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Environmental & Social Consultants

LIVERPOOL RANGE QUARRY

Environmental Impact Statement

Final

August 2024

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Environmental Impact Statement

Final

Prepared by Umwelt (Australia) Pty Ltd
on behalf of ARDG Deans Quarry Pty Ltd

Project Director:	David Holmes
Project Manager	Penelope Williams
Report No.:	23141/R12
Date:	August 2024





This report was prepared using Umwelt's
ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

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Document Status

Rev. No	Reviewer Name	Reviewer Date	Approved for Issue Name	Approved for Issue Date
Final	David Holmes	30/08/24	David Holmes	30/08/24

Summary

Project Overview

ARDG Deans Quarry Pty Limited (the Proponent), part of the Australian Resource Development Group Pty Limited (ARDG) group of companies, is seeking planning approval for a new hard rock quarry, known as the Liverpool Range Quarry (the Project) located on privately-owned land, approximately 10 km north-west of Cassilis, NSW (refer to **Figure S1**).

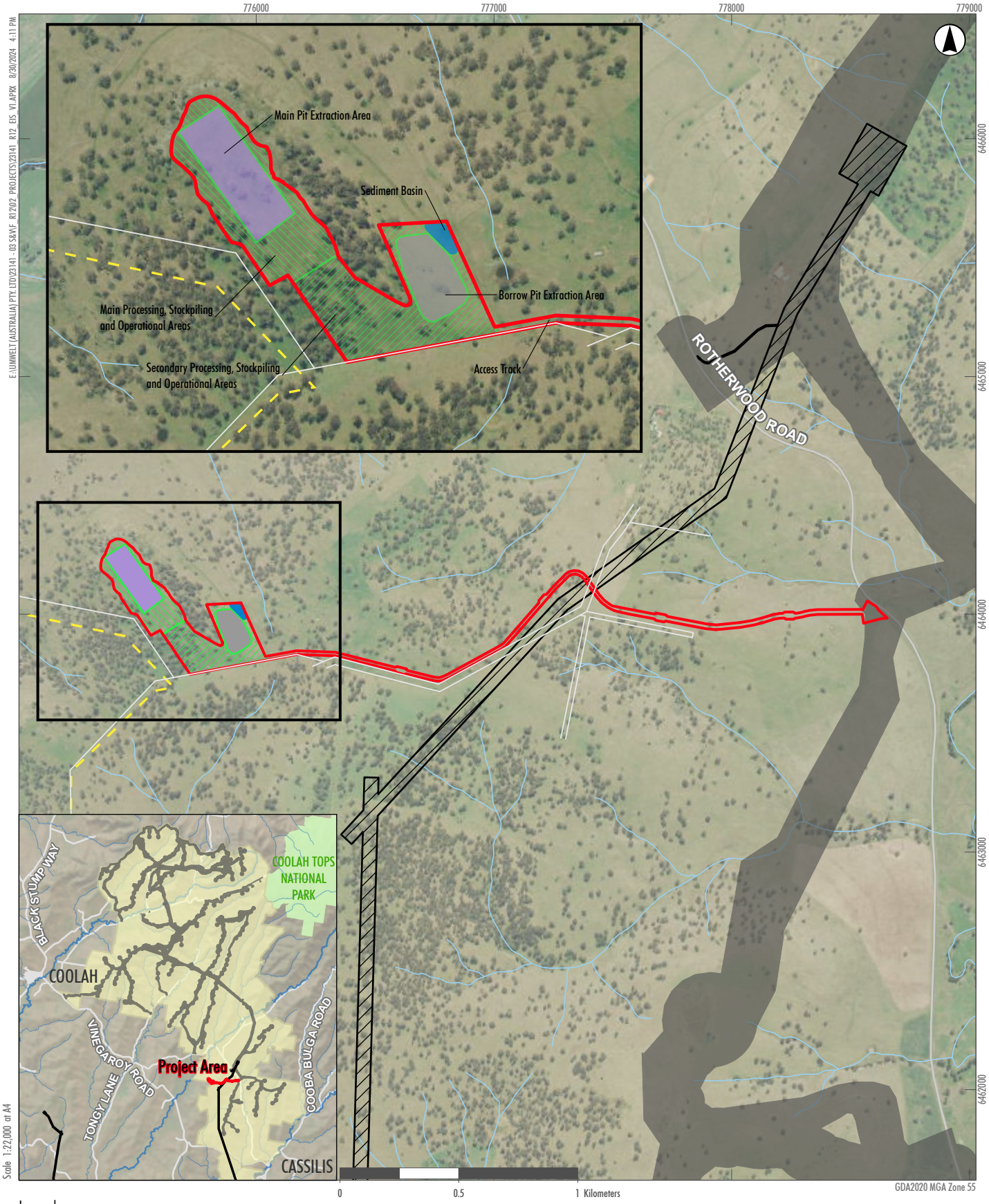
The Project is seeking to access a high quality, hard rock resource suitable for producing a range of products for the sole purpose of supporting the construction, operation and maintenance of the approved Liverpool Range Wind Farm (LRWF) project (SSD-6696), currently subject to the assessment of a modification application (Mod-1). Tilt Renewables Australia Pty Ltd, as a trustee for Liverpool Range Wind Farm Project Trust (Tilt Renewables), is the proponent for the LRWF project.

In response to government agency and community submissions received on the LRWF project (Mod-1) and following further design optimisation work for the wind farm, there is now more certainty in relation to the extent of public road upgrades/repairs and bulk earthworks (and the associated quantities of rock, gravel and sand) required for the construction of the LRWF project. Substantial quantities of suitable quarry product will be required and the nearest commercial quarries with potential to supply the LRWF project are located at a significant distance from the LRWF project area (the return haul trip from Dubbo is approximately 300 km).

The Proponent has undertaken detailed site geological investigations which identified a quarry resource at the site that is suitable for the production of a range quarry of products (e.g., roadbase, concrete aggregates, drainage rock) required for construction of the public road upgrades, wind farm access tracks, hardstand areas, turbine foundations and other associated civil works.

Haulage of quarry materials is the single largest contributor to heavy vehicle traffic movements associated with the development of wind farms, generally comprising more than 60% of all heavy vehicle movements. Therefore, sourcing materials close to the LRWF project area will have significant benefits for both the LWRF project and community including:

- reduced haulage costs
- a substantial reduction in heavy vehicle movements on the surrounding local and regional road network, which results in significant improvements to road safety and community amenity
- reduced greenhouse gas emissions associated with reduced haulage distances.



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Liverpool Range Wind Farm Project Development Corridor – External Transmission Line CWO REZ
- Liverpool Range Wind Farm Project Development Corridor – Wind Farm
- Road
- Drainage Line
- Surveyed Cadastre
- Borrow Pit Extraction Area
- Main Pit Extraction Area
- Main Processing and Stockpiling Area
- Secondary Processing and Stockpiling Area
- Sediment Basin

FIGURE S1

Conceptual Quarry Layout

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)

A summary of the key aspects of the Project is provided in **Table S1**.

Aspect	Description
Project Life	Approximately 3 to 4 years, in line with the construction period of the LRWF project
Limit of Production	Up to approximately 700,000 tpa of quarry product per year
Project Area	Approximately 19.5 ha
Disturbance Area	Approximately 19.5 ha
Extraction Method	Drill and blast (Main Pit), free dig (Borrow Pit)
Material Processing	Processing on site using mobile crushing and screening plant
Overburden Management	Overburden will be minimal however any topsoil and overburden will be stockpiled on site for use in rehabilitation
Product Transportation	Road transport of up to approximately 700,000 tpa via Rotherwood Road and approved haul routes of the LRWF project
Site Access	Single access point off Rotherwood Road
Employment	Approximately 6 full-time employees, and 2 to 3 part-time employees
Hours of Operation	**Operations**: 7am to 6pm Monday to Friday 8am to 1pm Saturday No work on Sunday or Public Holidays **Blasting**: 9am to 5pm Monday to Friday (approximately 6 to 12 blasts per year)
Rehabilitation and Final Landform	Rehabilitation will be undertaken progressively where appropriate in the context of site development. A conceptual final landform will be prepared for the Project based on full extraction of the identified approximately 2 Mt of resources. At the completion of quarry operations, the Project Area will be rehabilitated in consultation with the landowner to determine an appropriate, safe and stable landform(s) that can facilitate ongoing rural activities.

Why is the Project Needed?

NSW is currently experiencing significant public infrastructure development (government spending on roads, rail, ports, schools, housing and hospitals), and private investment (commercial and industrial development and residential construction) due to population growth and associated planned infrastructure development. This short- to medium-term construction demand is driving significant supply-side pressure for high quality quarry products across NSW. These supply issues are currently resulting in cost and delivery time pressures on projects, with a flow on of negative productivity and inflationary pressures to the broader local and regional economies. Specifically in relation the Region associated with the Project, the significant infrastructure development required for the establishment of the Central West Orana Renewable Energy Zone (CWO REZ) will create further supply-side pressures unless alternate quarry resources can be located and developed.

The objective of the Project is to provide quarry material for the approved LRWF project. ARDG has undertaken detailed site geological investigations which have identified a hard rock resource within the

LRWF project area capable of supplying a range of in-specification quarry products required to construct the LRWF project.

The Project would not result in the generation of any additional truck movements as any material provided to the LRWF project area from the quarry would displace material sourced from quarries further afield. All material hauled from the site would utilise existing approved haul routes for the LRWF project construction. Due to the shorter haul distance from the Project Area to the LRWF construction areas, fewer trucks will be required to service the demand due to the short turn-around period. In addition, the location of the Project Area is such that the key haulage link of Vinegaroy Road (between the Golden Highway and Rotherwood Road) will no longer be required as a haulage route for quarry materials, creating a substantial benefit for road users and residences located along this road.

What alternatives were investigated?

A detailed opportunities and constraints assessment was undertaken by the Proponent in the vicinity (both inside and out) of the LRWF project area. These investigations determined that the vast majority of the LRWF project area and surrounding areas is not suited to the production of quarry materials for the LRWF project due to the very deeply weathered basalt soils and limited exposure of competent rock close to surface.

From a geological and topographic perspective, the Project Area is an ideal location for sourcing the optimum mix of raw materials required to produce high quality quarry products, that can be viably extracted while minimising the extent of surface disturbance. In addition, the close proximity of the Project Area to the areas where quarry product is required for the LRWF project, its relative isolation from any sensitive receivers and the opportunity to utilise a suitable resource within an existing highly disturbed environment with good road access, means that potential impacts the Project can be minimised, as would the haul distance for supply of materials to the LRWF project.

What planning and approvals process applies?

The Project requires approval under both NSW and Commonwealth environmental and planning legislation.

The Project is defined under NSW planning legislation as a State significant development (SSD) as it is development for the purpose of an extractive industry, which extracts more than 500,000 tonnes per annum of extractive material and extracts from a resource of more than 5 million tonnes. As such it requires development consent under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Project also requires assessment and approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to potential impacts on Matters of National Environmental Significance (MNES) in relation to Commonwealth listed threatened species and communities. The Project will be assessed under the Bilateral Agreement between the State and the Commonwealth.

This Environmental Impact Statement (EIS) has been prepared to accompany the development application to provide the necessary information to allow the consent authority to make an informed decision on the overall merits of the Project. The EIS provides an assessment of the environmental, social and economic impacts of the Project as well as its benefits. The consent authority will be the NSW Minister for Planning and Public Spaces or the Independent Planning Commission (IPC) if at least 50 public objections to the

Project are made; if any reportable political donations are made by the Proponent; and/or the local council of the area within which the development is to be carried out objects to the Project.

How has the Proponent engaged with Stakeholders?

Key Stakeholders include local, State and Commonwealth government agencies, infrastructure and service providers, local businesses and various community organisations and interest groups and the Aboriginal community, refer to **Figure S2**.

