2,000 / NE	12
R13	526,195	6,781,452	1,900 / NE	14
R14	525,319	6,781,416	1,290 / NE	65
R15	525,808	6,781,339	1,550 / NE	28
R16	525,997	6,780,531	1,200 / E	33
R17	525,785	6,780,062	885 / E	39
R18	525,555	6,780,067	660 / E	66
R19	525,645	6,779,028	1,250 / SE	40
R20	525,044	6,779,358	666 / SE	73
R21	524,812	6,778,888	1,100 / S	80
R22	523,667	6,778,875	1,230 / S	58
R23	523,577	6,779,225	885 / S	92
R24	522,700	6,779,224	1,140 / SW	27
R25	522,827	6,779,641	715 / SW	43
R26	522,303	6,780,147	1,005 / W	17
R27	522,248	6,780,808	1,185 / NW	45
R28	522,399	6,781,005	1,180 / NW	31
R29	522,394	6,781,150	1,270 / NW	30
R30	522,219	6,781,517	1,650 / NW	16
R31	522,607	6,781,512	1,410 / NW	7
R32	523,371	6,781,383	980 / N	26
R33	524,380	6,782,717	2,280 / N	11
R34	524,659	6,783,080	2,660 / N	15
R35	524,921	6,783,566	3,150 / N	13
R36*	524,613	6,781,474	1,050 / N	97

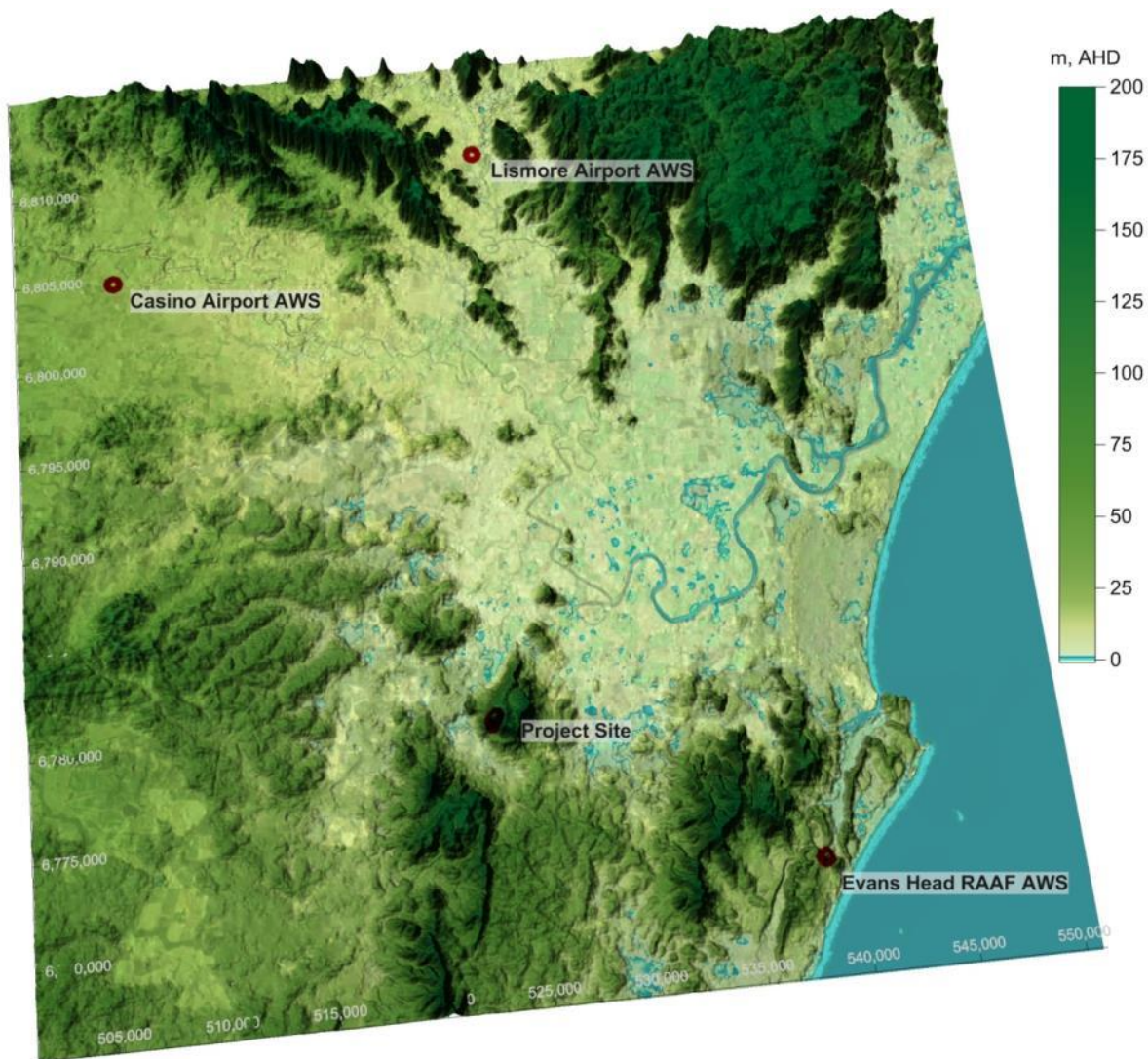
* Owner/operator's dwelling

3.2 Surrounding topography

Topography is important in air quality studies as local atmospheric dispersion can be influenced by night-time katabatic (downhill) drainage flows from elevated terrain or channelling effects in valleys or gullies around the project site.

A three dimensional representation of the area is given in **Figure 4**. The topography of the local area within the model domain ranges from approximately 0 m to 200 m Australian Height Datum (AHD). The project site is located on the top of Moonimba Ridge, the highest parts of which reach an elevation of more than 188 m. There are extensive floodplains to the north and east of the project site with elevations generally between 0 and 10 m. The areas southwest and southeast of the project site are marked by elevated terrain with elevations generally similar to the project site.

Figure 4 Local topography surrounding the project site



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 Air Quality Impact Assessment**
Topography

Note: Vertical exaggeration applied

4 AIR QUALITY CRITERIA

4.1 Pollutants of interest

SLR Consulting has conducted a large number of assessments for quarry operations across Australia. The results of these assessments have indicated that the key pollutants for determining compliance with relevant air quality criteria from these types of operations are suspended particulate matter (TSP, PM₁₀ and PM_{2.5}) and fugitive dust deposition.

While emissions of pollutants associated with the combustion of diesel fuel, including nitrogen oxides (NO_x), sulphur dioxide (SO₂), carbon monoxide (CO) and Volatile Organic Compounds (VOCs), will be generated by the current and proposed operations at the project site, these emissions are unlikely to compromise air quality goals at the closest receptors, given the nature and scale of the operation.

4.2 Suspended particulate matter

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms “dust” and “particulates” are often used interchangeably. The health effects of particulate matter are strongly influenced by the size of the airborne particles. Smaller particles can penetrate further into the respiratory tract, with the smallest particles having a greater impact on human health as they penetrate to the gas exchange areas of the lungs. Larger particles primarily cause nuisance associated with coarse particles settling on surfaces.

The term “particulate matter” refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm and is termed total suspended particulate (TSP). Particulate matter with an aerodynamic diameter of 10 microns or less is referred to as PM₁₀. The PM₁₀ size fraction is sufficiently small to penetrate the large airways of the lungs, while PM_{2.5} (2.5 microns or less) particulates are generally small enough to be drawn in and deposited into the deepest portions of the lungs. Potential adverse health impacts associated with exposure to PM₁₀ and PM_{2.5} include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

The ambient air quality goals set by NSW EPA for suspended particulate matter are summarised in **Table 3**. These include updated PM₁₀ and PM_{2.5} air quality goals established by the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) (National Environment Protection Council, 2016), which were adopted by NSW EPA through an amendment to the Approved Methods in 2017.

Table 3 Suspended particulate air quality criteria used in this assessment

Pollutant	Averaging Time	Goal
TSP	Annual	90 µg/m ³
	24 Hours	50 µg/m ³
PM ₁₀	Annual	25 µg/m ³
	24 Hours	25 µg/m ³
PM _{2.5}	Annual	8 µg/m ³

SOURCE: (NSW EPA, 2017)

4.3 Deposited particulate matter

The preceding section is largely concerned with the health impacts of particulate matter. Nuisance (amenity) impacts also need to be considered, mainly in relation to deposition of dust. In NSW, accepted practice regarding the nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition levels exceed 4 grams per square metre per month ($\text{g/m}^2/\text{month}$).

Table 4 presents the EPA impact assessment goals for dust deposition, showing the allowable increase in dust deposition level over the ambient (background) level which would be acceptable so that dust nuisance could be avoided.

Table 4 Goals for allowable dust deposition

Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2 $\text{g/m}^2/\text{month}$	4 $\text{g/m}^2/\text{month}$

Source: (NSW EPA, 2017)

4.4 Summary of project air quality goals

In view of the foregoing, the air quality goals adopted for this assessment, which conform to current EPA and Federal air quality criteria, are summarised in **Table 5**.

Table 5 Project air quality goals

Pollutant	Averaging Period	Criteria ($\mu\text{g/m}^3$)	Source
PM ₁₀	24 hours	50	(NSW EPA, 2017)
	Annual	25	(NSW EPA, 2017)
PM _{2.5}	24 hours	25	(NSW EPA, 2017)
	Annual	8	(NSW EPA, 2017)
TSP	Annual	90	(NSW EPA, 2017)
Criteria ($\text{g/m}^2/\text{month}$)			
Deposited dust	Annual	2 (maximum increase in deposited dust level) 4 (maximum total deposited dust level)	(NSW EPA, 2017)

5 CLIMATE AND METEOROLOGY

The nearest available meteorological monitoring stations collecting data suitable for use in a quantitative air dispersion modelling study operated by the Bureau of Meteorology (BoM) are located at Evans Head RAAF Bombing Range, Casino Airport and Lismore Airport.

The nearest station, at Evans Head RAAF Bombing Range (Station 58212, elevation 63 m), has data available from 1998 to 2017 for the following parameters:

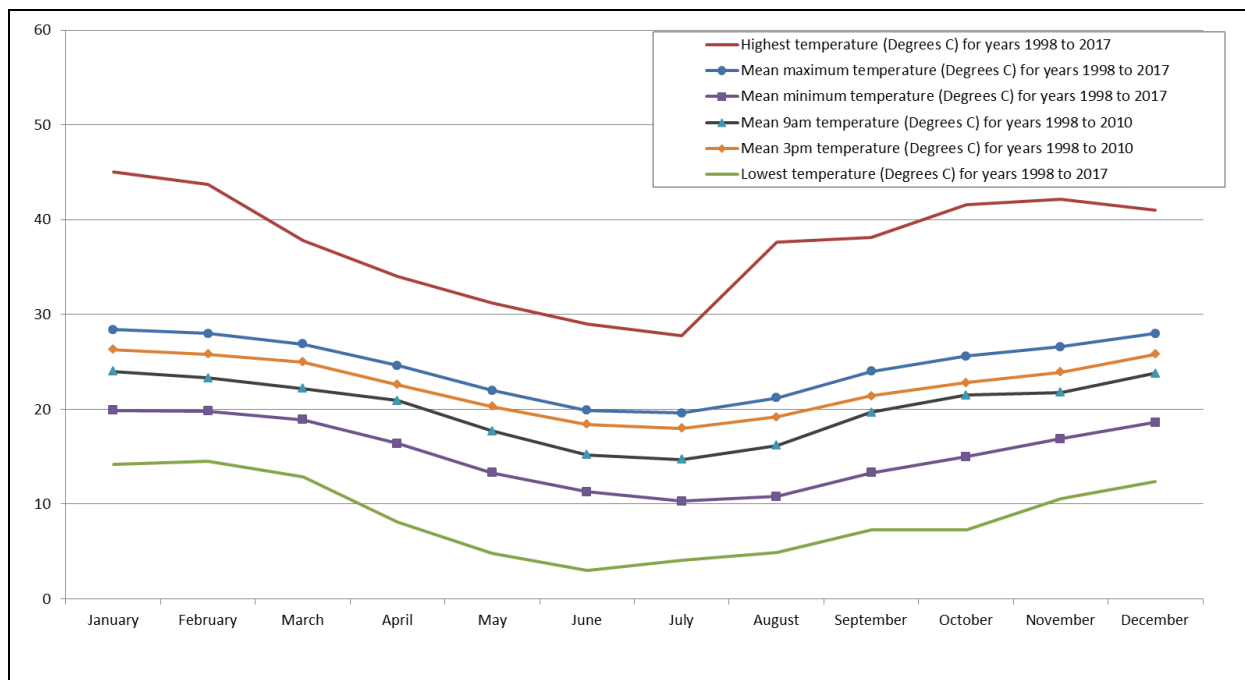
- Temperature (°C)
- Rainfall (mm)
- Relative humidity (%)
- Cloud cover
- Wind speed (m/s) and wind direction (degrees).

A review of the long term data collected by this station is provided in the following sections.

5.1 Temperature

Long-term temperature statistics for Evans Head RAAF Bombing Range are summarised in **Figure 5**. Mean maximum temperatures range from 19.6°C in winter to 28.4°C in summer, while mean minimum temperatures range from 10.3°C in winter to around 19.9°C in summer. Maximum temperatures above 40°C and minimum temperatures less than 5°C have been recorded.