The Project was originally communicated to the community as ancillary development to the LRWF project as part of the LRWF Mod-1 application. Consultation was delivered through in-person meetings with neighbouring landholders, key stakeholder meetings and drop-in community sessions held in the townships of Cassilis and Coolah. It was observed during the Scoping phase that community interest and concerns about the proposed quarry were limited; however, it was also acknowledged that the engagement in the Scoping phase covered both the quarry and the proposed temporary workers accommodation in the context of the broader LRWF project which may have detracted focus away from the quarry. Additional efforts to engage with a range of stakeholders were therefore made during the preparation of the EIS to elicit focussed feedback on the Project. This additional consultation focused solely on the quarry to ensure relevant stakeholders had additional space, time, and opportunity to provide feedback on the Project without the wider consultation on the LRWF project.



Figure S2 Key Stakeholders

Environmental, Social and Economic Assessment Outcomes

Following on from the scoping process, the identification of key environmental and community issues to be considered in this EIS was refined based on:

- the environmental and strategic context for the locality

- outcomes of the stakeholder engagement process
- the SEARs for the Project
- specialist assessments completed as part of the preparation of this EIS
- a risk analysis of potential environmental and social impacts.

Specialist environmental assessments were undertaken for a range of issues and the key outcomes are summarised below.

Noise

An Environmental Noise Assessment was prepared to determine the likely construction, operational and transportation noise impacts of the Project, the assessment results are as follows:

- Applicable construction and operational noise criteria can be achieved through the implementation of management and mitigation measures.
- Road traffic noise criteria can be met at the nearest sensitive receiver with both the existing traffic volumes and the proposed Project traffic volumes on Rotherwood Road.
- Nighttime activities will be restricted to maintenance works, these works are predicted to comply with relevant sleep disturbance criteria.
- Road traffic noise levels at the nearest and potentially most affected receiver location are predicted to comply with relevant criteria.
- No adverse cumulative noise impacts are predicted as a result of the Project.

The Proponent will implement appropriate noise management and mitigation measures and undertake appropriate noise monitoring. These management, mitigation and monitoring measures will be outlined in the Environmental Management Plan (EMP) for the Project.

Blasting

Blasting will be undertaken Monday to Friday (between 9 am and 5 pm) and drilling activities will be undertaken Monday to Saturday (between 7 am and 6 pm). It is anticipated that the quarry will fire a limited number of blasts per year (approximately 6 to 12 blasts per year) dependent on demand.

A Blasting Impact Assessment was undertaken for the Project which found:

- compliance with relevant ground vibration and airblast overpressure criteria at all private residential receptors and public and private infrastructure can be achieved.
- potential flyrock impacts can be adequately managed through appropriate blast design and management practices and potential risks from flyrock are considered to be negligible.

The proponent will implement a blast monitoring system, pre-blast assessment protocol and a public notification system.

Air Quality and Greenhouse Gas

Emissions to air from the Project could occur from a variety of activities including material handling, material transport, processing, and wind erosion from exposed areas. These emissions will primarily occur during the operational phase, as limited construction works will be required.

The Air Quality Impact Assessment results are as follows:

- Modelling showed that the Project would not cause exceedances of the EPA assessment criteria for 24-hour average or annual average PM_{10}, 24-hour average or annual average $PM_{2.5}$, TSP or deposited dust, at any sensitive receptor.
- Post-blast fume modelling results show that, under worst-case meteorological conditions with a rated 3 fume, the maximum 1-hour average NO_2 concentrations will not exceed the EPA's criterion at any off-site sensitive receptor.
- Modelled maximum 1-hour average and annual average NO_2 concentrations due to diesel exhaust emissions are in compliance with EPA criteria at all sensitive receptors.
- The direct emissions from the Project (i.e. Scope 1) were estimated to average 2,198 t CO2-e per year. Comparisons in a State and national context using the DPE Net Zero Emissions Dashboard data and DCCEEW (2022) projections show that the Project emissions would be in the order of:
    - 0.0019% to 0.0020% of NSW emissions, depending on policy measures, and
    - 0.0004% of Australia's emissions.
- The Project will provide a more efficient option for supplying materials to the LRWF project, compared to sourcing materials from more distant, existing quarries. Based on a comparison of the haul distances, the transport of a notional 1.7 Mt of construction materials from the Project is estimated to save in the order of 17,185 t CO2-e.

The Proponent will implement appropriate air quality and greenhouse gas management and mitigation measures which will be outlined in the EMP for the Project.

Water Resources

The Project is located within both the Macquarie-Bogan River Catchment, and the Hunter Catchment areas. As the Project Area is situated upon an elevated ridge, there are no defined drainage features within the Project Area. Several first and second order drainage lines surround the Project Area, with the closest natural waterbody being the perennial Talbragar River approximately 1.5 km northwest of the site in the Macquarie-Bogan Catchment. The results of the assessment are as follows:

- The Project will have an adequate and reliable water source (i.e., captured rainfall runoff and groundwater bore) to support the construction and operation of the Project.
- Impacts on groundwater quality or quantity are considered unlikely during construction and operation and no groundwater interactions or adverse impacts to aquifers are predicted as a result of the Project. In addition, there are no known groundwater issues (e.g. contamination) in the vicinity of the Project Area.

- The potential for adverse water quality impacts on downstream receiving waters during construction and closure phases of the Project can be satisfactorily mitigated by the implementation of erosion and sediment controls.
- The Proponent will implement a Water Management System (WMS), with the implementation of the WMS the potential for adverse water quality impacts on downstream receiving waters during the operational phases are considered negligible.
- Reductions in rainfall runoff volumes reporting to downstream users due to the Project Water Management System catchment area are considered negligible.
- As the Project Area is located on a ridge line and away from hydrological features, no flood impacts are expected.

Biodiversity

The Project Area has been subject to extensive grazing and has been largely cleared of treed vegetation with only grassland and scattered paddock trees remaining. The design of the quarry has targeted areas which have historically high levels of disturbance associated with historical and existing agricultural management practices. Management measures will be implemented by the Proponent to further mitigate impacts to biodiversity, including workforce education and training, salvage of biodiversity features, ecologist pre-clearance survey and supervision of work, weed management and fauna exclusion fencing.

The Biodiversity Development Assessment Report (BDAR) provides an assessment of the biodiversity values of the Project Area, documents the application of the avoid, minimise and offset framework and assesses the likely biodiversity impacts of the Project. The BDAR included detailed biodiversity field survey across the Project Area for species identified as being potentially present. Surveys for two threatened species remain ongoing.

The Project will result in residual direct impacts to native vegetation communities and threatened species habitats within the Disturbance Area as a result of vegetation clearing. This includes impacts to the following threatened ecological communities and species:

- PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
- barking owl (*Ninox connivens*)
- the BDAR has also assumed presence (and therefore potential impacts) on the following two species however further surveys are being undertaken to confirm presence or absence of these species:
    - pink-tailed legless lizard (*Aprasia parapulchella*)
    - striped legless lizard (*Delma impar*).

Only one entity listed under the EPBC Act has been recorded in the Project Area which has the potential to be significantly impacted by the Project, being the White Box-Yellow Box-Blakeley's Red Gum Grassy Woodland and Derived Native Grassland CEEC (Commonwealth Box Gum Woodland CEEC) associated with PCT 438. Approximately 3.2 ha of the 19.5 ha Project Area meets the BC Act and EPBC Act listing criteria for this community.

For impacts to biodiversity that cannot be avoided, the NSW biodiversity assessment process requires use of the NSW Government online calculator to generate biodiversity credits. These credits are generated by inputting the results of the survey and impact areas. All credits then need to be offset prior to the impact occurring, with the system designed to result in a no-net-loss in biodiversity value for NSW. In accordance with the EPBC Act requirements, offsets associated with impacts to threatened species habitat will be subject to like-for-like offsetting requirements. The area of impact and credit liability for biodiversity impacts associated with the Project is set out in **Table S2** below.

Table S2 Impacts requiring offset

Entity	Area of impact (ha)	Impact credits generated
PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	3.2	113
barking owl (*Ninox connivens*)	2.8	79
pink-tailed legless lizard (*Aprasia parapulchella*)	5.2	95
striped legless lizard (*Delma impar*)	18.3	240

The offset liability for the Pink-tailed Legless Lizard and Striped Legless Lizard are based on assumed presence and further surveys are proposed in September and October 2024 to confirm presence or absence. Should the species not be identified as being present within the disturbance area in these surveys, the credit liabilities for these species identified in the BDAR will not apply. The results of these surveys will be confirmed during the assessment phase of the Project and will be communicated to both BCS and DPHI when available.

Heritage

An Aboriginal Cultural Heritage Assessment (ACHA) has been prepared to assess any impacts and management of Aboriginal cultural heritage that may occur as a result of the Project in consultation with the Registered Aboriginal Parties. No Aboriginal sites were recorded within the Project Area during the survey. Based on the environmental and social context of the Project Area and the archaeological survey results, the ACHA concluded that no Aboriginal cultural heritage objects or sites were identified as part of the survey and there is a low potential for unknown sites to be present within the Project Area.

There are no listed heritage items in the vicinity of the Project Area, and none were observed by the archaeologists during the ACHA surveys.

Given the Project will not impact on any heritage items and there is a low potential for unknown Aboriginal artefact sites to be present, no specific mitigation or management measures are proposed, however, the EMP will include an unexpected finds management procedure in the unlikely event that potential items of Aboriginal cultural value or heritage value are uncovered during construction works.

Traffic and Transport

Sourcing materials from the Quarry would result in several significant benefits from a traffic and transport perspective, including:

- Reduced driver fatigue due to shorter commutes for haulage drivers between the LRWF project work fronts and the quarry compared to the travel distances required from external commercial quarries in the Dubbo area (with a return haulage distance of approximately 300 km and reduction of 17,000,000 km on the broader road network).
- Reduced number of potential interactions between heavy and light vehicles. Existing traffic is significantly lower on Rotherwood Road compared to Vinegaroy Road and the Golden Highway, reducing vehicle interactions and the subsequent probability of road safety incidents with the public.
- The haulage fleet required to accommodate the LRWF project is significantly reduced by the use of an on-site quarry as the number of trips a single heavy vehicle can complete in a day is substantially increased by the reduced haulage distance.

Additionally, most of the landholdings along Rotherwood Road are associated with the LRWF project and this gives Tilt Renewables and the Proponent the ability to communicate potential traffic impacts more effectively to landowners when compared communication with non-associated residents further away from the LRWF project area.

Potential traffic and transport impacts will be mitigated and managed through appropriate intersection design and compliance with the LRWF Traffic Management Plan (TMP).

As all heavy vehicle movements associated with the Project are required for the LRWF project, additional road maintenance requirements associated with quarry movements will be subject to the existing obligations under the LRWF development consent and this includes an obligation to make-good any damage to roads at the completion of the LRWF project construction period.

Land Resources

A detailed assessment of the potential impacts of the Project on soils and land capability, landforms (particularly long-term geotechnical stability) and the compatibility of the development with other land uses in the vicinity was undertaken.

The surface environment of the extraction and processing areas of the Project are characterised by a thin veneer of basalt-derived soil, organic material (from grazing activity) and clay interspersed with rubble. The soil profile development is skeletal (0 – 0.2 m) in the areas of more resistant geology with occasional pockets (up to 1 m) of heavy clay sitting in direct contact with rock outcrop. In the more highly weathered areas of the Project Area (Borrow Pit) these skeletal soils overly saprolite (extremely weathered in-situ basaltic volcanic rocks). While regional mapping indicates a higher land capability for the Project Aea, the thin soils overlying the basalt is consistent with a Land Soil Capability classification of Class 6 which has significant production limitations and is generally only suitable for grazing activities. The permanent removal of areas for potential production as a result of the extraction areas and associated final voids is therefore considered unlikely to have a significant impact on the productive capacity of land.

Detailed geotechnical analysis indicates the quarry design meets the slope stability design acceptance criteria. During operations defect mapping and regular inspections will be undertaken to observe for signs of any adverse geotechnical conditions.

A range of management and mitigation measures are proposed to address potential land use incompatibilities associated with the Project and surrounding land use. This appropriately reduces the risk of associated land use conflicts for the Project.

Waste Management

Any waste generated by the Project will be appropriately managed on site and any disposal will be managed by an appropriately licenced waste contractor. All required waste management measures will be developed and implemented through the EMP. With these controls in place, it is expected that the impacts associated with waste generation and disposal resulting from the Project can be effectively managed.

Bushfire

The Project Area is identified as bushfire prone land. Extensive areas surrounding the Project Area have been subject to clearing associated with historical agricultural activities which reduces the bushfire risk in these cleared areas. An assessment of the Project has been undertaken against the requirements of Planning for Bushfire Protection (PBP) (RFS, 2019). Appropriate site management will be undertaken to mitigate bushfire risk. The EMP will include a range of bushfire emergency management and mitigation measures to appropriately manage bushfire threat to the Project.

Hazard Analysis

A preliminary risk screening was undertaken for the Project to identify and assess the storage of specific dangerous goods classes that have the potential for significant off-site effects. Based on the quantities and types of materials to be stored on site, or transported to the site, the preliminary risk screening concluded that none of the hazardous materials are above screening thresholds and further assessment is not required.

Visual

A comprehensive assessment of the existing landscape character and the potential visibility of the Project was undertaken, due to a combination of distance, vegetation and topography the proposed quarry will be predominately screened from view from all public viewpoints. Due to the low horizontal extent of the Project and existing vegetation (particularly to the northeast) the visual impact rating for the three dwellings with potential views of the Project Area is considered negligible.

Social

Based on the community consultation, Stakeholders were most concerned about potential amenity impacts of the Project such as air quality, noise, visual amenity and traffic. Perceived positive impacts associated with the Project were also noted including the benefit of reduced traffic movements (relative to the approved LRWF project), local procurement and employment opportunities and community support/funding.

Overall, the Social Impact Assessment has identified a number of positive impacts associated with the Project, including:

- increased road safety for road users by reducing the distances travelled on the local and regional road network to transport quarry material to the LRWF project area using heavy vehicles
- increased employment opportunities for local community members
- increased procurement opportunities for local businesses
- royalty benefits from the extraction of resources obtained by the host landholder
- opportunity for the proponent to support or fund community services leading to improved amenity or service provision for the local community in specific instances.

In relation to potential negative social impacts which predominately relate to amenity issues related to noise, air quality, traffic and visual, the SIA determines that all negative social impacts receive a post-mitigation ranking of 'Low'. Independent assessments for visual impacts, noise, vibration, and air quality have found that the Project will have minimal negative impacts from these factors, and that any impacts can be mitigated through the appropriate management measures such that the levels of predicted impacts are within accepted impact assessment criteria.

Overall, the benefits of the Project in relation to reduced impacts associated with quarry product haulage for the LRWF project on the broader road network have been rated as 'High'.

Economic

The Project is estimated to have net production benefits of $6M (present value at 7% discount rate). The cost benefit analysis indicates that overall, the Project is estimated to have a net social benefit to both Australia ($41M) and NSW ($14M) and is justified from an economic efficiency perspective. The positive economic benefits to NSW and Australia were robust under a range of different risk and uncertainty scenarios.

The Project is estimated to provide the following annual direct and indirect annual effects to the local economy:

- $31 M in output
- $10 M in value-added
- $4 M in gross wages
- 51 jobs.

Rehabilitation

The overarching objective for the rehabilitation of the Project Area is that the final landform is safe, stable and non-polluting having regard to the proposed end land use for the site and surrounding areas.

Rehabilitation of the Project will address the long-term stabilisation of both quarried and disturbed areas, including stabilisation of the quarry benches in the Main Pit and excavated slopes of the Borrow Pit and areas surrounding the quarry pits, with two final voids (Main Pit and Borrow Pit) to remain after closure.

A conceptual final landform and life of operations rehabilitation management strategy relevant to achieving these land use outcomes will be detailed in the EMP, which will also contain a Quarry Closure Plan.

Conclusion

The Project has been assessed against the principles of ecologically sustainable development as required by the EP&A Act and *Environmental Planning and Assessment Regulation*. This assessment has indicated that while the Project would have impacts, these impacts can be effectively managed, mitigated and offset. In particular the Project will provide significant social and environmental benefits in terms of reduced road haulage impacts on the broader road network relative to the Project not proceeding. As noted above, these benefits are achieved with relatively minor adverse social and environmental impacts.

The Project is estimated to provide the following annual direct and indirect annual effects to the local economy:

- $31 M in output
- $10 M in value-added
- $4 M in gross wages
- 51 jobs.

Overall, the Project is estimated to have a net benefit to both Australia and NSW and is justified from an economic efficiency perspective.

EIS Declaration

Project Details

Project Name	Application Number	Address of the land in respect of which the development application is made
Liverpool Range Quarry	SSD-68063715	Refer to Schedule of Lands in **Appendix 1**

Applicant Details

Required Information	Details
Applicant Name	ARDG Deans Quarry Pty Ltd
Applicant Address	69 Ross Street, Belmont NSW 2280

Details of Person by Whom this EIS was Prepared

Name	Address	Professional Qualifications
Penelope Williams	Umwelt (Australia) Pty Limited, 75 York St, Teralba NSW 2284	Bachelor of Environmental Science

Declaration by Registered Environmental Assessment Practitioner

Required Information	Details
Name	David Holmes
Registration Number	R80035
Organisation registered with	EIANZ
Declaration	The undersigned declares that this EIS: • has been prepared in accordance with the *Environmental Planning and Assessment Regulation 2021* • contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates • does not contain information that is false or misleading • addresses the Planning Secretary's environmental assessment requirements (SEARs) for the Project • identifies and addresses the relevant statutory requirements for the Project, including any relevant matters for consideration in environmental planning instruments • has been prepared having regard to the Department's State Significant Development Guidelines – Preparing an Environmental Impact Statement • contains a simple and easy to understand summary of the Project as a whole, having regard to the economic, environmental and social impacts of the Project and the principles of ecologically sustainable development • contains a consolidated description of the project in a single chapter of the EIS • contains an accurate summary of the findings of any community engagement

Required Information	Details
	contains an accurate summary of the detailed technical assessment of the impacts of the Project as a whole.
Signature	
Date	30/08/24

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1.0 Introduction

ARDG Deans Quarry Pty Limited (the Proponent), part of the Australian Resource Development Group Pty Limited (ARDG) group of companies, is seeking planning approval for a new hard rock quarry, known as the Liverpool Range Quarry (the Project) located on privately-owned land, approximately 10 km north-west of Cassilis, NSW (refer to **Figure 1.1**).

The Project is seeking to access a high quality, hard rock resource suitable for producing a range of products for the sole purpose of supporting the construction, operation and maintenance of the approved Liverpool Range Wind Farm (LRWF) project (SSD-6696), currently subject to the assessment of a modification application (Mod-1). Tilt Renewables Australia Pty Ltd, as a trustee for Liverpool Range Wind Farm Project Trust (Tilt Renewables), is the proponent for the LRWF project.

1.1 Background

In response to government agency and community submissions received on the LRWF project (Mod-1) and following further design optimisation work for the wind farm, there is now more certainty in relation to the extent of public road upgrades/repairs and bulk earthworks (and the associated quantities of rock, gravel and sand) required for the construction of the LRWF project. Substantial quantities of suitable quarry product will be required and the nearest commercial quarries with potential to supply the LRWF project are located at a significant distance from the LRWF project area (the return haul trip from Dubbo is approximately 300 km).

Haulage of quarry materials is the single largest contributor to heavy vehicle traffic movements associated with the development of wind farms, generally comprising more than 60% of all heavy vehicle movements. Therefore, sourcing materials close to the LRWF project area will have significant benefits for both the LWRF project and community including:

- reduced haulage costs
- a substantial reduction in heavy vehicle movements on the surrounding local and regional road network, which results in significant improvements to road safety and community amenity
- reduced greenhouse gas emissions associated with reduced haulage distances.

The Proponent has undertaken detailed site geological investigations which identified a quarry resource at the site that is suitable for the production of a range quarry of products (e.g., roadbase, concrete aggregates, drainage rock) required for construction of the public road upgrades, wind farm access tracks, hardstand areas, turbine foundations and other associated civil works. The construction and operation of a quarry within the footprint of the LRWF project area would enable quarry resources to be supplied locally, significantly reducing transport related impacts with associated benefits in terms of improvements to road safety and reductions in noise, air quality and greenhouse gas emissions.

The Project is State significant development (SSD) as defined under *State Environmental Planning Policy (Planning Systems) 202*1 (Planning Systems SEPP) and will require development consent under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). An Environmental Protection Licence

(EPL) under the NSW *Protection of the Environment Operations Act 1997* would also be required for the quarry operation.

1.2 Overview of the Project

The Project Area covers approximately 19.4 ha and is located on Lot 89 DP 750749 while the access road linking the Project Area to Rotherwood Road is located on Lot 89 DP 750749 and Lot 2 DP 747190 and crosses an unnamed Crown road. Site access is off Rotherwood Road (refer to Schedule of Land **Appendix 1**), approximately 10 km north of Cassilis township within the Upper Hunter Shire Local Government Area (LGA).

Key components of the Project are illustrated on **Figure 1.2** and include:

- main extraction area ('Main Pit')
- satellite extraction area ('Borrow Pit')
- processing and stockpiling area
- operational areas to accommodate internal temporary administration (mobile crib room/toilet facilities), peripheral topsoil bunds, access tracks, light vehicle parking and surface water management controls
- sealed access road linking the operational areas with Rotherwood Road.

Annual production from the Project is anticipated to be up to 700,000 tonnes per annum (tpa) and all materials produced by the quarry will supply the LRWF project only.

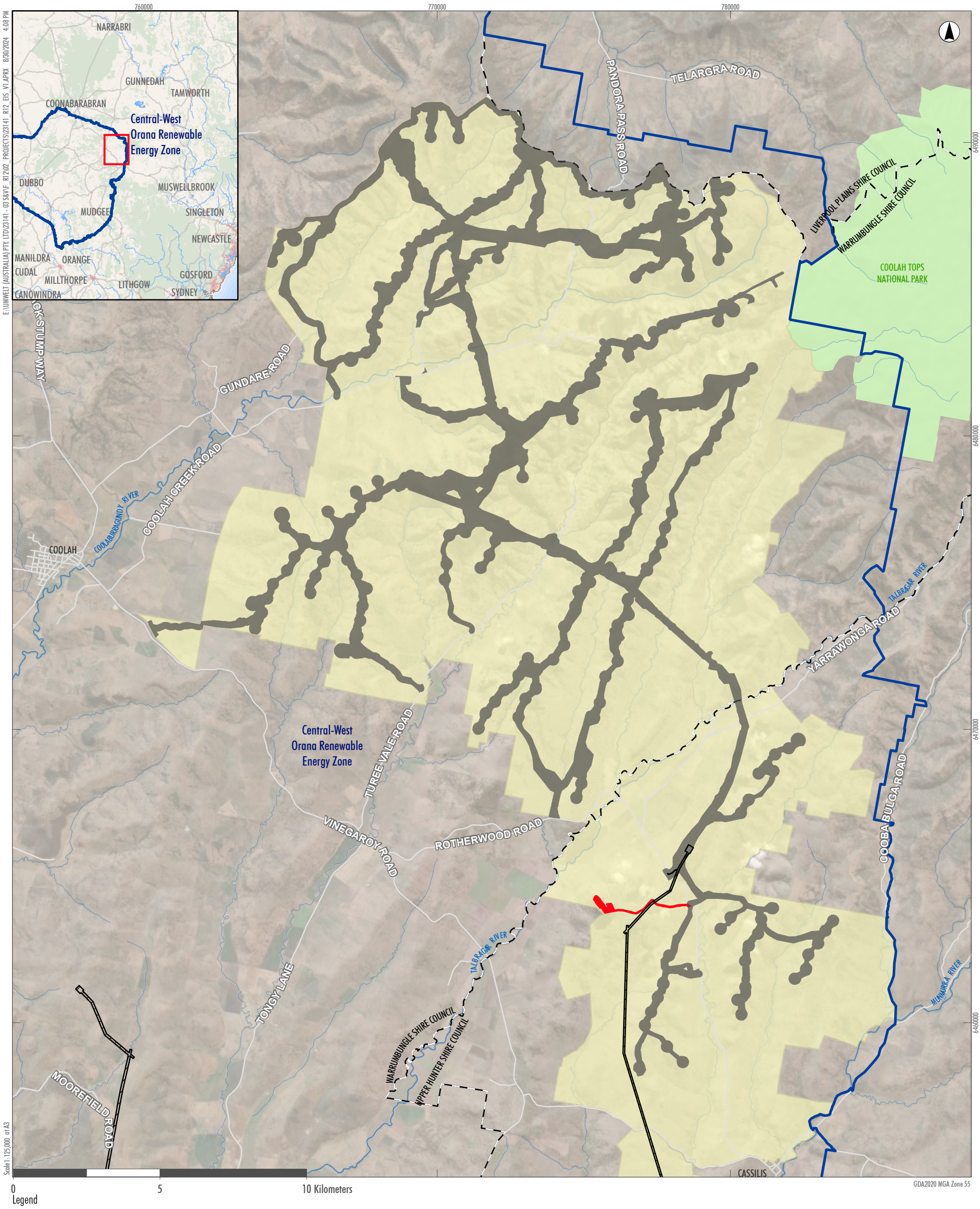
At the completion of quarry operations, the Project Area will be rehabilitated in consultation with the landowner to determine an appropriate, safe and stable landform(s) that can facilitate ongoing rural activities.