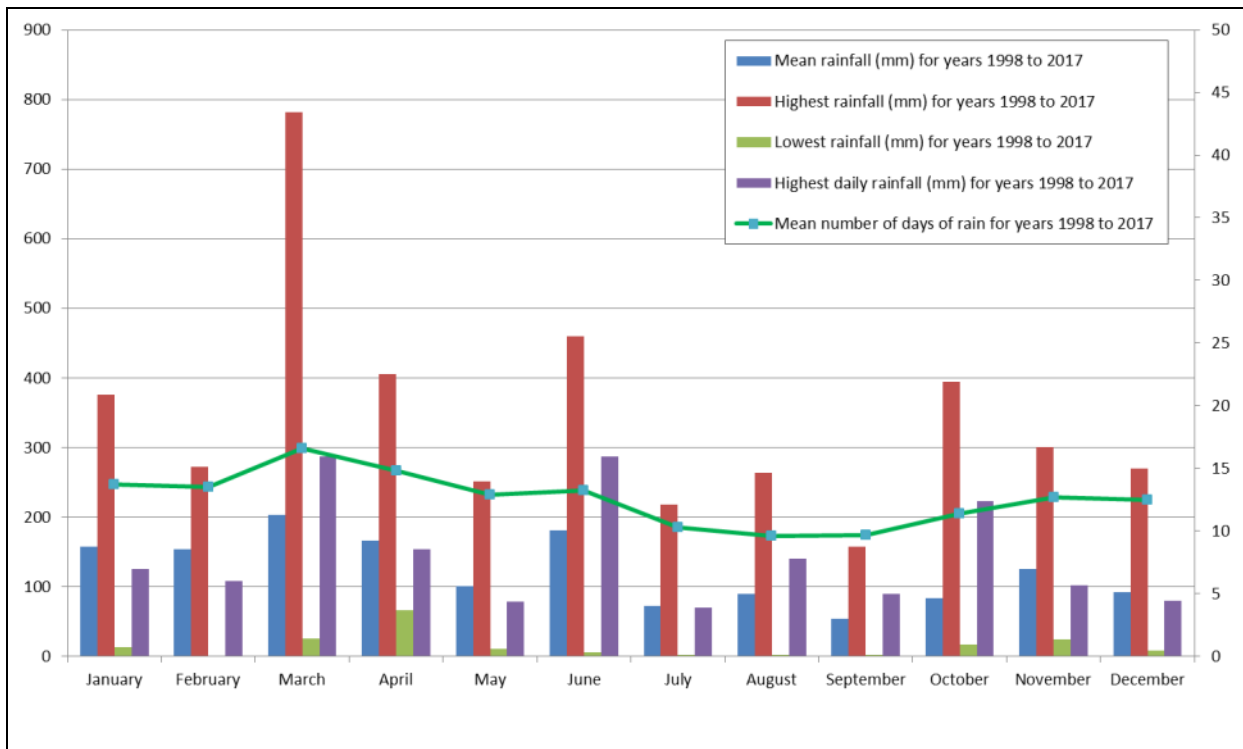
Figure 5 Long term temperature data for Evans Head RAAF Bombing Range



5.2 Rainfall

Long-term rainfall statistics for Evans Head RAAF Bombing Range are summarised in **Figure 6**. The average monthly rainfall is relatively high in summer and autumn, reducing from mid-winter to spring with the lowest average of 53.6 mm/month recorded during September. August and September recorded an average of less than ten days of rain days per month. The highest average monthly rainfall of 202.8 mm/month occurs in March, with an average of 16.6 rain days recorded in this month. The highest monthly rainfall recorded over the time period examined was 781.2 mm recorded in March 2017.

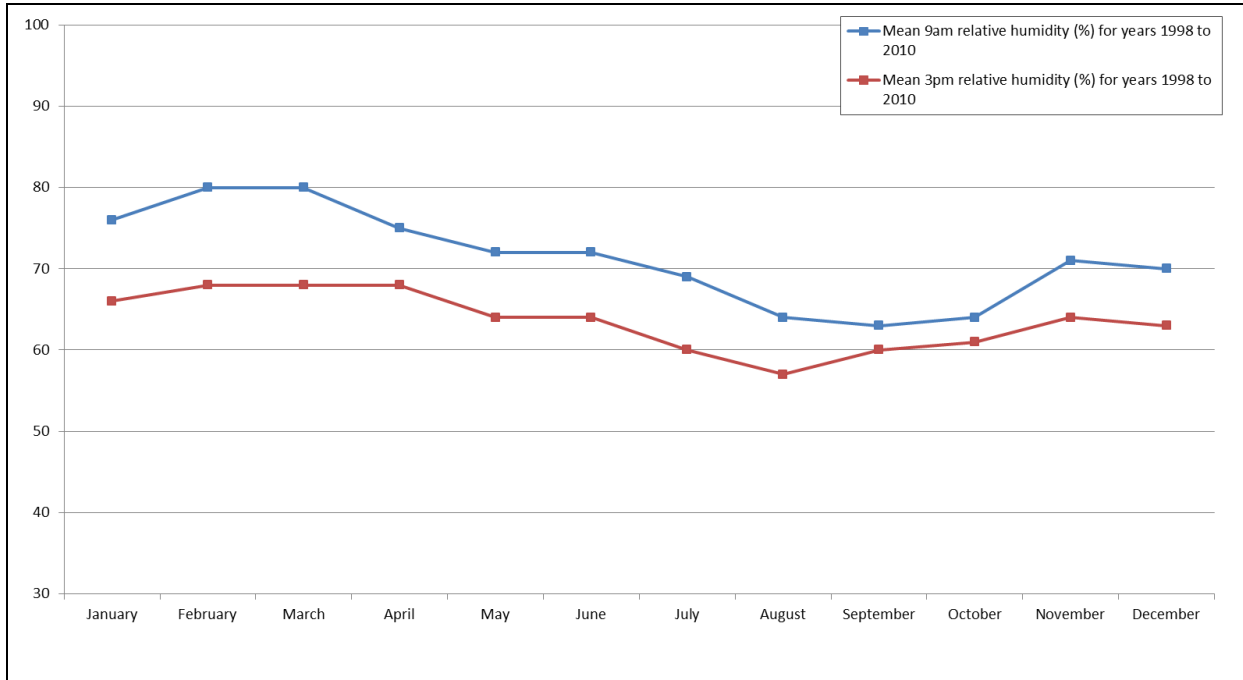
Figure 6 Long term monthly rainfall data for Evans Head RAAF Bombing Range



5.3 Relative humidity

Long-term humidity statistics (9 am and 3 pm monthly averages) for Evans Head RAAF Bombing Range are summarised in **Figure 7**. Morning humidity levels range from an average of around 80% in early winter to around 59% in mid-spring. Afternoon humidity levels are lower, at around 49% in summer and dropping to a low of 37% in mid of spring.

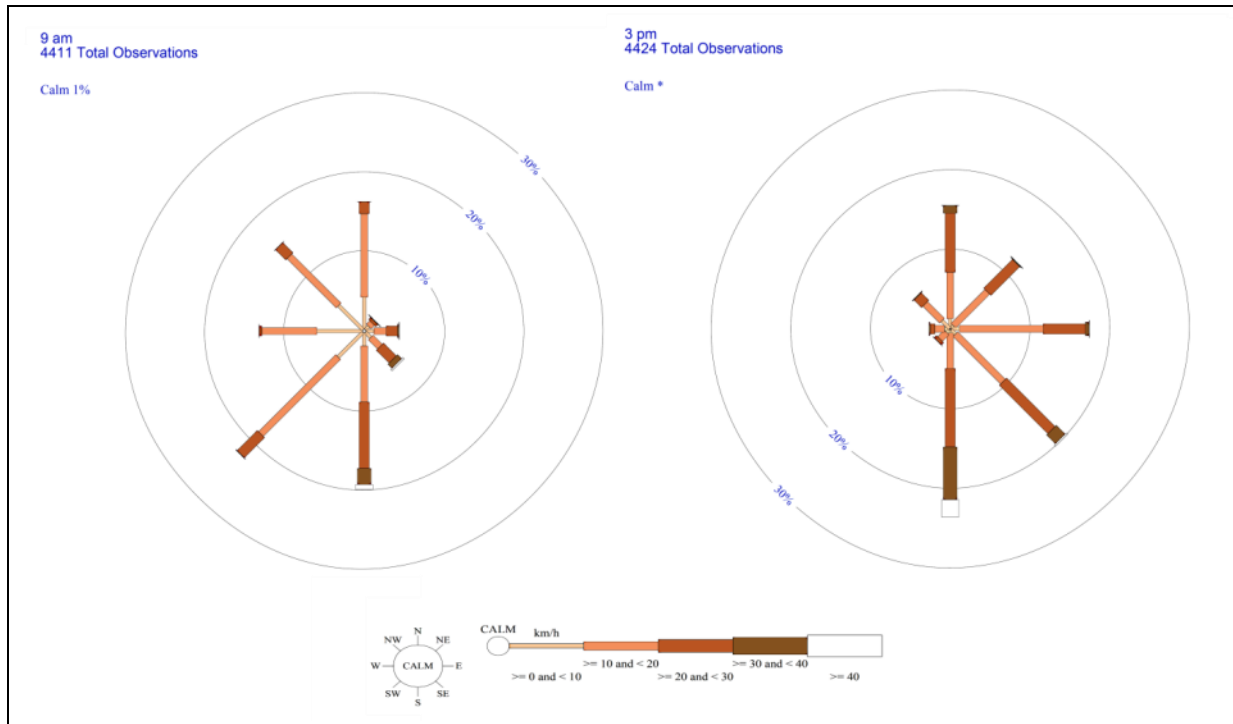
Figure 7 Long term humidity data for Evans Head RAAF Bombing Range



5.4 Wind speed and direction

Long term wind data (9 am and 3 pm) for Evans Head RAAF Bombing Range are presented as wind roses in **Figure 8**. The wind roses show a strong diurnal pattern, with winds from the northwest and southwest quadrants dominating during the morning and winds from the northeast and southeast quadrants dominating in the afternoon. Winds are also stronger in the afternoon than during the morning.

Figure 8 Rose of wind direction vs wind speed (km/hr) at Evans Head RAAF Bombing Range (1998 - 2010)



Note: An asterisk (*) indicates that the frequency of calms is less than 0.5%.

5.5 Selection of representative year for meteorological modelling

To identify an appropriate calendar year for use in the dispersion modelling study, observed wind, temperature and relative humidity data from Evans Head RAAF Bombing Range for five calendar years (2012 - 2016) were analysed and compared against the long term average wind data. Based on this long term meteorological data analysis, the 2016 calendar year was identified as a suitable representative year for use in this study.

6 EXISTING AIR QUALITY

The main focus of this report is the assessment of the potential impacts of the project site on the closest sensitive receptors, which include thirty six residences as identified in **Section 3.1**. The purpose of assessing background air quality is to determine the concentrations of air pollutants currently experienced at these residences, with the predicted concentrations from the modification added to these background concentrations to identify the likely future cumulative air quality impacts. It is therefore important to gain an understanding of the current background air quality at these residential locations.

6.1 Existing sources of air emissions in the region

The air quality in the region surrounding the project site will be influenced by emissions generated by a range of sources, originating from both within and outside the local area. Specifically, air quality will be influenced by traffic-generated pollution, wind generated dust emissions from exposed areas, dust and diesel emissions from agricultural activities, pollution transported into the area from more distant sources and pollution generated by the existing Moonimba Borrow Site itself. More remote and episodic sources including dust storms, bush fires and sea spray may also contribute to particulate levels in the region.

A desktop review of industrial sites in the area regulated by the NSW EPA and those that are required to report under the provisions of *Protection of the Environment (General) Regulation 2009* and with information stored in the National Pollutant Inventory (NPI) was carried out. Only three industrial sources of dust emissions which may potentially cause direct cumulative impacts with emissions from the project site were identified within a 20 km radius of the project site. These are:

- Coraki Quarry, 18 Petersons Quarry Rd, Coraki, NSW 2471
- Cape Byron Power Broadwater, 117 Pacific Highway, Broadwater, NSW 2472
- Broadwater Sugar Mill, 117 Pacific Highway, Broadwater, NSW 2472

To appropriately assess the *cumulative* impact of the proposed intensification of extraction at the project site, the incremental impact from the proposed operation needs to be added to a dataset which includes the influences of all other sources of particulate in the region, including those listed above, and is representative of the air quality likely to be experienced at sensitive receptor locations without the impact of the proposed operation.

6.2 Review of air quality monitoring data

There is limited information on existing air quality in the region surrounding the project site. No publicly available air quality monitoring data is available for the region surrounding the project site and no air quality monitoring has been carried out at the project site.

During the Environmental Assessment stage of the Pacific Highway upgrade between Sapphire and Woolgoolga, RMS monitored air quality at a site adjacent to the Pacific Highway at Korora between Korora Public School and the Korora Rural Fire Brigade, north of Coffs Harbour. According to the *Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement* (RMS, 2012), this location is one of the most trafficked sections of the highway.