A detailed Project description is provided in **Section 3.0**.

1.3 Project Objectives

The objectives of the Project are to:

- provide a local, secure supply of high-quality quarry products to support the construction of the LRWF project
- conduct quarrying activities using industry best-practices to protect the environmental, social and cultural values of the area
- reduce construction traffic movements associated with the approved LRWF project from the broader local and regional road network, with associated benefits in terms of improvements to road safety and community amenity
- improve the financial viability of the LRWF project, by placing downward pressure on construction costs, with flow on effects benefitting end consumers of electricity.

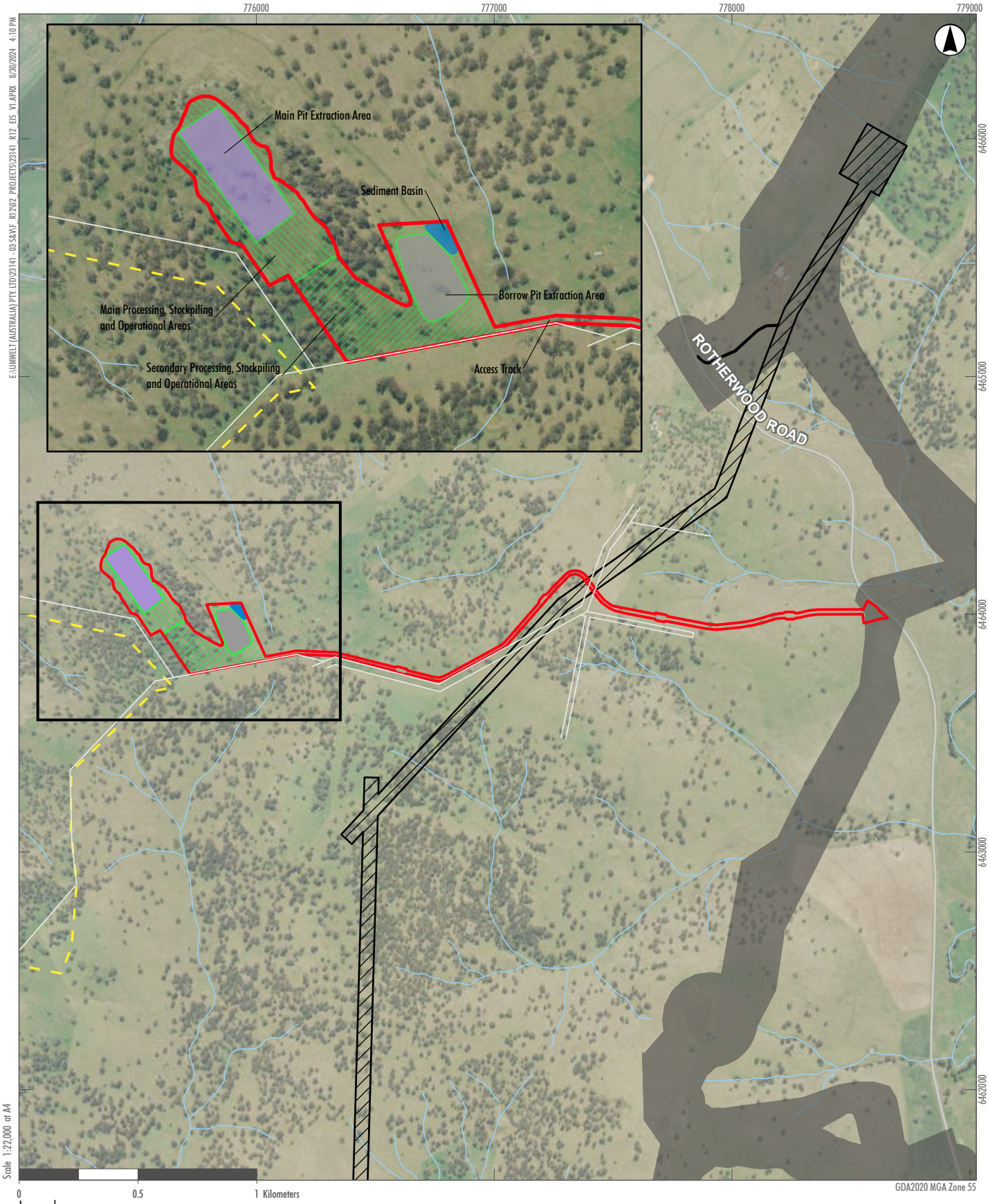


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FIGURE 1.1

Locality Plan

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Liverpool Range Wind Farm Project Development Corridor – External Transmission Line CWO REZ
- Liverpool Range Wind Farm Project Development Corridor – Wind Farm
- Road
- Drainage Line
- Surveyed Cadastre
- Borrow Pit Extraction Area
- Main Pit Extraction Area
- Main Processing and Stockpiling Area
- Secondary Processing and Stockpiling Area
- Sediment Basin

FIGURE 1.2

Conceptual Quarry Layout

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)

1.4 The Proponent

The Proponent for the Project is ARDG Deans Quarry Pty Limited, part of the Australian Resource Development Group Pty Limited (ARDG) group of companies. ARDG has consulted closely with Tilt Renewables (the proponent of the LRWF project). The Proponent and Tilt Renewables have separate land agreements in place with the landholders of the Project Area.

ARDG is a Newcastle-based business with specialist expertise in identifying and developing quarry resources to supply the construction materials requirements of renewable energy projects and major construction materials markets. Its principals have over 50 years combined professional experience in the resource and planning sectors, with extensive experience in the extractive industries (i.e., quarries) sector. Relevant details of the proponent for the Project are provided in **Table 1.1**.

Since 2018, ARDG has obtained approval for 12 on-site/near site quarries that have supplied quarry products to support the development of three wind farms in NSW. ARDG operates independently of wind farm developers to provide solutions for the supply of quarry products to wind farm developments where existing commercial quarry operations are located a significant distance from the wind farm Project and/or there is insufficient supply in local market to service the project's quarry materials demand.

Table 1.1 Proponent Details

Aspect	Detail
Full Name	ARDG Deans Quarry Pty Limited
Postal Address	69 Ross St, Belmont NSW 2280
CAN	671 476 896
Contact	Dr Justin Meleo (Director – Planning & Development)
Project Site	Lot 89 DP 750749 and Lot 2 DP 747190 Rotherwood Road Cassilis NSW 2329

1.5 Structure of this Report

This Environmental Impact Statement (EIS) is intended to assist the community, Councils, Government agencies and other stakeholders to understand the Project and its benefits and impacts.

This EIS provides an assessment of the environmental, social and economic impacts of the Project and has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs), issued on 27 March 2024 (refer to **Appendix 2**). This EIS has also been prepared in consideration of the following NSW guidelines:

- State significant development guidelines – preparing an environmental impact statement (Appendix B to the state significant development guidelines) (EIS Guidelines) (Department of Planning and Environment (DPE), 2022a)
- Cumulative Impact Assessment Guidelines for State Significant Projects (DPE, 2022b)
- Social Impact Assessment Guideline for State Significant Projects (DPE, 2023)

- *Undertaking Engagement Guidelines for State Significant Projects* (Department of Planning, Housing and Infrastructure (DPHI), 2024) (Engagement Guidelines).

This report has the following sections:

- **Section 1.0** introduces the Project, the Proponent and provides an outline of the structure of the document.
- **Section 2.0** outlines the strategic context for the Project, including the justification for the Project, a summary of the locality in which the Project is undertaken and an overview of the environmental and social context.
- **Section 3.0** contains a detailed description of the Project.
- **Section 4.0** summarises the relevant State and Commonwealth statutory context applicable to the approval process for the Project.
- **Section 5.0** describes the stakeholder engagement program for the Project and identifies the environmental and social matters identified during consultation for the EIS.
- **Section 6.0** contains the assessment of environmental and social matters relevant to the Project.
- **Section 7.0** provides a justification and conclusion.
- **Section 8.0** contains the references.

The EIS contains a number of appendices that provide detailed technical assessments of the key environmental and social issues related to the Project (refer to **Table 1.2**). The key outcomes of these studies are summarised in **Section 6.0**.

Table 1.2 Technical Assessments

Technical Assessment	Technical Specialist
Environmental Noise Assessment	Sonus Pty Ltd
Blasting Impact Assessment	Enviro Strata Consulting Pty Limited
Air Quality and Greenhouse Gas Assessment	Airen Consulting
Surface Water Impact Assessment	Engeny
Biodiversity Development Assessment Report	Umwelt
Aboriginal Cultural Heritage Assessment	Umwelt
Traffic Impact Assessment	Constructive Solutions
Geotechnical Stability Review	GHD Pty Ltd
Landscape and Visual Impact Assessment	Moir Landscape Architecture Pty Limited
Social Impact Assessment	Umwelt
Economic Impact Assessment	Gillespie Consulting
Resource Assessment	ARDG

2.0 Strategic Context

2.1 Project Justification

NSW is currently experiencing significant public infrastructure development (government spending on roads, rail, ports, schools, housing and hospitals), and private investment (commercial and industrial development and residential construction) due to population growth and associated planned infrastructure development. This short- to medium-term construction demand is driving significant supply-side pressure for high quality quarry products across the state. These supply issues are currently resulting in cost and delivery time pressures on projects, with a flow on of negative productivity and inflationary pressures to the broader local and regional economies. Specifically in relation the Region associated with the Project, the significant infrastructure development required for the establishment of the Central West Orana Renewable Energy Zone (CWO REZ) will create further supply-side pressures unless alternate quarry resources can be located and developed.

The objective of the quarry is to provide quarry material for the approved LRWF project. ARDG has undertaken detailed site geological investigations which have identified a hard rock resource within the LRWF project area capable of supplying a range of in-specification quarry products required for the construction of the public road upgrades/repairs, internal road network, hardstand areas, turbine footings and other associated works.

The Project would not result in the generation of any additional truck movements as any material provided to the LRWF from the quarry would displace material sourced from quarries further afield. All material hauled from the Quarry for LRWF project requirements, including material required for public road upgrade works would utilise existing approved haul routes for the LRWF construction. Due to the shorter haul distance from the Project to the LRWF construction areas, fewer trucks will be required to service the demand due to the short turn-around period. In addition, the location of the Project is such that the key haulage link of Vinegaroy Road (between the Golden Highway and Rotherwood Road) will no longer be required as a haulage route for quarry materials, creating a substantial benefit for road users and residences located along this road.

There are significant benefits to the LRWF project and the surrounding community associated with sourcing quarry materials in proximity to the LRWF project, primarily associated with the reduction in haul distances. These benefits also extend to other developments in the broader region, in that the Project will reduce demand for quarry products sourced from other existing quarries.

2.2 Local and Regional Planning Context

The Project occupies approximately 19.4 ha of privately-owned agricultural land in the Upper Hunter Shire LGA, and is also located less than 5 km south-east of the boundary with the adjacent Warrumbungle Shire LGA. The Project Area also lies within the CWO REZ (refer to **Figure 1.1**). The NSW Government has indicated that REZs will play a vital role in delivering affordable energy to help prepare the State for the retirement of thermal power stations over the coming decades. EnergyCo is the statutory authority responsible for leading the delivery of REZs. EnergyCo describes REZs as modern-day power stations which combine renewable energy generation and energy storage systems, that are connected to transmission infrastructure via energy hubs (EnergyCo, 2022b).

The *Hunter Regional Plan 2041* (Hunter Regional Plan) (DPE, 2022c) is the NSW Government's strategic long-term plan for guiding land use decisions for the Hunter region. The Hunter has the largest share of both population and employment in regional NSW and is located in the State's fastest growing development corridor. The Hunter Regional Plan sets the strategic land use framework for continued economic growth and diversification and aims to unlock sustainable growth opportunities and investments, as well as housing choice and lifestyle opportunities to retain the Hunter's position as a leading regional economy in Australia. The Hunter Regional Plan specifically identifies the need for a reliable supply of construction materials to support this continued growth. District planning priorities for the Upper Hunter support a diverse energy, innovation and industry centre with efficient freight and transport connections.

Similarly, the *Central West and Orana Regional Plan 2041* (CWO Regional Plan) (DPE, 2022c) which includes the Warrumbungle LGA, establishes a strategic framework, vision and direction for land use, to create a healthy, connected and resilient region with a prosperous economy. The CWO Regional Plan promotes further development of renewable energy across the region, while Objective 3 aims to 'Sustainably manage (ARDG, 2024) extractive resource land and grow the critical minerals sector'. The Plan identifies that major infrastructure projects within the region (including the CWO REZ and the Inland Rail project) are expected to lead to an increased demand for construction materials and recognises the potential for growth in this sector.

The Project is located on land zoned RU1 Primary Production under the *Upper Hunter Local Environmental Plan, 2013* and extractive industries are permitted with consent. Additionally, clause 2.9(3) of the *State Environmental Planning Policy (Resources and Energy) 2021* (Resources and Energy SEPP) provides that development for the purpose of an extractive industry may be carried out with consent on land on which development for the purposes of agriculture is permissible (with or without consent).

2.3 Resource Context

A detailed resource assessment report has been prepared by ARDG, based on site investigations undertaken between May and July 2023. The outcomes of the assessment are summarised in the following sections with the full report provided as **Appendix 17**. The site investigations included assessment included 20 percussion drill holes (each up to 25 m deep), followed by six diamond core holes (each up to 35 m deep) (refer to **Figure 2.1**)

2.3.1 Geological Setting

Stratigraphically the region is dominated by the Liverpool West Basalt, a sub-unit of the Liverpool Range Volcanic Complex. It consists of Cenozoic-age volcanics, predominantly comprised of basalts. There are also common occurrences of dolerite, polymictic conglomerate, quartzose sandstone, shale, gravel, siltstone and carbonaceous claystone. Along the river channels and in low lying areas, alluvial valley deposits comprise Quaternary clastic fluvially deposited sediments of clay, silt, sand and gravel.

2.3.2 Project Area Geology and Structure

The geology of the Main Pit is characterised by two distinct flat-lying basalt flows that are separated by a thin (1 – 3 m) weathered zone of interflow, as shown in the cross section of the Main Pit in **Figure 2.1**. The upper and lower flows represent the geological units suited to producing the bulk of quarry products required for the construction of the LRWF project.

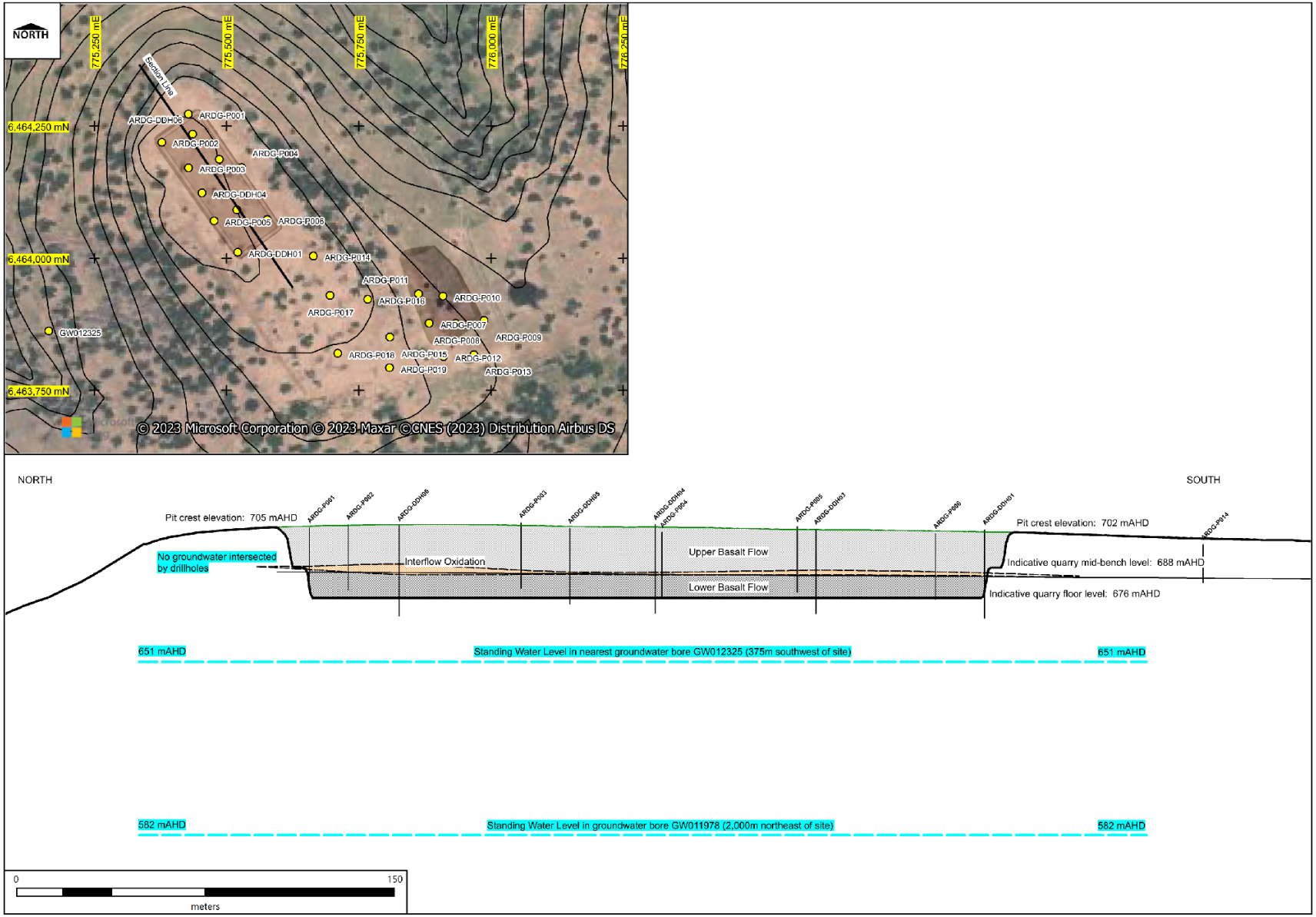


FIGURE 2.1

Main Pit Cross Section and Drill Holes

Image Source: Tilt (2023)

The upper flow comprises a microporphyritic[1] olivine basalt that extends from the surface to a depth of 12 – 15 m. In contrast the lower flow comprises a coarser grained olivine dolerite. The Project Area is overlain by a very thin (0 – 0.2 m) veneer of basalt-derived soil, organic material from grazing activity and clay interspersed with rubble in the areas of more resistant geology. Occasional pockets of heavy clay (up to 1 m) are sitting in direct contact with rock outcrop. The Borrow pit covers an area of approximately 1.9 ha and comprised of saprolitic clay (saprolite) derived from weathering of basaltic volcanic rocks.

The upper basalt and lower basalt/dolerite flows have been classified as slightly weathered to fresh, with the presence of some more locally weathered bands in the interflow.

Percussion drilling along the southeastern flank of the hill and below the projected base of the lower basalt flow, confirmed that the geology of the Borrow Pit area is characterised by underlying basaltic volcanic rocks that are deeply weathered to saprolitic clay.

2.3.3 Project Area Resource Estimate

Additional resources accessible by the quarry in excess of the 2 Mt proven resource are likely, although additional drilling would be required to confirm.

Quarry resources within the Main Pit are dominated by a volcanic flow sequence of basalt and dolerite, whereas resources within the Borrow Pit are predominantly clay derived from the weathering of basaltic volcanic rock. Resources from both pits are ideally suited to producing the typical range of blended, in-specification quarry products required to support the construction of the LRWF project, including:

- significant volumes of durable wind-farm specification road base and sub-base products, required for creation of access tracks, hardstand areas, construction compounds and substation/transformer pads
- coarse rubble and crushed rock products required for drainage mitigation works
- densely graded base and sub-base products for targeted use within the wind farm development corridor and for use on public road upgrades (in accordance with the requirements of RMS3151 – Granular Base and Subbase Materials for Surfaced Road Pavements)
- aggregates required for use in concrete for the construction of wind tower footings (in accordance with the requirements of AS2758.1 – Aggregates and Rock for Engineering Purposes – Part 1 Concrete Aggregates).

Investigative work is ongoing to determine the potential suitability of fine manufactured sand (crusher dust up to 5 mm) produced from processed basalt, for use in concrete (as a replacement for natural sand) and for backfilling of electrical cable trenches.

[1] Porphyritic is an adjective used in geology to describe igneous (volcanic) rocks with a distinct difference in the size of mineral crystals, where large crystals are set in a finer grained or glassy groundmass. Microporphyritic texture refers to a difference in crystal size that is only visible under a microscope.

2.4 Environmental and Social Context

2.4.1 Land Use and Social Locality

Land uses surrounding the Project Area comprise agricultural activities, primarily grazing with some minor cropping, consistent with the RU1 Primary Production land zoning. The surrounding area is sparsely populated, with the closest private dwelling (not currently associated with the Project or the LRWF project) located approximately 3.1 km to the south-west (Dwelling ID# 2) (refer to **Figure 2.2**). There are four residences associated with the LRWF project within 5 km of the Project Area (Dwelling ID # F8-1, F7-5, F7-4 and F7-6). Dwelling ID#F8-1 is owned/occupied by the owner of land on which the Project is located and there are commercial arrangements between ARDG and the landholder regarding the development of the quarry. There are no other non-associated dwellings within 5 km of the Project Area.

The social locality of the Project includes the townships of Coolah (to the north-west) and Cassilis (to the south-east) within the Upper Hunter Shire LGA. The regional locality also includes the adjoining Warrumbungle, Mid-Western and Dubbo Regional LGAs.

The Project Area is located off Rotherwood Road which runs north from Coolah Road in the south near Cassilis to Vinegaroy Road in the north-west towards Coolah.