Monitoring was undertaken for a range of air quality parameters including PM₁₀ and PM_{2.5} from October 2005 to January 2006, which covers the holiday period when traffic emissions are likely to be higher than typical levels in the area. The results of this monitoring were published in Working Paper 8 of the *Environmental Assessment for the Sapphire to Woolgoolga Pacific Highway Upgrade* (RTA, 2007) and have been referenced in this assessment. Working Paper 8 states that:

“Due to the proximity of the monitoring site to the Pacific Highway, the concentrations of air quality parameters measured include traffic emissions. Therefore, the concentrations detected are likely to be higher than the background levels for the local area and will give a conservative indication of the air quality experienced on the NSW north coast.”

Considering the lack of any significant source of emissions in the surrounding area of the project site and the conditions under which the Korora monitoring was conducted, the adoption of the Korora monitoring dataset will provide a conservative estimate of the background air quality likely to be found in the area surrounding the project site.

As part of the W2B project, dust deposition monitoring has also been performed at several locations along this section of the Pacific Highway since July 2016. The dust deposition monitoring network for this section of the highway currently consists of a total of 17 dust deposition gauges, eight of which are located within a 20 km radius of the project site. **Figure 9** illustrates the location of these eight dust deposition gauges which have been reviewed for the purpose of this assessment.

6.2.1 Suspended particulate matter

Table 6 presents a summary of the 24-hour PM_{10} and $PM_{2.5}$ concentrations recorded at Korora over the period October 2005 to January 2006.

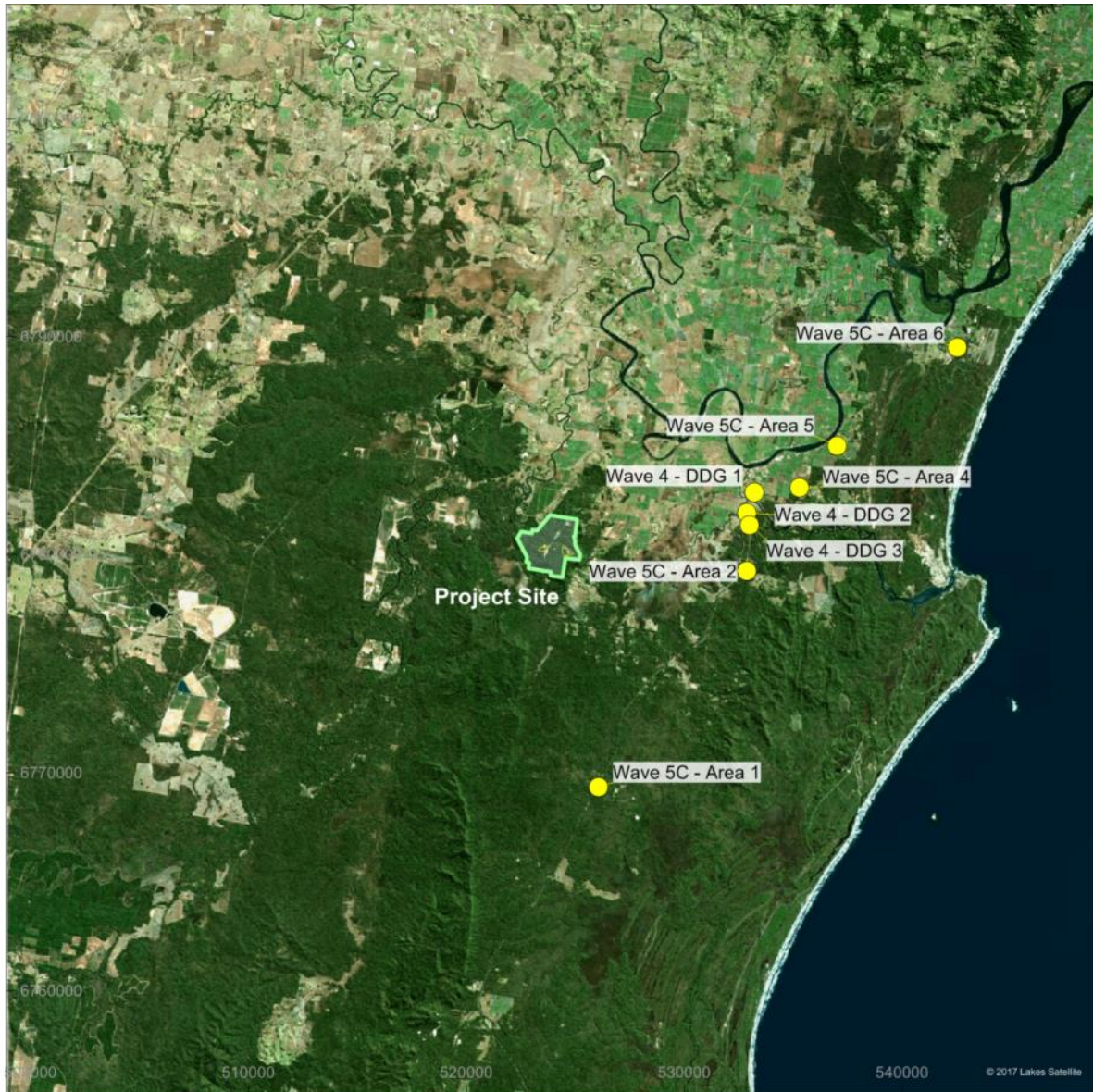
Table 6 Korora Monitoring Dataset Summary – October 2005 to January 2006

	Unit	PM_{10}	$PM_{2.5}$
Number of Measurements		98	80
Minimum	$\mu\text{g}/\text{m}^3$	2.0	4.0
Maximum	$\mu\text{g}/\text{m}^3$	37.0	15.0
Average	$\mu\text{g}/\text{m}^3$	17.8	7.9

For the purpose of this AQIA, the maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations recorded at the Korora RTA site have been adopted as background levels to assess cumulative 24-hour average PM_{10} and $PM_{2.5}$ concentrations at each sensitive receptor. The average PM_{10} and $PM_{2.5}$ concentrations have been used to assess cumulative annual average concentrations at each sensitive receptor location.

TSP concentrations were not monitored at the Korora monitoring site. For the purpose of this assessment, the estimated TSP levels presented in the 2014 AQIA have been adopted as the background annual average TSP concentration. The 2014 AQIA used a baseline annual average TSP concentration of $43 \mu\text{g}/\text{m}^3$, derived from the average PM_{10} concentration recorded at Korora ($17 \mu\text{g}/\text{m}^3$) and an assumed PM_{10}/TSP ratio of 40%.

Figure 9 W2B dust monitoring locations



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Dust Deposition Gauges

6.2.2 Background dust deposition

A summary of the dust deposition rates recorded by the W2B deposition monitoring program from July 2016 to April 2017 is presented in **Table 7**.

Table 7 W2B dust deposition monitoring data (2016-2017)

Monitoring Location	Measured Dust Deposition Rate (g/m ² /month)										Average Recorded Deposition Rate (g/m ² /month)
	2016					2017					
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
Wave 5C - Area 1	1.4	1.4	1.1	3.5	6.7	2.1	1.9	1.2	0.2	5.6	2.5
Wave 5C - Area 2	0.8	0.8	1.7	0.5	--	0.7	0.4	0.6	2.0	0.3	0.9
Wave 5C - Area 4	2.6	2.6	2.4	0.9	1.2	1.6	2.6	2.0	6.4	12.9	3.5
Wave 5C - Area 5	2.4	2.4	0.9	1.6	1.8	2.6	2.3	1.7	1.3	1.6	1.9
Wave 5C - Area 6	0.6	0.6	0.2	0.4	1.0	0.1	0.6	0.8	1.0	0.4	0.6
Wave 4 - DDG 1	0.9	2.1	1.6	1.1	1.5	2.5	1.2	3.4	1.0	1.0	1.6
Wave 4 - DDG 2	0.8	1.3	1.1	0.9	2.1	4.9	1.6	3.7	0.8	1.1	1.8
Wave 4 - DDG 3	1.9	1.9	2.3	1.1	1.6	0.8	1.0	1.6	1.1	0.9	1.4

Note: An unrealistically high dust deposition rate of 135.8 g/m²/month was recorded at Wave 5C - Area 2 for November 2016. It is most likely that this isolated high recording was due to sample contamination and has therefore not been included.

The average deposition rate recorded across the eight selected monitoring sites was 1.8 g/m²/month. Based on this, the background level of dust deposition for the area surrounding the project site is conservatively taken as 2.0 g/m²/month.

6.3 Adopted background levels

The adopted background levels assumed for each pollutant are presented in **Table 8**.

Table 8 Adopted background particulate levels

Air Quality Indicator	Value	Averaging Period
Deposited dust	2.0 g/m ² /month	Annual
TSP	43 µg/m ³	Annual
PM ₁₀	37 µg/m ³	24-hours
	17 µg/m ³	1-year
PM _{2.5}	15 µg/m ³	24-hours
	7.0 µg/m ³	1-year

7 EMISSION ESTIMATION

7.1 Emission scenarios

In order to assess the potential variation in emissions over the two years of extraction at the project site, two emission inventories were compiled (namely year 1 and year 2). Emissions from each scenario were estimated and dispersion modelling was carried out for year 2, which was shown to be the year with the highest overall emissions.

7.2 Overview of emission estimation methodology

Particulate emissions for each operational scenario (year 1 and year 2) were estimated for various particle size fractions based on the relevant emission factors sourced from National Pollutant Inventory (NPI) *Emission Estimation Technique Manual for Mining* (hereafter, "EETMM"), and the USEPA's AP-42 Emission Factor Handbook. The estimated TSP emission rates were used to provide an indication of dust deposition rates.

Meteorological data, particularly wind speed is a critical parameter used in the emission estimation calculations (specifically, for the estimation of emissions from wind erosion and material handling). For the estimation of these emissions, the 2016 meteorological data extracted from CALMET were used.

As noted in **Section 4.1**, on the basis of low emissions intensity, emissions of pollutants associated with the combustion of diesel fuel including NO_x, SO₂, CO and VOCs have not been assessed in this study.

7.3 Sources of operational emissions

Sources of particulate emissions associated with the project site include:

- Topsoil and overburden removal;
- Raw material extraction activities, including excavating, drilling and blasting;
- Vehicle entrainment of particulate matter during the haulage of material along the sealed and unsealed roads;
- Unloading of material to processing plants;
- Crushing and screening of extracted material at screening plants;
- Process plant operations including loading of product to stockpiles and stockpile management;
- Loading of products to delivery trucks;
- Unloading of imported fill to emplacement areas; and
- Wind erosion associated with material stockpiles, active pits and imported fill emplacement areas.

7.4 Emission factors

Potential particulate emissions from the current and proposed operations have been estimated based on the emission factors presented in the EETMM, Version 3.1 (Environment Australia, 2012). In some instances, the moisture content of materials at the project site is not adequately reflected within the default emission factors contained in the EETMM or the equations given in Table 1 of the EETMM document. USEPA AP-42 documentation was therefore used to derive representative emission factors in these instances. For wheel generated particulate emissions from haulage on unpaved roads, Australian-specific emission factors for PM₁₀, developed by Australian Coal Association Research Program (ACARP, 2015) were used. The PM₁₀ emissions were scaled using USEPA AP-42 data in order to estimate TSP and PM_{2.5} emissions. Details of the emission factor/equations used in estimating the potential emissions are presented in **Table 9**.

Table 9 Emission factor equations

Activity	Emission Factor Equation	Units	Source	Variables	Controls Applied*
Bulldozer	$EF = k \times \frac{s^{1.2}}{M^{1.3}}$	kg/h	NPI EETM v3.1 and USEPA AP42 Bulldozing on overburden	k = 2.6 (TSP) k = 2.6 × 0.75 (PM ₁₀) k = 2.6 × 0.105 (PM ₁₀) U = mean wind speed (m/s) M = Moisture content (%)	No Controls
Unpaved haul route wheel dust	$EF_{TSP} = 3.6 \times EF_{PM10}$ $EF_{PM10} = 0.26$ $EF_{PM2.5} = 0.10 \times EF_{PM10}$	kg/vehicle kilometres travelled (VKT)	ACARP 2015 and USEPA AP42 - Wheel Generated Dust from Unpaved Roads (2003)		Level 2 watering (>2 l/m ² /hr) - (75%)
Wheel generated dust from paved roads	$EF = k \times sL^{0.91} \times W^{1.02}$	kg/VKT	US EPA AP42 Section 13.2.1	k = 3.23 (TSP) k = 0.62 (PM ₁₀) k = 0.15 (PM _{2.5}) sL = silt loading (g/m ²) W = average weight of the vehicles traveling the road (tonnes)	No Controls
Loading and unloading from stockpiles and processing plants,	$EF = \frac{k \times 0.0016 \times \frac{U^{1.3}}{2.2}}{\frac{M^{1.4}}{2}}$	kg/t	NPI EETM v3.1	k = 0.74 (TSP) k = 0.35 (PM ₁₀) k = 0.053 (PM _{2.5}) U = average wind speed (m/s) M = Moisture content (%)	No Controls
Crushing	$EF_{TSP} = 0.0027$ $EF_{PM10} = 0.0012$ $EF_{PM2.5} = 0.047 \times EF_{TSP}$	kg/t	USEPA AP-42 11.19.2 – Tertiary Crushing Factor		Water Sprays (50%)
Screening	$EF_{TSP} = 0.0125$ $EF_{PM10} = 0.0043$ $EF_{PM2.5} = 0.047 \times EF_{TSP}$	kg/t	USEPA AP42 11.19.2 - Screening Factor		No Controls
Wind erosion	$EF_{TSP} = 0.4$ $EF_{PM10} = 0.2$ $EF_{PM2.5} = 0.047 \times EF_{TSP}$	kg/ha/hr	NPI EETM v3.1		Water Sprays (50%)
Topsoil removal	$EF_{TSP} = 0.029$ $EF_{PM10} = 0.39 \times EF_{TSP}$ $EF_{PM2.5} = 0.047 \times EF_{TSP}$	kg/t	NPI EETM v3.1, USEPA AP42 Topsoil removal by scraper and SPCC(1986) data		No Controls

* Refer Section 7.6

7.5 Site parameters and activity rates

The site parameters and activity data used in the emission factor equations to estimate particulate emissions for the two years of operation are summarised in **Table 10**. Haulage distances for the two scenarios were calculated as outlined in **Table 11**.