2.4.2 Topography, Hydrology and Hydrogeology

The Project Area is located on top of a relatively flat, basalt ridge that rises approximately 200 m from the valley floor of the Talbragar River to the north. Elevation over the Project Area (excluding the access road) ranges between approximately 660 m to 700 m AHD (refer to **Figure 2.3**). The Project is located on the divide between the eastern flowing Goulburn River catchment (part of the Hunter River catchment and western flowing Talbragar River which is part of the Murray Darling Catchment (refer to **Figure 2.3**) however there are no defined drainage features within the Project Area. Being an elevated ridge, surface drainage when soils are saturated is via sheet flow in all directions from the Project Area. The extraction area of Project and the vast majority of the processing and infrastructure area and haul road is located within the catchment of the Talbragar River; only a small area of the infrastructure/processing area and a section of the haul road closest to Rotherwood Road is located within the Hunter River catchment. There are six farm dams located near the Project Area, these farm dams are shown in **Figure 2.3**.

No groundwater was encountered during investigative drilling of the quarry resource. This is due to the basalt flows being generally massive in structure (i.e., only weakly fractured), confined to the top of the ridge and unconnected to the regional geology other than through vertical connectivity (i.e., there is little to no opportunity for horizontal flow within groundwater systems towards the proposed quarry pit). The relatively small surface area of the ridge is the only potential recharge catchment for groundwater systems potentially impacted by the Project and the low hydraulic conductivity and permeability of the basalt material restricts surface water infiltration through the unfractured basalt flows and the terrain precludes the area from supporting a perched groundwater table over the basalt in shallow weathered material. Due to the low hydraulic conductivity of the basalt material, there is limited scope for material recharge of regional groundwater systems to occur or be retained within the area potentially affected by quarrying operations and this is reflected in the absence of a groundwater encountered.

2.4.3 Soils

Based on soil and land capability mapping sourced from NSW Government datasets (DCCEEW, 2013), the Project Area is mapped as Class 3 (high capability land) and Class 6 (moderate to low capability land) with parts of the access road mapped as being Class 4 (moderate capability land) (refer to **Figure 2.4**).

Notwithstanding this mapping, detailed field geological investigations undertaken by ARDG (refer to **Appendix 17**) indicate that the surface environment of the site is characterised by a thin veneer of basalt-derived soil, organic material (from grazing activity) and clay interspersed with rubble. This material is in direct contact with an extensive shelf of slightly weathered to unweathered material that comprises the upper basalt flow. Consequently, soil profile development is skeletal (0 to 0.2 m) in the areas of more resistant geology with occasional pockets (up to 1 m) of heavy clay sitting in direct contact with rock outcrop.

In the more highly weathered areas of the site (Borrow Pit) these skeletal soils overly saprolite (extremely weathered in-situ basaltic volcanic rocks). The thin nature of soil material in the proposed extraction and processing area effectively precludes cultivation and restricts farming activities to grazing consistent with Class 6 land. Based on site investigations, the land capability of the quarry itself is therefore lower than the land capability classification indicated by the DCCEEW dataset.

2.4.4 Biodiversity

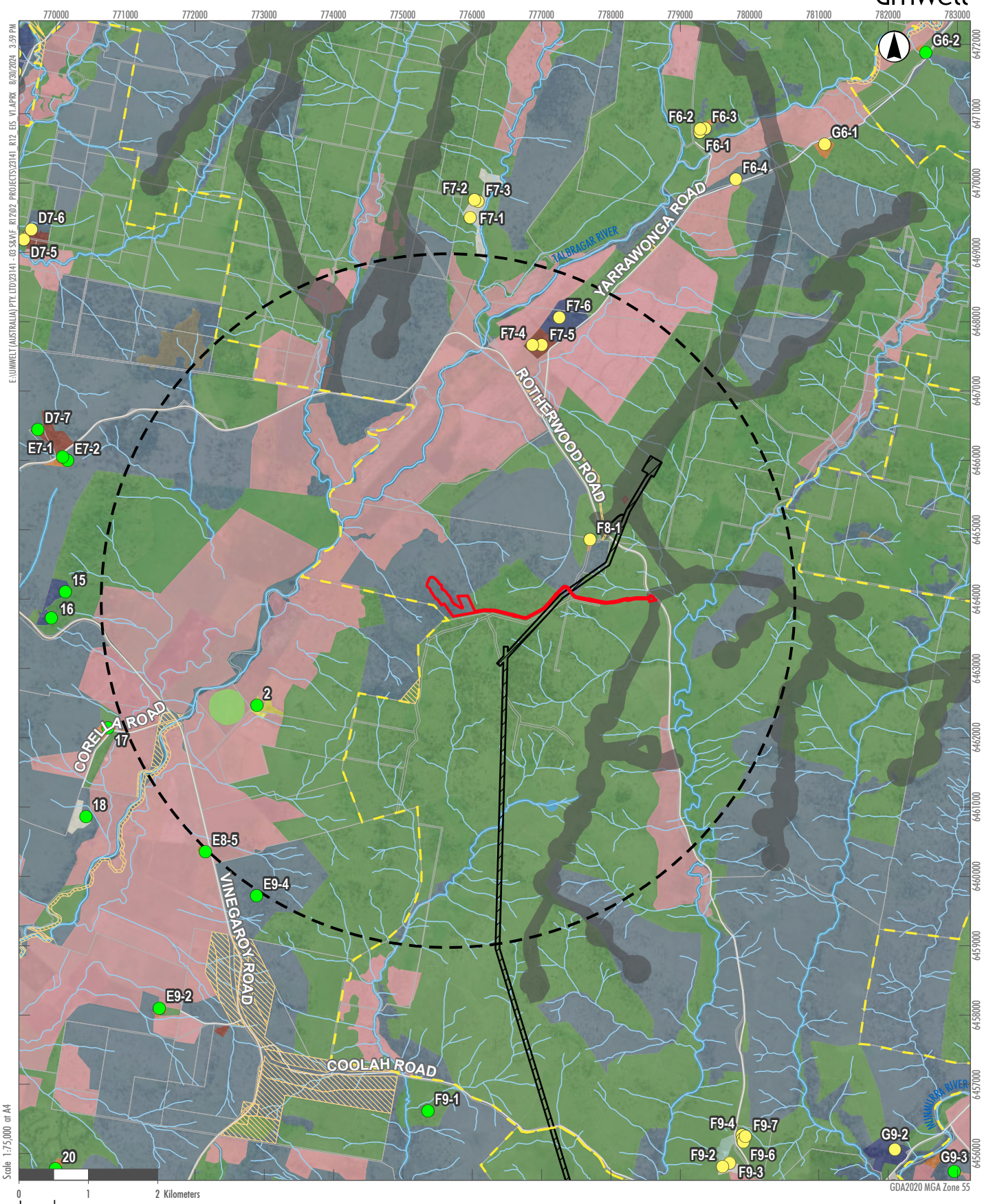
The Project Area is located within the Brigalow Belt South Interim Biogeographic Regionalisation for Australia (IBRA) Region, and the Liverpool Range IBRA sub-region. The Project Area has been subject to extensive grazing and has been largely cleared of treed vegetation with only grassland and scattered paddock trees remaining. The design of the quarry has targeted areas which have historically high levels of disturbance associated with historical and existing agricultural management practices. Areas with higher density tree coverage in the immediate vicinity of the quarry have largely been avoided through Project design. Further details regarding the biodiversity values of the site and surrounding areas are contained in **Section 6.6** and **Appendix 9**.

2.4.5 Climate

The average rainfall and evaporation for the Project Area are typically higher in the summer months and lower in the winter months. The total monthly evaporation is generally greater than rainfall with the exception of June and July. Between September and April, total monthly evaporation is between 2 and 3 times greater than the total monthly rainfall. Monthly average rainfall is greatest in January (78.3 mm) and lowest in April (43.0 mm).

The yearly average rainfall total for the Project Area is 680 mm indicating a typically dry climate. However, the range of monthly rainfall totals (i.e., minimum to maximum) indicates a variable climate where during dry periods very little rainfall occurs and wet periods where the maximum monthly rainfall ranges between 136.4 mm and 402.2 mm.

Evaporation in the Project Area is cyclic with a clear trend showing greater evaporation in warmer months and less evaporation in winter months. For each month, the difference between the minimum and maximum monthly total shows less variation than rainfall.



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Liverpool Range Wind Farm Project Development Corridor – External Transmission Line CWO REZ
- Liverpool Range Wind Farm Project Development Corridor – Wind Farm
- Crown Land
- 5km radius from centre of Quarry
- Property Boundary
- Road
- Drainage Line
- Non-associated Dwelling
- Associated Dwelling

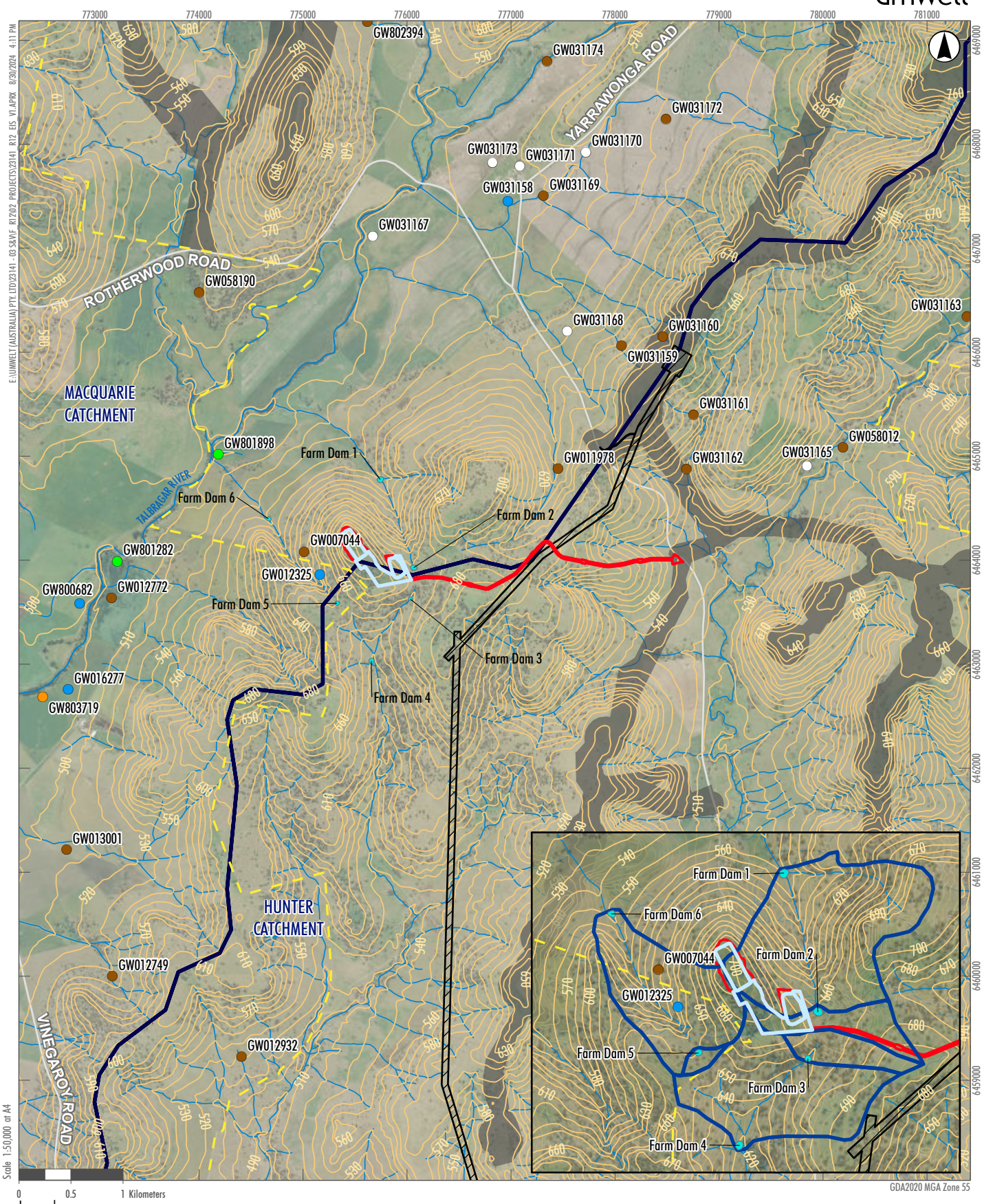
Land Use

- 1.3.3 Residual native cover
- 2.1.0 Grazing native vegetation
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 4.3.0 Irrigated cropping
- 5.2.0 Intensive animal production
- 5.2.2 Feedlots
- 5.4.0 Residential and farm infrastructure
- 5.4.2 Rural residential with agriculture
- 5.4.3 Rural residential without agriculture
- 5.4.5 Farm buildings/infrastructure
- 5.7.2 Roads
- 6.3.0 River