Table 10 Parameters used for the estimation of particulate emissions from the project site

Description	Unit	Year 1	Year 2
Annual topsoil throughput	tonnes/annum	10,200	--
Annual overburden throughput – Eastern Pit	tonnes/annum	307,143	--
Annual overburden throughput – Western Pit	tonnes/annum	192,857	--
Annual sandstone throughput – Eastern Pit	tonnes/annum	307,143	614,286
Annual sandstone throughput – Western Pit	tonnes/annum	192,857	385,714
Annual fill import throughput	m ³ /annum	30,000	30,000
Operating days per year		312	312
Operating hours - Monday to Friday	hours	0700 - 1800	0700 - 1800
Operating hours - Saturday	hours	0700 - 1700	0700 - 1700
Moisture content - Overburden	%	5.0 ^a	N/A
Moisture content – Raw Material	%	4.0 ^a	4.0 ^a
Silt content - Overburden	%	7.1 ^a	7.1 ^a
Silt content – Raw Material	%	10.0 ^b	10.0 ^b
Sealed road silt loading	g/m ²	0.6 ^c	0.6 ^c
Dozers	hours/annum	1,000	300
Drilling (total) – Eastern Pit	holes/blast	100	100
Blasting (total) – Eastern Pit	blasts/annum	29	29
Drilling (total) – Western Pit	holes/ blast	100	100
Blasting (total) – Western Pit	blasts/annum	19	19
Annual crushing and screening throughput	tonnes/annum	500,000	1,000,000
On-site dump trucks - Unloaded weight	tonnes	47.0	--
On-site dump trucks - Loaded weight	tonnes	112.0	--
On-site dump trucks – Number of return trips		159	--
Off-site transportation - Average unloaded weight	tonnes	13.0	13.0
Off-site transportation - Average loaded weight	tonnes	45.0	45.0
Off-site transportation – Number of return trips		32,844	32,844

^a Assumed same as existing operations as presented in the 2014 AQIA

^b Conservative assumption

^c USEPA AP-42 Section 13.2.1, paved roads with average daily traffic of less than 500 vehicles per day

Table 11 Distances of haul routes

Haul Route	Return Distance (km)
Project site boundary to Western Pit	4.8
Project site boundary to Eastern Pit	4.2
Boggy Creek Road to project site boundary	3.2
Boggy Creek Road between quarry access road and Reardons Lane	3.6
Total	15.8

The areas of disturbance assumed for the two scenarios are presented in **Table 12**.

Table 12 Areas of active disturbance

Disturbance Area	Area (ha)	
	Year 1	Year 2
Eastern Pit	12.9	12.9
Western Pit	8.1	8.1
TOTAL	21.0	21.0

7.6 Emission controls

Emission controls have been applied to the sources as identified in **Table 9**. Specifically, emissions controls have been applied as follows, as per Table 4 of the EETMM (DSEWPC, 2012):

- Unpaved haul roads – 75% reduction in particulate emissions relating to Level 2 watering (>2 l/m²/hour):
 - Eastern Pit to site boundary;
 - Western Pit to site boundary; and
 - All movements within the active pits.
- Wind erosion from pit, product stockpiles and overburden emplacement areas – 50% reduction in particulate emissions relating to use of water sprays.
- Processing of raw materials in mobile crushers - 50% reduction in particulate emissions relating to use of water sprays.
- Removal of topsoil - 50% reduction in particulate emissions relating to naturally or artificially moist soil.

7.7 Estimated emissions

Based on the emission factors detailed in **Section 7.4**, parameters detailed in **Section 7.5** and control measures outlined in **Section 7.6**, a particulate emissions inventory has been compiled for the two operational scenarios. **Table 13** and **Figure 10** present a summary of the total estimated TSP, PM₁₀ and PM_{2.5} emission rates for the two scenarios. Full details of the emission inventory are provided in **Appendix B**.

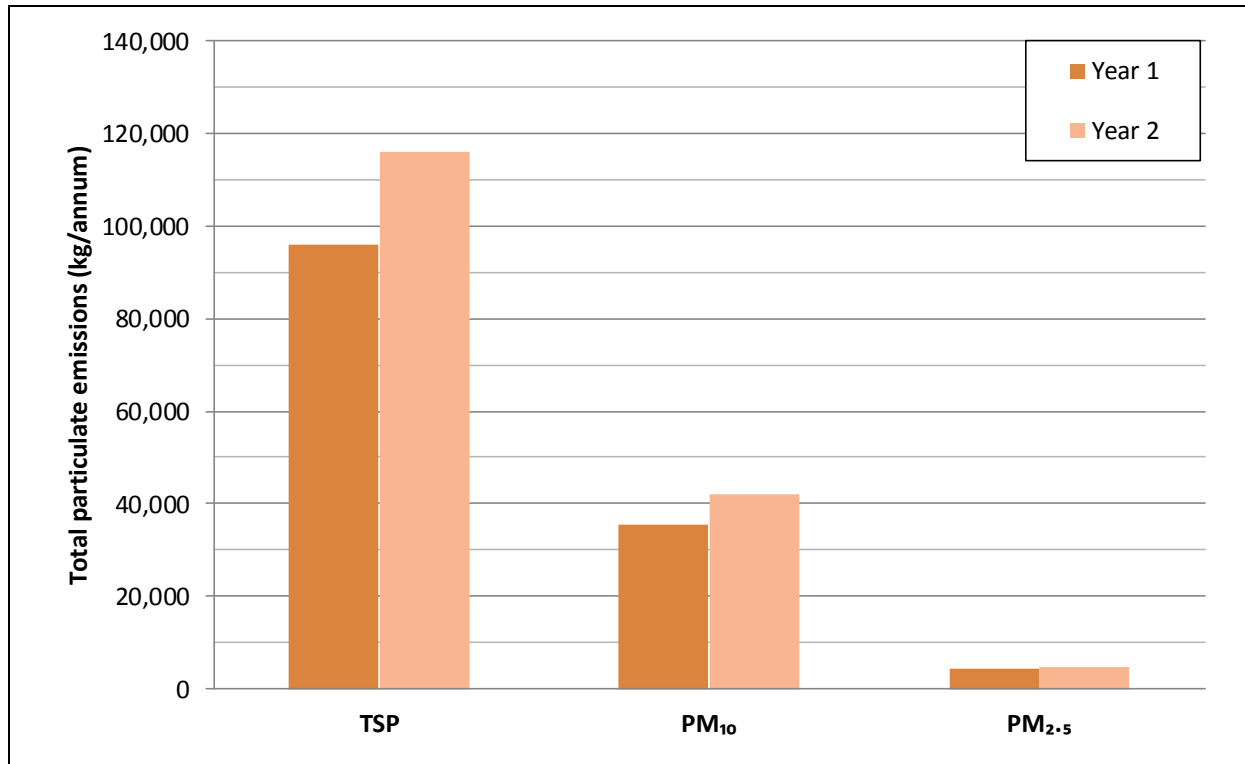
Year 2 was determined to have the worst case overall annual emissions and was therefore the year selected for the dispersion modelling. The most significant contribution to the estimated increase in emissions for the second year of operation at the project site is attributed to the higher levels of on-site crushing and screening. It is noted that for both years of operation, extraction and processing activities take place throughout the whole area of the two pits. Therefore, the estimated annual emissions calculated for each pit will be spread evenly across the pit. No sensitive receptor is therefore expected to be impacted more during the first year of operations due to changes in the source locations.

Table 13 Comparison of the estimated emission rates

Particulate Size Fraction	Unit	Year 1	Year 2	Difference ¹
TSP emission rate	kg/annum	95,988	116,225	21% increase
PM ₁₀ emission rate	kg/annum	35,518	41,925	18% increase
PM _{2.5} emission rate	kg/annum	4,275	4,734	11% increase

¹Difference between the year 1 and year 2 operations

Figure 10 Estimated annual TSP, PM₁₀ and PM_{2.5} emissions for year 1 and year 2



8 ATMOSPHERIC DISPERSION MODELLING METHODOLOGY

8.1 Model selection

Emissions from the project have been modelled using a combination of the TAPM, CALMET and CALPUFF models. CALPUFF is a transport and dispersion model that ejects “puffs” of material emitted from modelled sources, simulating dispersion and transformation processes along the way. In doing so it typically uses the fields generated by a meteorological pre-processor CALMET, discussed further below. Temporal and spatial variations in the meteorological fields selected are explicitly incorporated in the resulting distribution of puffs throughout a simulation period. The primary output files from CALPUFF contain either hourly concentration or hourly deposition fluxes evaluated at selected receptor locations. The CALPOST post-processor is then used to process these files, producing tabulations that summarise results of the simulation for user-selected averaging periods.

8.2 Meteorological modelling

8.2.1 Meteorological data availability

To adequately characterise the dispersion meteorology of the project site information is needed on the prevailing wind regime, atmospheric stability, mixing depth and other meteorological parameters. Hourly meteorological data from the following Automatic Weather Stations (AWSs) operated by BoM were used in the meteorological modelling study for the study area:

- Evans Head RAAF Bombing Range AWS (AWS Number 058212);
- Casino Airport AWS (AWS Number 058208);
- Lismore Airport AWS (AWS Number 058214);

The location of the AWSs listed above are summarised in **Table 14**.

Table 14 Meteorological monitoring station details

Station Name	Location (m, MGA)		Distance (km) / Direction From project site	Elevation (m, AHD)
	Easting	Northing		
Evans Head RAAF Bombing Range	538,541	6,771,674	16 km / SE	63
Casino Airport	506,026	6,805,042	30 km / NW	21
Lismore Airport	525,374	6,810,765	30 km / N	9

8.2.2 TAPM

The TAPM prognostic model, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) was used to generate the upper air data required for CALMET modelling.

TAPM predicts wind speed and direction, temperature, pressure, water vapour, cloud, rain water and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate one full year of hourly meteorological observations at user-defined levels within the atmosphere.

Additionally, the TAPM model may assimilate actual local wind observations so that they can optionally be included in a model solution. The wind speed and direction observations are used to realign the predicted solution towards the observation values. In this study, data from the BoM’s Evans Head RAAF Bombing Range, Casino Airport and Lismore Airport AWSs have been used to nudge (i.e. influence) the TAPM predictions. **Table 15** details the parameters used in the TAPM meteorological modelling for this assessment.

Table 15 Meteorological parameters used for this study - TAPM

TAPM (v 4.0)	
Number of grids (spacing)	4 (30 km, 10 km, 3 km and 1 km)
Number of grid points	35 x 35 x 35
Year of analysis	2016
Centre of analysis	525,967 m E 6,789,215 S
Data assimilation	Evans Head RAAF Bombing Range, Casino Airport and Lismore Airport

8.2.3 CALMET

In the simplest terms, CALMET is a meteorological model that develops hourly wind and other meteorological fields on a three-dimensional gridded modelling domain that are required as inputs to the CALPUFF dispersion model. Associated two dimensional fields such as mixing height, surface characteristics and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, sea breeze, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field. The final hourly varying wind field thus reflects the influences of local topography and land uses.

CALMET modelling was conducted using the nested CALMET approach, where the final results from a coarse-grid run were used as the initial guess of a fine-grid run. This has the advantage that off-domain terrain features including slope flows, blocking effect can be allowed to take effect and the larger-scale wind flow provides a better start in the fine-grid run.

The outer domain was modelled with a resolution of 0.9 km. The TAPM-generated 3-dimensional meteorological data was used as the initial guess wind field and the local topography and available surface weather observations in the area were used to refine the wind field predetermined by TAPM. Hourly surface meteorological data from BOM stations located at Evans Head RAAF Bombing Range, Casino Airport and Lismore Airport were incorporated in the outer domain modelling.

The output from the outer domain CALMET modelling was then used as the initial guess field for the mid and inner domain CALMET modelling. Horizontal grid spacing of 0.3 km and 0.1 km were used in the mid and inner domain respectively to adequately represent the important local terrain features and land use. The finer scale local topography and land use data were used in the inner domain run to refine the wind field parameters given by the coarse CALMET runs. **Table 16** details the parameters used in the meteorological modelling to drive the CALMET model.

Table 16 Meteorological parameters used for this study – CALMET (v 6.1)

Outer Domain	
Meteorological grid	45 km × 45 km
Meteorological grid resolution	0.9 km
Surface station data	Evans Head RAAF Bombing Range, Casino Airport and Lismore Airport
Initial guess field	3D output from TAPM modelling
Mid Domain	
Meteorological grid	15 km × 15 km
Meteorological grid resolution	0.3 km
Initial guess field	3D output from outer domain modelling
Inner Domain	
Meteorological grid	10 km × 10 km
Meteorological grid resolution	0.1 km
Initial guess field	3D output from mid domain modelling

8.3 Meteorological data used in modelling

8.3.1 Wind speed and direction

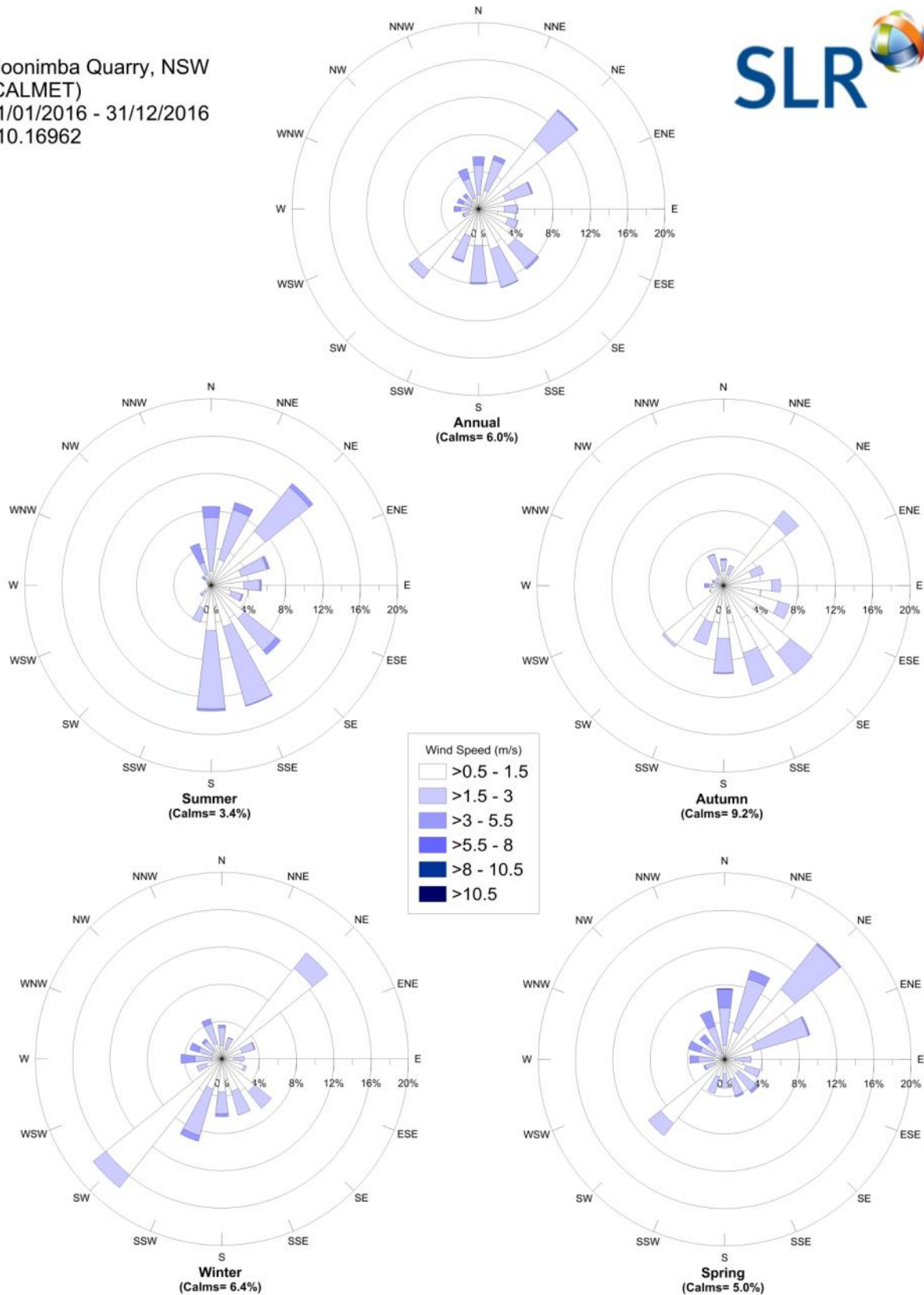
A summary of the annual wind behaviour predicted by CALMET for the site is presented in **Figure 11**, **which** indicates that in 2016 the site experienced predominantly light to moderate winds (between 1.5 m/s and 8 m/s). Calm wind conditions (wind speed less than 0.5 m/s) were predicted to occur 6% of the time during 2016.

The seasonal wind roses indicate that:

- In summer, the winds are light to moderate (1.5 to 8 m/s) predominantly from the south and south-southeast (occurring about 25% of the time in total) and from the northeast (approximately 15% of the time).
- In autumn, the winds are light (1.5 to 3 m/s) predominantly from the south to south-southeast (approximately 30% of the time).
- In winter, winds are light (1.5 to 3 m/s) predominantly from the northeast (approximately 15% of the time) and southwest (approximately 18% of the time).
- In spring, winds are light to moderate (1.5 to 8 m/s) predominantly from the north-northeast to east-northeast (approximately 35% of the time).

Figure 11 CALMET predicted seasonal wind roses for the project site – 2016

Moonimba Quarry, NSW
 (CALMET)
 01/01/2016 - 31/12/2016
 610.16962



8.3.2 Atmospheric stability

Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion. The Pasquill-Turner assignment scheme identifies six Stability Classes, A to F, to categorise the degree of atmospheric stability as follows:

- A = Extremely unstable conditions
- B = Moderately unstable conditions
- C = Slightly unstable conditions
- D = Neutral conditions
- E = Slightly stable conditions
- F = Moderately stable conditions

The meteorological conditions defining each Pasquill stability class are shown in **Table 17**.

Table 17 Meteorological conditions defining Pasquill stability classes

Surface wind speed (m/s)	Daytime insolation			Night-time conditions	
	Strong	Moderate	Slight	Thin overcast or > 4/8 low cloud	<= 4/8 cloudiness
< 2	A	A - B	B	E	F
2 - 3	A - B	B	C	E	F
3 - 5	B	B - C	C	D	E
5 - 6	C	C - D	D	D	D
> 6	C	D	D	D	D

Source: (Pasquill, 1961)

Notes:

1. Strong insolation corresponds to sunny midday in midsummer in England; slight insolation to similar conditions in midwinter.
2. Night refers to the period from 1 hour before sunset to 1 hour after sunrise.
3. The neutral category D should also be used, regardless of wind speed, for overcast conditions during day or night and for any sky conditions during the hour preceding or following night as defined above.

The frequency of each stability class at the project site during the modelled year (2016) as predicted by CALMET is shown in **Figure 12**. The results indicate a high frequency of conditions typical to Stability Class "F". Stability Class "F" is indicative of moderately stable conditions, conducive to a low level of pollutant dispersion due to limited mechanical mixing.

8.3.3 Mixing height

Diurnal variations in maximum and average mixing depths predicted by CALMET at the project site during 2016 are illustrated in **Figure 13**. It can be seen that an increase in the mixing depth during the morning is apparent, arising due to the onset of vertical mixing following sunrise. The maximum average mixing heights occur in the early to mid-afternoon, due to the dissipation of ground-based temperature inversions and the growth of the convective mixing layer.

Figure 12 CALMET predicted annual stability class distributions for the project site during 2016

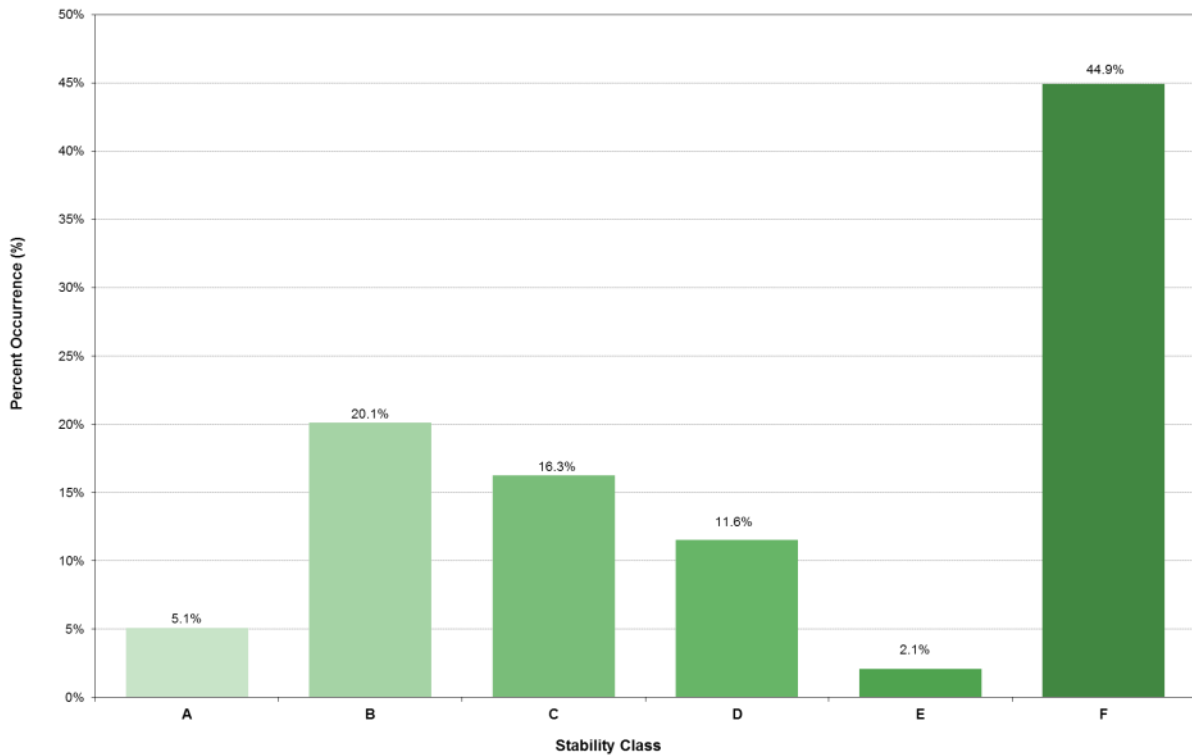
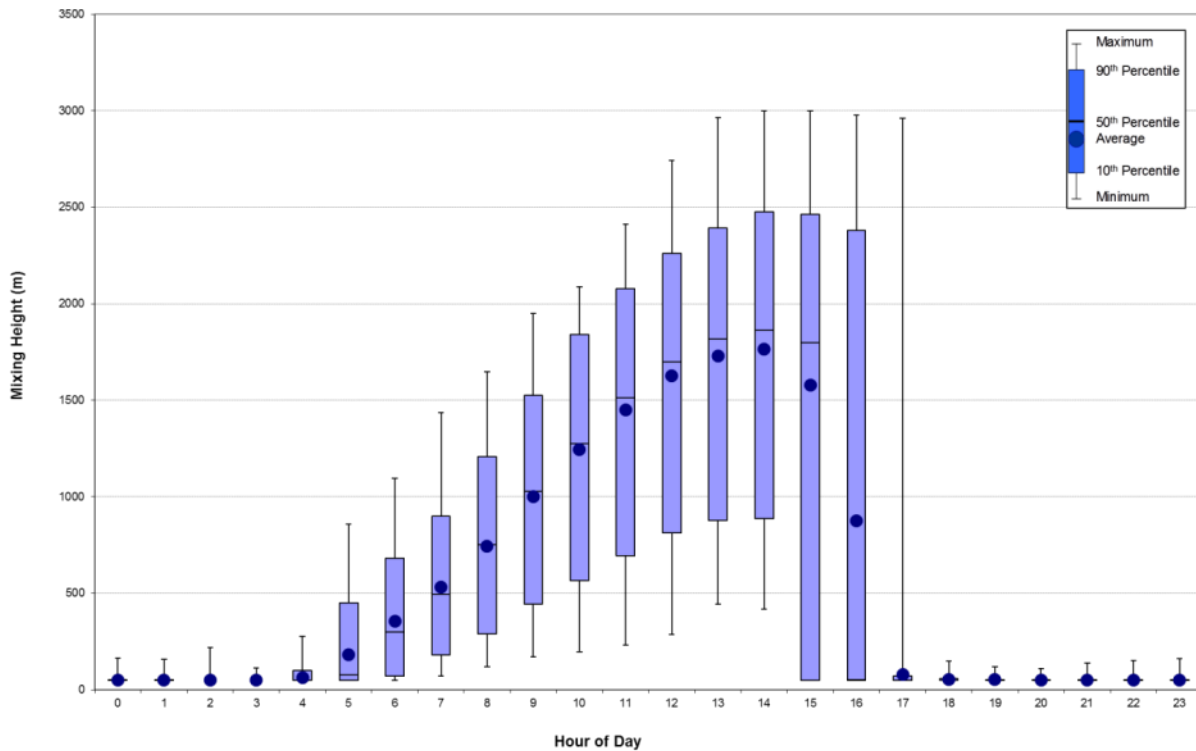


Figure 13 CALMET predicted diurnal variation in mixing depth for the project site during 2016



8.4 Dispersion model configuration

As discussed in **Section 8.1**, dispersion modelling was conducted using the CALPUFF dispersion model and three-dimensional meteorological data output from CALMET.

Emissions from the activities at the project site were represented by a series of volume sources, while wind erosion from exposed areas were represented by area sources.