FIGURE 2.2

Land Use

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Liverpool Range Wind Farm Project Development Corridor – External Transmission Line CWO REZ
- Liverpool Range Wind Farm Project Development Corridor – Wind Farm
- SWM Catchments
- Catchment Boundary
- Farm Dams
- Road
- Drainage Line
- Contours

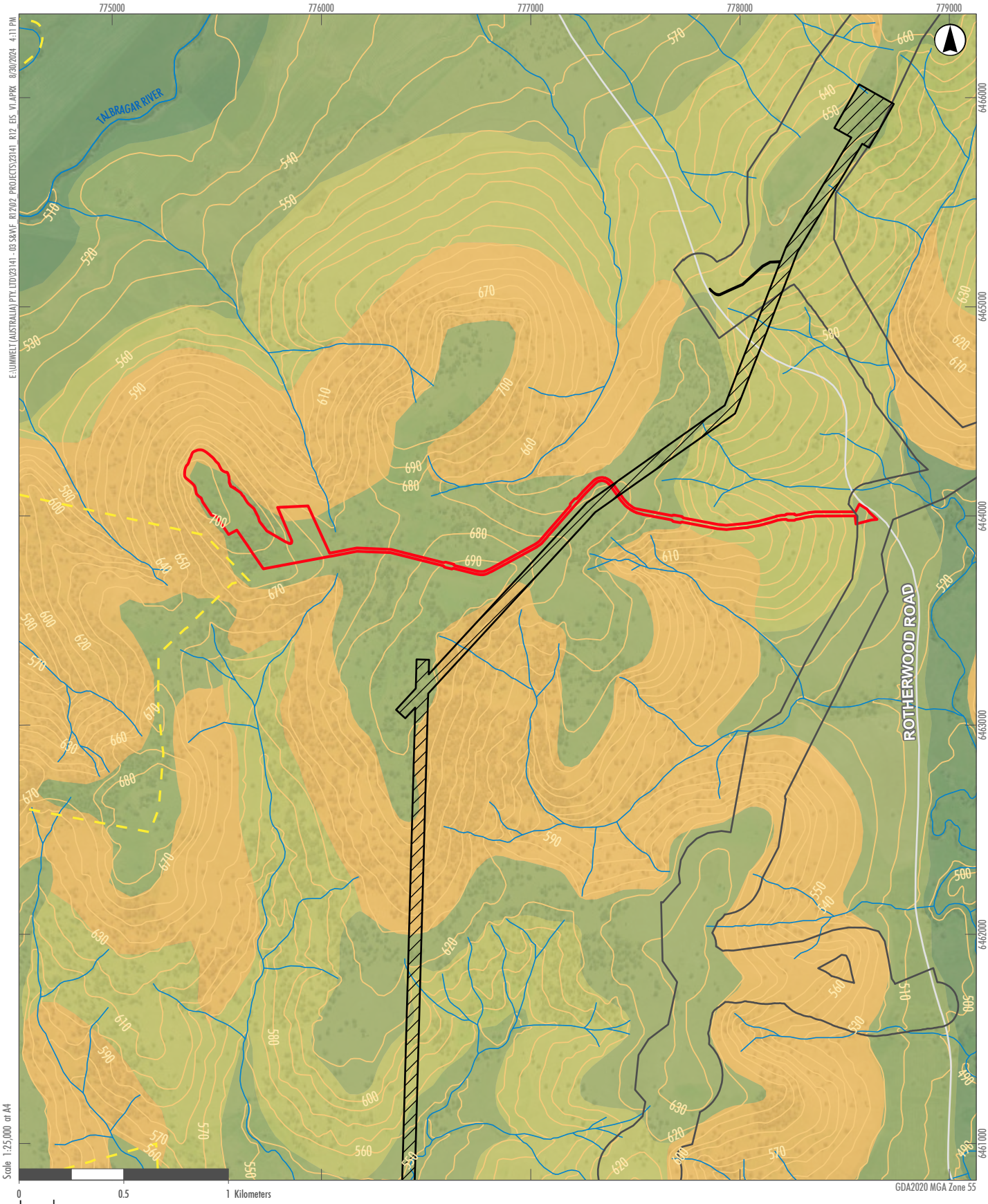
NGIS Bore Class

- Irrigation
- Monitoring
- Stock and Domestic
- Unknown
- Water Supply

FIGURE 2.3

Topography and Hydrology

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), © State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water 2010



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Liverpool Range Wind Farm Project Development Corridor – External Transmission Line CWO REZ
- Liverpool Range Wind Farm Project Development Corridor – Wind Farm
- Road
- Drainage Line
- Contours

Most Limiting LSC

- 1 - Very slight to negligible limitations
- 2 - Slight but significant limitations
- 3 - Moderate limitations
- 4 - Moderate to severe limitations
- 5 - Severe limitations
- 6 - Very severe limitations
- 7 - Extremely severe limitations
- 8 - Extreme limitations
- Not assessed
- Water

FIGURE 2.4

Land and Soil Capability Mapping

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), Department of Planning, Industry and Environment (2021)

2.5 Potential Cumulative Impacts

There are no other commercial-scale quarries located within the locality, while the closest operations with significant capacity to potentially supply the LRWF project are located in the Dubbo area, this is an approximately 300 km return trip.

There is significant renewable energy development occurring within the CWO REZ and the closest components of the Valley of the Winds Wind Farm (neighbouring the LRWF project), are located approximately 15 km west of the Project. Due to the distance between the Project and the Valley of the Winds project, cumulative noise and air quality impacts, even assuming concurrent construction periods, is unlikely.

The Cumulative Impact Assessment (CIA) Guidelines for State Significant Projects (DPIE, 2021) require the consideration of a project together with the impacts of other relevant future and existing projects in order to determine the potential cumulative impacts. The existing and proposed Projects requiring consideration are listed in **Table 2.1**. Further assessment of the potential cumulative impacts of the Project are discussed in the relevant assessments in **Section 6.0**.

There are a number of projects that are likely to have overlapping construction timeframes, however the potential cumulative impacts are limited given the nature of the Project and location within the LRWF project area. Additionally, the relatively small workforce required for the Project is likely to be sourced locally and therefore the Quarry's contribution to cumulative social impacts is expected to be minimal.

Given that if utilised the Project would provide a local source of construction materials for the LRWF project, the establishment of the quarry would ultimately reduce the cumulative traffic impacts associated with the construction of the LRWF project and other CWO REZ projects within the region. Additionally, the Project would reduce pressure currently applied to the construction industry and material supply through sourcing materials within the LRWF project area and freeing up resources for other projects.

Table 2.1 Existing and Proposed Projects in the CWO REZ

Developer	Project	Distance from Project
Energy Co	Central West Orana REZ Transmission Project	Overlaps with Project Area
Tilt Renewables	Liverpool Range Wind Farm	Project located within LRWF project area
RES Australia	Barneys Reef Wind Farm Tallawang Solar Farm	65 km South-West 65 km South-West
ACEN (previously UPC/AC Renewables)	Birriwa Solar Farm Stubbo Solar Farm Valley Of the Winds Wind Farm (located west of Coolah township)	82 km South-West 50 km South-West 15 km West
Marble Energy – Co	Cobbora Solar Farm	47 km South-West
Origin Energy	Dapper Solar Farm	80 km South-West
Acciona Energy Australia	Orana Wind Farm	84 km South-West
Lightsource bp	Sandy Creek Solar Farm	85 km South-West
Squadron Energy	Spicers Creek Wind Farm	58 km South-West

2.6 Partnerships

The Proponent has a land agreement in place with the landholders of the Project Area.

2.7 Alternatives

Various alternatives have been investigated by the Proponent to secure the required supply of suitable quarry material required to construct the LRWF project. The alternatives considered include:

- 'do nothing' (i.e., source the materials from the region surrounding the LRWF project area as approved)
- investigate alternate quarry sites outside of (though within close proximity to) the LRWF project area
- investigate alternate quarry sites within the LRWF project area.

2.7.1 'Do Nothing' Alternative

Without the Project the LRWF project could source construction materials (including road base, aggregate and drainage rock) from a range of commercial suppliers in the broader region, as approved under the original LRWF Development Consent. While the associated construction traffic volumes and routes associated with this option have been previously approved and therefore deemed to be acceptable, an improved economic, environmental and social outcome could be realised through sourcing the construction materials closer to the LRWF project area and, ideally, within the LRWF project area itself.

The Project would significantly reduce construction traffic volumes and distances travelled on the broader public road network, resulting in improved outcomes for the local and regional community, making it the preferred option over the 'do nothing' alternative. The reduced haulage distances will also have benefits in terms of reduced greenhouse gas emissions relative to the approved LRWF project. The additional supply of product from a local source rather than existing suppliers is also likely to reduce supply constraints for other users of extractive materials and reduce inflationary pressures associated with the increased demand. The shorter haul distances will also reduce supply pressures on road trucks required to haul quarry material with associated economic benefits relative to existing approved conditions.

2.7.2 Alternative Locations

A detailed opportunities and constraints assessment was undertaken by ARDG in the vicinity (both inside and out) of the LRWF project area. These investigations determined that the vast majority of the LRWF project area and surrounding areas is not suited to the production of quarry materials for the LRWF project, due to the very deeply weathered basalt soils and limited exposure of competent rock close to surface.

From a geological and topographic perspective, the Project Area is an ideal location for sourcing the optimum mix of raw materials required to produce high quality quarry products, that can be viably extracted while minimising the extent of surface disturbance. In addition, the close proximity of the Project Area to the areas where quarry product is required for the LRWF project, its relative isolation from any sensitive receivers and the opportunity to utilise a suitable resource within an existing highly disturbed environment with good road access, means that potential impacts the Project can be minimised, as would the haul distance for supply of materials to the LRWF project.

3.0 Project Description

The conceptual design for the Project has evolved throughout the environmental assessment process in response to preliminary environmental, social and cultural investigations, background monitoring, exploration and geological modelling, constraints and impacts identified during technical specialist studies and discussions with EnergyCo regarding potential interactions with CWO RES infrastructure. Project design has also taken into consideration the outcomes of stakeholder engagement undertaken during the scoping phase and EIS preparation.

3.1 Project Overview

A summary of the key aspects of the Project is provided in **Table 3.1**.

Table 3.1 Summary of Key Project Aspects

Aspect	Description
Project Life	Approximately 3 to 4 years, in line with the construction period of the LRWF project
Limit of Production	Up to approximately 700,000 tpa of quarry product per year
Project Area	Approximately 19.5 ha
Disturbance Area	Approximately 19.5 ha
Extraction Method	Drill and blast (Main Pit), free dig (Borrow Pit)
Material Processing	Processing on site using mobile crushing and screening plant
Overburden Management	Overburden will be minimal however any topsoil and overburden will be stockpiled on site for use in rehabilitation
Product Transportation	Road transport of up to approximately 700,000 tpa via Rotherwood Road and approved haul routes of the LRWF project
Site Access	Single access point on Rotherwood Road
Employment	Approximately 6 full-time employees, and 2 to 3 part-time employees
Hours of Operation	**Operations**: 7am to 6pm Monday to Friday 8am to 1pm Saturday No work on Sunday or Public Holidays **Blasting**: 9am to 5pm Monday to Friday (approximately 6 to 12 blasts per year)
Rehabilitation and Final Landform	Rehabilitation will be undertaken progressively where appropriate in the context of site development. A conceptual final landform will be prepared for the Project based on full extraction of the identified approximately 2 Mt of resources.