The estimated particulate emissions were modelled as:

- Fine Particulates (FP < 2.5 µm),
- Course Matter (2.5 µm < CM < 10 µm) and
- the Rest (RE > 10 µm),

and then grouped using CALPOST to predict PM_{2.5}, PM₁₀ and TSP concentrations at surrounding receptor locations. This approach provides the most realistic treatment of the differing size fractions, with the lighter, finer particulate matter being dispersed further than the heavier size fraction which settles out of the air more rapidly.

Based on the sensitivity of each activity to wind speed, an hourly varying emission file representing hourly FP, CM and RE emissions for each source was generated using the annual average emission rate estimated for each activity. Details of the algorithm used to generate the variable emission files are presented in **Appendix A**.

9 DISPERSION MODELLING RESULTS

The sections below present a summary of the air quality impacts predicted by the modelling at the sensitive receptors identified in **Section 3.1**. Dispersion modelling was performed for the year 2 operations at the project site, which is representative of the worst case impacts associated with the proposed future operations at the Moonimba Borrow Site.

The incremental and cumulative 24-hour and annual average $PM_{2.5}$ and PM_{10} concentrations predicted at surrounding sensitive receptors for year 2 operations are presented **Table 18** and **Table 19**. The predicted incremental and cumulative annual average TSP concentrations and maximum monthly dust deposition rates are presented in **Table 20**. The estimated background concentrations outlined in **Section 6.3** have been used to calculate the cumulative impacts at each sensitive receptor.

The modelling results presented in **Table 18**, **Table 19** and **Table 20** show that the cumulative $PM_{2.5}$, PM_{10} and TSP concentrations and dust deposition rates predicted at each surrounding sensitive receptor comply with the relevant ambient air quality criteria outlined in **Section 4.4**.

Contour plots showing the incremental impact predicted due to the project site's emissions (ie. excluding background levels) for each pollutant are presented in **Appendix C**. These plots do not represent the dispersion pattern for any individual time period, but rather illustrate the maximum concentration that was predicted to occur at each model calculation point given the range of meteorological conditions occurring over the 2016 modelling period.

Table 18 Predicted PM_{2.5} concentrations – year 2 operations (worst case)

Receptor ID	Incremental PM _{2.5} Concentrations (µg/m ³)		Cumulative PM _{2.5} Concentrations ¹ (µg/m ³)	
	24-Hour Average	Annual Average	24-Hour Average	Annual Average
R01	0.10	0.01	15.1	7.0
R02	0.50	0.11	15.5	7.1
R03	0.40	0.07	15.4	7.1
R04	0.10	0.02	15.1	7.0
R05	0.10	0.04	15.1	7.0
R06	0.10	0.02	15.1	7.0
R07	0.10	0.01	15.1	7.0
R08	0.10	0.01	15.1	7.0
R09	0.10	0.01	15.1	7.0
R10	0.10	0.02	15.1	7.0
R11	0.10	0.01	15.1	7.0
R12	0.10	0.01	15.1	7.0
R13	0.10	0.01	15.1	7.0
R14	0.30	0.03	15.3	7.0
R15	0.10	0.02	15.1	7.0
R16	0.20	0.02	15.2	7.0
R17	0.50	0.03	15.5	7.0
R18	0.80	0.04	15.8	7.0
R19	0.20	0.02	15.2	7.0
R20	0.50	0.06	15.5	7.1
R21	0.50	0.05	15.5	7.0
R22	0.30	0.04	15.3	7.0
R23	0.50	0.08	15.5	7.1
R24	0.20	0.02	15.2	7.0
R25	0.30	0.03	15.3	7.0
R26	0.20	0.02	15.2	7.0
R27	0.20	0.02	15.2	7.0
R28	0.20	0.02	15.2	7.0
R29	0.10	0.02	15.1	7.0
R30	0.10	0.02	15.1	7.0
R31	0.20	0.03	15.2	7.0
R32	0.20	0.04	15.2	7.0
R33	0.20	0.05	15.2	7.0
R34	0.50	0.14	15.5	7.1
R35	0.30	0.05	15.3	7.0
R36	1.20	0.24	16.2	7.2
Criteria			25.0	8.0

¹ Includes assumed constant background values of 15.0 µg/m³ (24-hour average) and 7.0 µg/m³ (annual average).

Table 19 Predicted PM₁₀ concentrations – year 2 operations (worst case)

Receptor ID	Incremental PM ₁₀ Concentrations (µg/m ³)		Cumulative PM ₁₀ Concentrations ¹ (µg/m ³)	
	24-Hour Average	Annual Average	24-Hour Average	Annual Average
R01	0.7	0.1	37.7	17.1
R02	1.9	0.5	38.9	17.5
R03	1.8	0.3	38.8	17.3
R04	0.6	0.1	37.6	17.1
R05	0.6	0.2	37.6	17.2
R06	0.5	0.1	37.5	17.1
R07	0.5	0.1	37.5	17.1
R08	0.5	0.1	37.5	17.1
R09	0.5	0.1	37.5	17.1
R10	0.6	0.1	37.6	17.1
R11	0.7	0.1	37.7	17.1
R12	0.7	0.1	37.7	17.1
R13	0.7	0.1	37.7	17.1
R14	3.0	0.2	40.0	17.2
R15	0.9	0.1	37.9	17.1
R16	2.3	0.2	39.3	17.2
R17	5.5	0.3	42.5	17.3
R18	7.9	0.4	44.9	17.4
R19	2.5	0.2	39.5	17.2
R20	5.2	0.5	42.2	17.5
R21	5.0	0.4	42.0	17.4
R22	2.8	0.4	39.8	17.4
R23	4.8	0.7	41.8	17.7
R24	2.3	0.2	39.3	17.2
R25	2.8	0.3	39.8	17.3
R26	2.0	0.2	39.0	17.2
R27	1.5	0.2	38.5	17.2
R28	1.5	0.2	38.5	17.2
R29	1.4	0.2	38.4	17.2
R30	1.2	0.2	38.2	17.2
R31	1.6	0.2	38.6	17.2
R32	2.1	0.4	39.1	17.4
R33	1.7	0.3	38.7	17.3
R34	2.0	0.6	39.0	17.6
R35	1.8	0.2	38.8	17.2
R36	11.5	2.3	48.5	19.3
Criteria			50.0	25.0

¹ Includes assumed constant background values of 37.0 µg/m³ (24-hour average) and 17.0 µg/m³ (annual average).

Table 20 Predicted TSP concentrations and dust deposition rates – year 2 operations (worst case)

Receptor ID	Annual Average TSP Concentrations ($\mu\text{g}/\text{m}^3$)		Maximum Monthly Dust Deposition Rates ($\text{g}/\text{m}^2/\text{month}$)	
	Increment	Cumulative	Increment	Cumulative
R01	0.2	43.2	0.01	2.0
R02	2.1	45.1	0.09	2.1
R03	1.3	44.3	0.06	2.1
R04	0.4	43.4	0.02	2.0
R05	0.6	43.6	0.03	2.0
R06	0.4	43.4	0.02	2.0
R07	0.2	43.2	0.01	2.0
R08	0.2	43.2	0.01	2.0
R09	0.2	43.2	0.01	2.0
R10	0.3	43.3	0.01	2.0
R11	0.2	43.2	0.01	2.0
R12	0.2	43.2	0.01	2.0
R13	0.2	43.2	0.01	2.0
R14	0.6	43.6	0.01	2.0
R15	0.3	43.3	0.01	2.0
R16	0.4	43.4	0.01	2.0
R17	0.6	43.6	0.02	2.0
R18	0.8	43.8	0.02	2.0
R19	0.4	43.4	0.01	2.0
R20	1.2	44.2	0.03	2.0
R21	0.9	43.9	0.03	2.0
R22	0.8	43.8	0.02	2.0
R23	1.5	44.5	0.03	2.0
R24	0.5	43.5	0.01	2.0
R25	0.7	43.7	0.02	2.0
R26	0.4	43.4	0.01	2.0
R27	0.4	43.4	0.01	2.0
R28	0.5	43.5	0.01	2.0
R29	0.5	43.5	0.01	2.0
R30	0.4	43.4	0.01	2.0
R31	0.5	43.5	0.02	2.0
R32	1.0	44.0	0.03	2.0
R33	0.9	43.9	0.03	2.0
R34	2.7	45.7	0.09	2.1
R35	0.8	43.8	0.03	2.0
R36	6.5	49.5	0.14	2.1
Criteria		90.0	2.0	4.0

1 Includes assumed constant background values of $43.0 \mu\text{g}/\text{m}^3$ (TSP) and $2.0 \text{ mg}/\text{m}^2/\text{month}$ (dust deposition)

10 DUST MITIGATION MEASURES

The results of the dispersion modelling indicate compliance for all modelled parameters. Nevertheless, in order to ensure that impacts on off-site air quality are minimised and within the scope permitted by the W2B planning approval, dust emissions from the project site will be managed in accordance with the W2B Construction Air Quality Management Plan (CAQMP).

The CAQMP covers all sources of emissions identified in **Section 7.3** of this AQIA, including wind erosion, wheel generated dust, blasting, extraction, material handling and processing of extracted material.

The contractor should review and apply all relevant mitigation measures from the CAQMP to the operation of the site. **Table 21** presents the key measures identified to be relevant for the operation of the Moonimba Borrow Site (but may not be limited to).

Table 21 Relevant mitigation measures from the W2B Construction Air Quality Management Plan

ID	Measure/Requirement
AQ1	Training will be provided to all project personnel, including relevant sub-contractors on sound air quality control practices and the requirements from this plan through inductions, toolboxes and targeted training.
AQ3	Vegetation clearing will be staged where possible to minimise the area and time that surfaces are exposed.
AQ4	Exposed surfaces with no scheduled work for two weeks will be treated to minimise dust generation. Exposed surfaces will be stabilised progressively using the most practical site specific methods, such as watering and geo-fabrics for short term exposure and emulsion spray, spray grass, soil compaction and revegetation for longer term exposed areas or final finishes.
AQ5	Construction activities will be modified, reduced or controlled during high or unfavourable wind conditions if they have a potential to increase dust generation.
AQ6	Control measures including water carts, sprinklers, sprays, dust screens or the application of geo-binding agents will be utilised where applicable to control dust emissions. The frequency of use will be modified accommodate prevailing conditions. Dust control equipment will be maintained to ensure its operability.
AQ10	Stockpiles will be located in accordance with the criteria established in The Stockpile Management Protocol. Control measures including water carts, sprinklers, sprays, dust screens or the application of geo-binding agents will be utilised where applicable to control dust emissions. A suitable cover crop or provision of other covering over topsoil stockpiles will be established where stockpiles are in place for longer than 4 weeks.
AQ11	Temporary stockpiles that are planned to be in place for long periods will be temporarily seeded and stabilised.
AQ16	Disturbed areas will be progressively rehabilitated as soon as practical.
AQ17	Areas of disturbed material and access roads will be stabilised where possible by methods such as compaction. Compounds, ancillary facilities, administration access roads and standing areas will be hard surfaced.
AQ18	Measures implemented to minimise dust, soil or mud from being deposited from vehicles on public roads. This will be achieved by implementing mitigation measures such as rumble grids and large aggregate at entry/exit points. Manual cleaning will also be carried out where appropriate. In the event of any spillage or tracking, the spilt material will be removed within 24 hours.

ID	Measure/Requirement
	Management measures should include: <ul style="list-style-type: none">• Watering of unsealed haul roads, as required• Visual checks of exhaust emissions.
AQ19	Hardstand areas and surrounding public roads will be cleaned, as required, using methods including brooms, bobcat attachments or street sweepers.
AQ20	Vehicle movement will be confined to designated haul roads and areas. These roads will have speed limits of 40 km/h in order to reduce dust generation. Reduced speed limit maybe implemented where dust generation persists.
AQ21	All loaded haulage trucks will be covered where there is a risk of release of dust or other materials and at all times on public roads.
AQ25	Dust suppression systems will be installed and used on crushing and screening plants and mulching equipment to minimise generation of dust from these activities.
AQ30	Where practical during blasting, a combination of the following mitigation measures will be used to suppress dust: <ul style="list-style-type: none">• Weather reports checked prior to blasting minimise the potential for windblown dust reaching surrounding residents.• Controlled blasts to minimise dust produced.
AQ31	Crushers will be positioned in protected areas, where practical, to reduce wind dispersion of dust particles (eg within cuts). Water spraying will be utilised if necessary.
AQ33	Dust deposition gauges will be established at least one month prior to the commencement of construction to establish background dust levels. Monitoring equipment will remain in place until completion of the construction works and/or where ground conditions are stable. Results will be captured on a monthly basis and collected in accordance with DEC's "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW" guidelines.
AQ34	An onsite weather station will be established to record weather data. Rainfall at the premises will be measured and recorded in millimetres per 24-hour period at the same time each day from the time that the site office is established.
AQ35	Public roads will be inspected each day at main entry and exit points to and from areas where construction activities are taking place including the project compound and site offices. Material tracked onto the road pavement will be removed in accordance with AQ18.
AQ36	Weather forecast will be reviewed on a daily basis and appropriate measures implemented where unfavourable weather conditions (dry weather, wind speed >10m/s) are anticipated. Measures to be implemented during unfavourable weather conditions are outlined in AQ5.
AQ37	Dust control and operational procedures will be reviewed and modified if results exceed the air quality criteria and are attributable to construction activities.

11 CONCLUSION

SLR Consulting was commissioned by Pacific Complete to conduct an AQIA for the proposed intensification of extraction at the Moonimba sand and sandstone borrow site situated in Bungawalbin, NSW. The site is currently operating an annual extraction rate of 30,000 m³ per annum. Pacific Complete is proposing to intensify the extraction rate at the site to 400,000 m³ per annum for two years to provide sufficient material to complete the W2B project. This AQIA has been prepared in accordance with The Approved Methods (NSW EPA, 2017).

Emissions of fugitive particulate matter from all on-site activities (both years of operation) were estimated using Environment Australia National Pollutant Inventory, ACARP and US EPA approved emission factors. Mitigation measures implemented at the site to minimise dust emissions, including on-site haul road watering and water spraying of exposed areas and stockpiles, were included in the emission calculations. Year 2 was selected as the worst case scenario as it was estimated to give rise to the highest emission rates. The calculated emissions from year 2 were modelled using the CALMET/CALPUFF modelling software to investigate the transport of emitted pollutants (TSP and PM₁₀ and PM_{2.5}) from the project site to predict the impact upon the nearest identified sensitive receptor locations.

Based on the modelling results, the following conclusions have been drawn for the proposed intensification of extraction at the Moonimba Borrow Site:

- The modelling of PM_{2.5} emissions from all identified sources associated with the operations at the project site showed that maximum predicted annual and 24-hour average cumulative PM_{2.5} concentrations at all nearby sensitive receptors would remain below the relevant ambient air quality criteria. The incremental impacts predicted by the modelling of PM_{2.5} emissions are negligible.
- The modelling of PM₁₀ emissions from all identified sources associated with the operations at the project site showed that maximum predicted annual and 24-hour average cumulative PM₁₀ concentrations at all nearby sensitive receptors would remain below the relevant ambient air quality criteria.
- The modelling of TSP emissions from identified sources associated with the operations at the project site showed that these emissions have no potential to give rise to ground level exceedances of the ambient air quality criteria for annual average TSP concentrations and dust deposition rates.

No air quality constraints have therefore been identified for the proposed intensification of extraction at the Moonimba Borrow Site as a result of this air quality impact assessment.

12 REFERENCES

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Variable Emission File – Calculation Steps

A brief summary of the steps used in calculating the hourly varying emission rates for each source are presented below.

Step 1: Calculate annual average emission rate (kg/year) for FP, CM and RE

$FP_{\text{annual}} = PM_{2.5, \text{annual}}$	(FP) Fine Particulate – particulate of size less than 2.5 μm
$CM_{\text{annual}} = PM_{10, \text{annual}} - PM_{2.5, \text{annual}}$	(CM) Coarse Particulate – particulate of size between 10 μm and 2.5 μm
$RE_{\text{annual}} = TSP_{\text{annual}} - PM_{10, \text{annual}}$	(RE) Rest Particulate – particulate of size greater than 10 μm

Step 2: Identify the operating hours for each activity

Step 3: Classify the sensitivity of each type of activity to wind speed

- Wind insensitive: activities with emission factor that is independent of wind speed (e.g. blasting)
- Wind sensitive: activities with emission factor that is a function of (wind speed/2.2)^{1.3} (e.g. loading)
- Wind erosion: emission from exposed areas/stockpiles

Step 4: Identify the number of sources associated with each activity

- Note that each wind erosion source is modelled as an independent source.

Step 5: Calculate the hourly average emission rate for each activity per source

$FP_{AC,i,h} = \frac{FP_{\text{annual},i} \times 1000}{N_{\text{days}} \times OH_i \times 3600 \times N_{s,i}} \times WSFactor_{i,h}$ $CM_{AC,i,h} = \frac{CM_{\text{annual},i} \times 1000}{N_{\text{days}} \times OH_i \times 3600 \times N_{s,i}} \times WSFactor_{i,h}$ $RE_{AC,i,h} = \frac{RE_{\text{annual},i} \times 1000}{N_{\text{days}} \times OH_i \times 3600 \times N_{s,i}} \times WSFactor_{i,h}$ <p>For wind insensitive activities $WSFactor_{i,h} = 1$</p> <p>For wind sensitive activities</p> $WSFactor_{i,h} = \frac{\left(\frac{WS_h}{2.2}\right)^{1.3}}{\sum_{j=1}^n \left(\frac{WS_j}{2.2}\right)^{1.3}}$ <p>For wind erosion activities</p> $WSFactor_{i,h} = \frac{(WS_h)^3}{\sum_{j=1}^n (WS_j)^3}$	<p>Where:</p> <p>$FP_{AC,i,h}$ - Fine particulates emission rate for Activity i (g/s) at hour h</p> <p>$CM_{AC,i,h}$ - Coarse particulates emission rate for Activity i (g/s) at hour h</p> <p>$RE_{AC,i,h}$ - Rest particulates emission rate for Activity i (g/s) at hour h</p> <p>OH_i - daily Operating hours (1- 24) for Activity i</p> <p>N_{days} - Number of days in the meteorological data file</p> <p>$N_{s,i}$ - Number of sources associated with Activity i</p> <p>WS_h - Wind speed at the hour</p> <p>n - number of hours in the meteorological data file</p>
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Note: If the activity was modelled as area source, the equation on the left column of the table needs to be divided by the area of that activity.

Step 6: Calculate hourly average emission rate for each source

To calculate the emission rate for a particular source for a particular hour, add up the calculated emission rate for each activity associated with source.

Variable Emission File – Calculation Steps

For example, if Source 1 is associated with Activity 1, Activity 2 and Activity 3, then:

- $ER_{S1,h,FP} = FP_{AC,1,h} + FP_{AC,2,h} + FP_{AC,3,h}$
- $ER_{S1,h,CM} = CM_{AC,1,h} + CM_{AC,2,h} + CM_{AC,3,h}$
- $ER_{S1,h,RE} = RE_{AC,1,h} + RE_{AC,2,h} + RE_{AC,3,h}$

Table B1 Detailed emission estimation calculation for year 1 operations

ACTIVITY	Annual Average Emission Rate			Intensity	Units	TSP EF	PM ₁₀ EF	PM _{2.5} EF	Units	Var 1	Units	Var 2	Units	Var 3	Units	Var 4	Units	Var 5	Units	
	TSP emission (kg/y)	PM ₁₀ emission (kg/y)	PM _{2.5} emission (kg/y)																	
TS - West-Removal	62	24	3	4,293	tonnes/year	0.0290	0.0113	0.0014	kg/t											
TS - West-Loading to Trucks	2	0	0	4,293	tonnes/year	0.0004	0.0002	0.00003	kg/t	1.19	WS Factor	5	%MC							
TS - West-Emplacing at dump	2	1	0	4,293	tonnes/year	0.0004	0.0002	0.00003	kg/t	1.19	WS Factor	5	%MC							
TS - West-Hauling on unpaved roads	16	4	0	66	VKT	0.943	0.260	0.026	kg/VKT											
TS - East-Removal	86	34	4	5,950	tonnes/year	0.0290	0.0113	0.0014	kg/t											
TS - East-Loading to Trucks	2	1	0	5,950	tonnes/year	0.0004	0.0002	0.00003	kg/t	1.19	WS Factor	5	%MC							
TS - East-Emplacing at dump	2	1	0	5,950	tonnes/year	0.0004	0.0002	0.00003	kg/t	1.19	WS Factor	5	%MC							
TS - East-Hauling on unpaved roads	20	5	1	83	VKT	0.943	0.260	0.026	kg/VKT											
OB - West-Dozers	1,667	368	175	328	hours/year	5.1	1.1	0.5	kg/h	10	%SC	5	%MC							
OB - West-Loading to truck	76	36	5	192,857	tonnes/year	0.0004	0.0002	0.00003	kg/t	1.19	WS Factor	5	%MC							
OB - West-Hauling on unpaved roads to Site Boundary	10,865	2,995	299	46,071	VKT	0.943	0.260	0.026	kg/VKT											
OB - East-Dozers	2,655	585	279	522	hours/year	5.1	1.1	0.5	kg/h	10	%SC	5	%MC							
OB - East-Loading to truck	120	57	9	307,143	tonnes/year	0.0004	0.0002	0.00003	kg/t	1.19	WS Factor	5	%MC							
OB - East-Hauling on unpaved roads to Site Boundary	5,969	1,645	165	25,313	VKT	0.943	0.260	0.026	kg/VKT											

Emission Calculations

ACTIVITY	Annual Average Emission Rate			Intensity	Units	TSP EF	PM ₁₀ EF	PM _{2.5} EF	Units	Var 1	Units	Var 2	Units	Var 3	Units	Var 4	Units	Var 5	Units
	TSP emission (kg/y)	PM ₁₀ emission (kg/y)	PM _{2.5} emission (kg/y)																
OB - Hauling on paved roads - Boundary to Reardons Lane	6,688	1,284	311	500,000	tonnes/year	0.013	0.003	0.001	kg/t	32	tonnes/load	29	Ave GMV	6.8	km/return trip	0.1	kg/VKT	0.6	SL
BL - West-Blasting	132	69	6	19	Blasts/year	6.957	3.618	0.33	kg/blast	1000	area blasted (m2)								
DR - West-Drilling	1,121	583	52	1,900	holes/year	0.590	0.31	0.03	kg/hole										
BL - East-Blasting	202	105	9	29	Blasts/year	6.957	3.618	0.33	kg/blast	1000	area blasted (m2)								
DR - East-Drilling	1,711	890	80	2,900	holes/year	0.590	0.31	0.03	kg/hole										
EM - West-Dozers	393	89	41	58	hours/year	6.8	1.5	0.7	kg/h	10	%SC	4	%MC						
EM - West-Unloading to process plant	103	49	7	192,857	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC						
EM - West-Crusher	260	116	12	192,857	tonnes/year	0.0027	0.0012	0.0001	kg/t										
EM - West-Screener	2,411	829	113	192,857	tonnes/year	0.0125	0.0043	0.0006	kg/t										
EM - East-Dozers	626	141	66	92	hours/year	6.8	1.5	0.7	kg/h	10	%SC	4	%MC						
EM - East-Unloading to process plant	164	78	12	307,143	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC						
EM - East-Crusher	415	184	19	307,143	tonnes/year	0.0027	0.0012	0.0001	kg/t										
EM - East-Screener	3,839	1,321	180	307,143	tonnes/year	0.0125	0.0043	0.0006	kg/t										
PR - West-Unloading to Stockpiles	103	49	7	192,857	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC						
PR - West-Loading to customer trucks	103	49	7	192,857	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC						
PR - West-Hauling on unpaved roads to Site Boundary	5,433	1,497	150	23,036	VKT	0.943	0.260	0.026	kg/VKT										
PR - East-Unloading to Stockpiles	164	78	12	307,143	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC						

Emission Calculations

ACTIVITY	Annual Average Emission Rate			Intensity	Units	TSP EF	PM ₁₀ EF	PM _{2.5} EF	Units	Var 1	Units	Var 2	Units	Var 3	Units	Var 4	Units	Var 5	Units	
	TSP emission (kg/y)	PM ₁₀ emission (kg/y)	PM _{2.5} emission (kg/y)																	
PR - East-Loading to customer trucks	164	78	12	307,143	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC							
PR - East-Hauling on unpaved roads to Site Boundary	4,753	1,310	131	20,156	VKT	0.943	0.260	0.026	kg/VKT											
PR - Haulage on paved roads - Boundary to Reardons Lane	6,688	1,284	311	500,000	tonnes/year	0.013	0.003	0.001	kg/t	32	tonnes/load	29	Ave GMV	6.8	km / return trip	0.1	kg/VKT	0.6	SL	
IF - Unloading	27	13	2	51,000	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC							
IF - Haulage on unpaved roads from site boundary	1,466	404	40	6,216	VKT	0.943	0.260	0.026	kg/VKT											
IF - Haulage on paved roads to site boundary	682	131	32	51,000	tonnes/year	0.013	0.003	0.001	kg/t	32	tonnes/load	29	Ave GMV	6.8	km / return trip	0.1	kg/VKT	0.6	SL	
WE - East Pit	22,601	11,752	1,058	13	ha	0.40	0.21	0.02	kg/ha/hour	8,760	hours									
WE - West Pit	14,191	7,379	664	8	ha	0.40	0.21	0.02	kg/ha/hour	8,760	hours									
Total (kg/yr)	95,988	35,518	4,275																	

SC = Silt Content (%)
 TS = Topsoil
 EM = Extracted Materials
 TS = Topsoil

MC = Moisture Content (%)
 GVM = Gross Vehicle Mass
 PR = Product
 BL = Blasting

SL = g/m² silt loading
 VKT = Vehicle kilometre travelled
 OB = Overburden
 IF = Imported Fill

WS Factor = average of (wind speed/2.2)^{1.3} in m/s
 WE = Wind erosion
 DR = Drilling
 EF = Emission Factor

Table B1 Detailed emission estimation calculation for year 2 operations

ACTIVITY	Annual Average Emission Rate			Intensity	Units	TSP EF	PM ₁₀ EF	PM _{2.5} EF	Units	Var 1	Units	Var 2	Units	Var 3	Units	Var 4	Units	Var 5	Units	
	TSP emission (kg/ y)	PM ₁₀ emission (kg/y)	PM _{2.5} emission (kg/y)																	
BL - West-Blasting	132	69	6	19	Blasts/year	6.96	3.62	0.33	kg/blast	1000	area blasted (m2)									
DR - West-Drilling	1,121	583	52	1,900	holes/year	0.59	0.31	0.03	kg/hole											
BL - East-Blasting	202	105	9	29	Blasts/year	6.96	3.62	0.33	kg/blast	1000	area blasted (m2)									
DR - East-Drilling	1,711	890	80	2,900	holes/year	0.59	0.31	0.03	kg/hole											
EM - West-Dozers	786	177	83	116	hours/year	6.80	1.53	0.71	kg/h	10	%SC	4	%MC							
EM - West-Unloading to process plant	207	98	15	385,714	tonnes/year	0.00054	0.00025	0.00004	kg/t	1.19	WS Factor	4	%MC							
EM - West-Crusher	521	231	24	385,714	tonnes/year	0.0027	0.0012	0.0001	kg/t											
EM - West-Screener	4,821	1,659	226	385,714	tonnes/year	0.013	0.004	0.001	kg/t											
EM - East-Dozers	1,253	282	132	184	hours/year	6.8	1.5	0.7	kg/h	10	%SC	4	%MC							
EM - East-Unloading to process plant	329	156	24	614,286	tonnes/year	0.00054	0.00025	0.00004	kg/t	1.19	WS Factor	4	%MC							
EM - East-Crusher	829	369	39	614,286	tonnes/year	0.0027	0.0012	0.0001	kg/t											
EM - East-Screener	7,679	2,641	359	614,286	tonnes/year	0.0125	0.0043	0.0006	kg/t											
PR - West-Unloading to Stockpiles	207	98	15	385,714	tonnes/year	0.00054	0.00025	0.00004	kg/t	1.19	WS Factor	4	%MC							
PR - West-Loading to customer trucks	207	98	15	385,714	tonnes/year	0.00054	0.00025	0.00004	kg/t	1.19	WS Factor	4	%MC							
PR - West-Hauling on unpaved roads to Site Boundary	13,645	3,761	376	57,857	VKT	0.94	0.26	0.03	kg/VKT											
PR - East-Unloading to Stockpiles	329	156	24	614,286	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC							
PR - East-Loading to customer trucks	329	156	24	614,286	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC							

Emission Calculations

ACTIVITY	Annual Average Emission Rate			Intensity	Units	TSP EF	PM ₁₀ EF	PM _{2.5} EF	Units	Var 1	Units	Var 2	Units	Var 3	Units	Var 4	Units	Var 5	Units	
	TSP emission (kg/ y)	PM ₁₀ emission (kg/y)	PM _{2.5} emission (kg/y)																	
PR - East-Hauling on unpaved roads to Site Boundary	19,014	5,241	524	80,625	VKT	0.943	0.260	0.03	kg/VKT											
PR - Haulage on paved roads - Boundary to Reardons Lane	13,376	2,568	621	1,000,000	tonnes/year	0.0134	0.0026	0.0006	kg/t	32	tonnes/load	29	Ave GMV	6.8	km/return trip	0.1	kg/VKT	0.6	SL	
IF - Unloading	27	13	2	51,000	tonnes/year	0.0005	0.0003	0.00004	kg/t	1.19	WS Factor	4	%MC							
IF - Haulage on unpaved roads from site boundary	12,027	3,315	332	51,000	VKT	0.94	0.26	0.03	kg/VKT											
IF - Haulage on paved roads to site boundary	682	131	32	51,000	tonnes/year	0.0134	0.0026	0.0006	kg/t	32	tonnes/load	29	Ave GMV	6.8	km/return trip	0.0629	kg/VKT	0.6	SL	
WE - East Pit	22,601	11,752	1,058	13	ha	0.40	0.21	0.02	kg/ha/hour	8760	hours									
WE - West Pit	14,191	7,379	664	8	ha	0.40	0.21	0.02	kg/ha/hour	8760	hours									
Total (kg/ yr)	116,225	41,925	4,734																	

SC = Silt Content (%)

TS = Topsoil

EM = Extracted Materials

IF = Imported Fill

MC = Moisture Content (%)

GVM = Gross Vehicle Mass

PR = Product

EF = Emission Factor

SL = g/m² silt loading

VKT = Vehicle kilometre travelled

DR = Drilling

WS Factor = average of (wind speed/2.2)^{1.3} in m/s

WE = Wind erosion

BL = Blasting

Figure C 1 Maximum predicted incremental 24-hour average PM_{2.5} (µg/m³) – proposed year 2 operations





 <p>2, Lincoln Street Lane Cove NSW 2066 T: +61 2 9427 8100 F: +61 2 9427 8200 www.slrconsulting.com</p> <p><small>The content within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.</small></p>	<p>Project Number: 610.16962</p> <p>Dispersion Model: CALPUFF</p> <p>Modelling Period: 2016</p> <p>Projection: GDA 1994 MGA Zone 55</p> <p>Date: 31/05/2017</p>		<p>Pacific Complete</p> <p>Moonimba Borrow Site Air Quality Impact Assessment</p> <p>Incremental Impact - Proposed Operations</p> <table border="1"> <thead> <tr> <th>Pollutant</th> <th>PM_{2.5}</th> <th>Averaging Period</th> <th>24-Hour</th> <th>Unit</th> <th>µg/m³</th> </tr> </thead> </table>	Pollutant	PM _{2.5}	Averaging Period	24-Hour	Unit	µg/m ³
	Pollutant		PM _{2.5}	Averaging Period	24-Hour	Unit	µg/m ³		

Figure C 2 Predicted incremental annual average PM_{2.5} (µg/m³) – proposed year 2 operations



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Project Number:	610.16962
Dispersion Model:	CALPUFF
Modelling Period:	2016
Projection:	GDA 1994 MGA Zone 55
Date:	31/05/2017



Pacific Complete				
Moonimba Borrow Site Air Quality Impact Assessment				
Incremental Impact - Proposed Operations				
Pollutant	PM _{2.5}	Averaging Period	Annual	Unit
				µg/m ³

Figure C 3 Maximum predicted incremental 24-hour average PM₁₀ (µg/m³) – proposed year 2 operations





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	<table border="1"> <thead> <tr> <th>Pollutant</th> <th>PM₁₀</th> <th>Averaging Period</th> <th>24-Hour</th> <th>Unit</th> <th>µg/m³</th> </tr> </thead> </table>		Pollutant	PM ₁₀	Averaging Period	24-Hour
Pollutant	PM ₁₀	Averaging Period	24-Hour	Unit	µg/m ³	

Figure C 4 Predicted incremental annual average PM₁₀ (µg/m³) – proposed year 2 operations



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Pacific Complete					
Moonimba Borrow Site Air Quality Impact Assessment					
Incremental Impact - Proposed Operations					
Pollutant	PM ₁₀	Averaging Period	Annual	Unit	µg/m ³

Figure C 5 Predicted incremental annual average TSP ($\mu\text{g}/\text{m}^3$) – proposed year 2 operations



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**Moonimba Borrow Site
Air Quality Impact Assessment**

Incremental Impact - Proposed Operations

Pollutant	TSP	Averaging Period	Annual	Unit	$\mu\text{g}/\text{m}^3$
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Figure C 6 Predicted incremental annual average dust deposition rate (g/m²/month) – proposed year 2 operations



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**Moonimba Borrow Site
 Air Quality Impact Assessment**

Incremental Impact - Proposed Operations

Pollutant	Dust Deposition	Averaging Period	Annual	Unit g/m ² /month
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APPENDIX L

COMMUNITY NOTIFICATION



Australian Government

BUILDING OUR FUTURE



August 2017

Using rock from Moonimba to build the Woolgoolga to Ballina Pacific Highway upgrade

The Australian and NSW governments are jointly funding the \$4.36 billion Woolgoolga to Ballina Pacific Highway upgrade. Roads and Maritime Services Pacific Highway Project Office and Pacific Complete are working together to deliver the project.

The Woolgoolga to Ballina project team is proposing to use rock from the Moonimba quarry site (also known as Robinsons Quarry) on Old Boggy Creek Road, Bungawalbin to build the upgrade.

Roads and Maritime Services is seeking approval from the NSW Department of Planning and Environment to remove 800,000 cubic metres of rock over two years for the upgrade. This is being sought under the project's existing Conditions of Approval. To prepare for work we will:

- Remove vegetation
- Establish site offices and amenities
- Install plant and equipment
- Install environmental controls.

Excavation, drilling and blasting will be used to extract material from the site. The material will then be crushed and screened to make it a uniform size and shape that meets road building specifications. Work activities involve:

- Operating machines and equipment within the site
- Excavating, drilling and blasting
- Crushing and stockpiling rock material
- Hauling the material from the site to the project's work areas.

How will the work affect you?

There will be noise when we are working at this site. To manage noise we will, wherever possible:

- Minimise the numbers of plant and equipment operating at the same time and direct them away from residential properties
 - Only carry out blasting:
 - From 9am to 5pm between Monday and Friday
 - From 9am to 1pm on Saturday
 - At no time on Sunday or public holidays.
 - Monitor noise and use natural features and site structures to shield noise.
-

How will traffic be managed?

Heavy vehicles will travel along existing haulage routes and traffic will be managed in accordance with the project's Traffic and Access Management Plan. It is estimated that at peak periods there will be about 300 heavy vehicle movements per day. To manage this increase we will, wherever possible:

- Reduce speed limits along local roads, if required
- Maintain local roads during the use of the site
- Carry out any required improvements to local roads or intersections before starting haulage.

We have included a map to show the site's location and haulage routes to the project boundary. This haulage route will split heavy vehicle movements to different parts of the site so that not all vehicles will travel through Woodburn.

Work hours

Typically work will be carried out during the project's approved construction hours, which are **from Monday to Friday between 7am and 6pm** and on **Saturday between 8am and 5pm**.

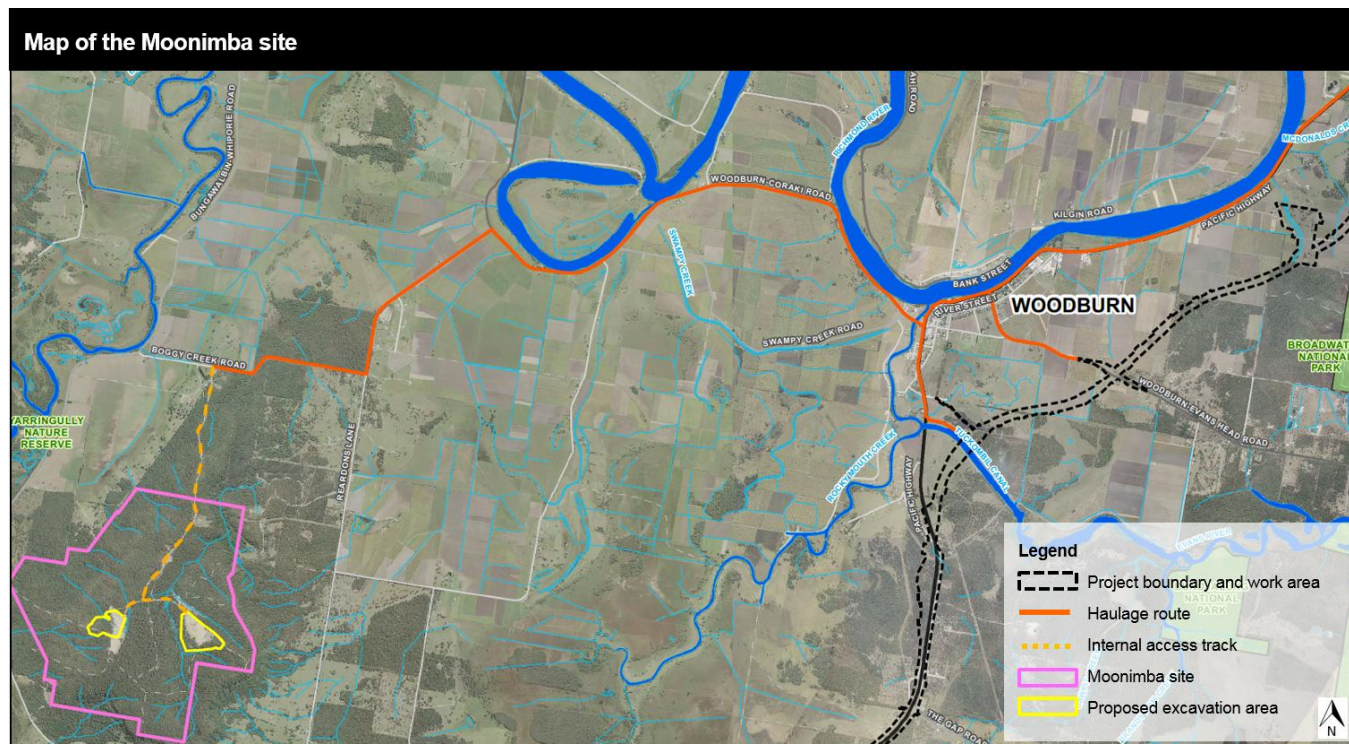
Next steps

The Department of Planning and Environment will display this proposal for public comment. This is expected to take place later this year. The Woolgoolga to Ballina project team will hold an information session and keep the community updated.

For more information

If you have any questions, please contact the Woolgoolga to Ballina project on 1800 778 900 dial 1, W2B@pacificcomplete.com.au or visit the project website rms.nsw.gov.au/W2B.

We apologise for any inconvenience and thank you for your patience during this important work.



If you need help understanding this information, please contact the Translating and Interpreting Service on 131 450 and ask them to call us on 1800 778 900.