3.1.1 Project Area

As previously described in **Section 1.2** and shown on **Figure 1.2**, the Project Area covers approximately 19.4 ha and is located off Rotherwood Road approximately 10 km north of Cassilis township within the Upper Hunter Shire LGA. The Quarry pits are located on Lot 89 DP 750749 while the access road linking the

Project Area to Rotherwood Road is located on Lot 89 DP 750749 and Lot 2 DP 747190 also crossing an unnamed Crown road.

3.1.2 Project Layout

The conceptual layout of the Project is shown on **Figure 1.2** and comprises the following key components:

- Main extraction area ('Main Pit') covering an area of approximately 3.2 ha from where a high-quality basalt resource would be drilled, blasted and extracted, prior to processing. The Main Pit would be developed to a floor level of approximately 675 m AHD, with extraction undertaken as two benches with nominal height of 12.5 m.
- Satellite extraction area ('Borrow Pit') covering an area of approximately 1.9 ha, located 250 m to the south-east of the Main Pit. Highly weathered rock and clay would be extracted from the Borrow Pit by dozer/excavator, prior to being transported by truck to the main processing area for blending with rock from the Main Pit. The Borrow Pit would be developed to a floor level of approximately 660 m AHD.
- Processing and stockpiling area covering an area of approximately 2 ha adjacent to the southern edge of the Main Pit. Processing of extracted rock would be undertaken in this area using mobile crushing and screening equipment, with finished quarry products transferred to discrete stockpiles. As the pit face progresses, processing/stockpiling will occur in pit (i.e. below the natural ground surface), further shielding operations.
- Operational areas (peripheral to the above areas) covering an area of approximately 7.1 ha. These areas would accommodate internal temporary administration (mobile crib room/toilet facilities), peripheral topsoil bunds, access tracks, light vehicle parking and surface water management controls.
- A new all-weather sealed access road linking the operational areas with Rotherwood Road (8 m wide road surface with 1 m wide shoulders). The access road corridor would be approximately 2.9 km long and have a width of 15 to 20 m to allow for micro-siting of the final running surface (approximately 7 m wide, plus shoulder) and be used by road haulage trucks. It would contain several passing bays (30 m wide x 50 m long) and have a disturbance footprint of approximately 5.4 ha. Approximately 40 m of the access road crosses an unnamed Crown Road, while the alignment has been developed in consultation with EnergyCo to avoid the planned location of the CWO REZ 330 kV transmission line/tower. Transport of processed quarry material would be managed by the appointed civil contractor for the LRWF on an 'as needs' basis during the LRWF project construction period. Material from the quarry would also be used for the construction of the quarry access road.

Annual production from the Project is anticipated to be up to 700,000 tpa during the LRWF project construction phase. Total production over the 3 – 4 year LRWF construction phase is anticipated to be approximately 2,000,000 tonnes. Extraction quantities will be calculated by belt/loader scales. All materials produced by the quarry will supply the LRWF project only.

3.2 Quarrying Process

3.2.1 Site Preparation

Initial site preparation works are required prior to the commencement of quarrying operations and will include:

- removal of existing vegetation and topsoil along the access road, within the initial areas of extraction and processing, loading and administration areas
- stockpiling of vegetation and topsoil material for future re-use in rehabilitation
- removal and stockpiling of any surface rock considered suitable for eventual processing
- establishment of erosion and sediment control structures prior to initial site stripping/earthworks and construction of the processing and stockpiling areas
- construction of the site access point and associated access road from Rotherwood Road
- construction of operational areas
- construction of main processing/stockpiling area.

3.2.2 Extraction

The main hard rock target resource will be drilled and blasted to allow the rock to be broken into sizes which can be readily handled and transported to the processing area.

Drilling and blasting will be conducted using experienced drill and blast contractors. No explosives would be stored on site, with all explosives transported to the site from licensed suppliers and/or magazines as needed and loaded directly into the drill holes. Blasting will only be undertaken Monday to Friday, between 9 am and 5 pm. It is anticipated that approximately 6 to 12 will be required in a year, depending on LRWF project demand.

Following blasting, rock material will be loaded by front-end loaders or excavators into haul trucks at the quarry face and transported to the processing area for crushing and screening. Should the blasting result in the formation of oversize rock fragments, where possible these will be broken up using an excavator with a rock hammer prior to being loaded onto trucks.

Dozers will be used periodically to move blasted material within the pit to improve the efficiency of loading activities and will also be used for the construction of haul roads and loading areas within the pits. A water cart will be used to manage dust impacts associated with handling and haulage activities.

3.2.3 Product Processing and Stockpiling

Following extraction, quarry material will be processed through a series of mobile crushers to reduce the rock into various sized fragments. A series of mobile screens will then be used to sort the crushed rock into various sized categories, resulting in a number of different crushed rock products.

The production cycle consists of a three-stage crushing and screening process (primary, secondary and tertiary stages), with each stage producing finer quarry products. Highly weathered rock and clay extracted from the Borrow Pit would also be blended with rock from the Main Pit in the processing area to create a road base/capping product. Following processing, products will be stockpiled in readiness for dispatch in nominated product-specific stockpile areas.

During initial stages of operations, crushing and screening activities will occur on the surface in the processing and stockpiling area. Mobile crushing and screening plant will be screened to the south and south west through the installation of noise barriers and/or shipping containers to mitigate noise impacts. As the depth of the Main Pit progresses and there is sufficient room within the pit, the mobile crushers and screens will be relocated to the pit to further mitigate noise and dust impacts.

3.2.4 Loading and Transportation

Road trucks will access the site via a single access point on Rotherwood Road. Road trucks will be loaded from the stockpiles using wheel loaders. Loaded trucks will exit the site via the access point on Rotherwood Road and turn either left of right, depending on destination.

All materials produced by the quarry will supply the LRWF project only. Transport of processed quarry material would be managed by the appointed civil contractor for the LRWF project on an 'as needs' basis using only vehicles from the LRWF project approved heavy vehicle fleet and travelling only on existing approved haulage routes of the LRWF project. Other than truck movements associated with the delivery of quarry equipment prior to operations commencing and deliveries of fuel and other consumables, the quarry will not generate any additional truck movements.

The location of the quarry is such that any haulage of quarry materials from the Project to the LRWF project would result in a corresponding reduction in extractive material movements on the Golden Highway, as well as on the Vinegaroy Road link between the Golden Highway and Rotherwood Road component of the approved LRWF haul route.

3.2.5 Rehabilitation

At the completion of quarry operations, the site will be rehabilitated in consultation with the landowner to determine an appropriate, safe and stable landform(s) that can facilitate ongoing rural activities.

The exact timing of rehabilitation works will be dependent upon on the rate of resource extraction and the timing of the LRWF project construction. Stabilisation of the processing/stockpiling areas and operational areas will allow a return to pre-quarrying conditions in consultation with the landowner (e.g., re-seeded with appropriate pasture grass) and in accordance with all relevant approvals.

A final void will remain in the Main Pit and this is expected to periodically hold water but not form a permanent pit lake due to the high pan evaporation rates and limited catchment area of the final void. Safety berms will be constructed around the perimeter of steep slopes of the void and may be fenced (to prevent inadvertent access by stock and humans), in consultation with the landowner. An access ramp will be retained to the pit benches and floor.

The Borrow Pit will be reshaped to form a small farm dam with surrounding disturbed areas top-dressed with stockpiled topsoil and revegetated with pasture species.

3.3 Plant and Equipment

The Project will utilise a fleet of mobile plant and equipment for initial and ongoing site operations. A typical list of mobile equipment is provided in **Table 3.2**, noting that the type and specifications of equipment may change during the life of the Project to meet operational demands and to reflect changes in technology.

Table 3.2 Typical Mobile Equipment

Activity	Equipment
Clearing, topsoil stripping, overburden removal, bench development, shaping emplacement areas, on site haulage	Front-end loader, dozer, grader, excavator, dump truck (rigid body and articulated), water truck (rigid road truck)
Drilling for blasting activities	Blast hole drill rig
Product processing	Mobile/modular crushing and screening plant
Stockpiling and dispatch loading	Wheel loader
Road haulage	Road trucks (e.g., semi-trailer/truck and trailer)
Dust suppression	Water cart
Miscellaneous	Light 4WD vehicles, maintenance and servicing trucks

All plant will be delivered to site via public roads on low loader semitrailers. It is anticipated that equipment used for the initial access road development will be delivered to site over a one-week period with additional plant associated with Pit development delivered over a 2 – 3-week period following initial access road development (noting that quarry product will be used for access road construction works). The transport route for this plant would be via Vinegaroy Road, either via Coolah (subject to height and load restrictions) or the Golden highway. No upgrades to any intersections are considered necessary for transport of this plant to site given the low numbers of movements and the period during which movements will occur.

3.4 Services and Utilities

The Project Area is not currently serviced by electricity, telecommunications, water or sewage infrastructure.

Electricity will be provided by a generator to be located in proximity to the administration area. Telecommunications will be managed through mobile network connection.

Water will be required for dust suppression on the processing plant and across all disturbed areas of the site as required. Water supply for dust suppression will be sourced from either water collected in sediment control structures and/or an existing licensed bore located on Lot 5 DP 883170 owned by the quarry site landholder. Water from this bore is currently pumped to two tanks located approximately 270 m to the east of the Project Area.

Potable water for amenities will be supplied to the site by water tanker. Wastewater from amenities will be collected in a tank and removed from site by a licensed waste contractor as required.

Refuelling of plant and equipment will be undertaken on site within a hardstand fuel storage area which would comprise (typically) 10,000 to 20,000 L self-bunded diesel storage tank/s and a grease and oil storage area for the storage of grease drums and intermediate bulk containers (IBC) for engine oils. The storage area, refuelling area and equipment servicing area would be fully bunded and fitted with oil-water separators to process any petrochemical spills, in accordance with relevant Australian Standard requirements. All waste products would be stored within dedicated IBC that are emptied periodically by licensed waste contractors. Mobile plant may also be refuelled using a portable diesel fuel tank mounted on the rear of a quarry service vehicle.

3.5 Hours of Operation

Construction and operation activities at the quarry will take place from 7 am to 6 pm Monday to Friday and 8 am to 1 pm on Saturdays, Minor non-operational works such as maintenance activities to be undertaken outside these hours as necessary.

All blasting will occur between 9 am and 5 pm Monday to Friday.

No operations are proposed on Sundays or public holidays apart from maintenance activities as required.

3.6 Workforce

The approximate workforce breakdown is provided in **Table 3.3**.

Table 3.3 Workforce

Activity	Construction workforce	Operation workforce
Quarry operators	3 – 4 operators and 1 – 2 supervisor(s)/general hand(s)	Approximately 4 operators, and 1 – 2 supervisor(s)/general hand(s)
Drill and blast crew	2 – 3 (prior to initial blast and commencement of operations for a period of 7 – 10 days, weather dependent) 8 – 10 crew will be present on the day for loading and firing of the shot	2 – 3 (prior to each blast for a period of 7 – 10 days, weather dependent) 8 – 10 drill and blast crew will be present on the day for loading and firing of each shot.

Sufficient parking will be provided on site for employee vehicles.

3.7 Environmental Management

The Proponent will develop and implement an Environmental Management Strategy (EMS) as part of the Project to provide the strategic framework for environmental management of all components of the Project. The EMS would:

- incorporate an Environmental Management Plan (EMP), including all required sub-plans, protocols, management and mitigation measures proposed in this EIS
- identify all relevant statutory approvals

- establish roles, responsibilities, authority and accountability of all key personnel involved in the environmental management of the Project
- establish procedures for consulting with the local community and relevant stakeholders about the operation and environmental performance of the Project
- establish procedures for handling of complaints, disputes, non-compliances and emergency response.

Appendix 5 provides a consolidated summary of the management measures to be implemented during the construction and operation of the Project to manage, mitigate and/or monitor potential impacts identified within this EIS.

4.0 Statutory Context

The statutory provisions applying to the Project with respect to environmental assessment and planning approval at Commonwealth, State and local level, and the roles these play in the Project's assessment and determination, are outlined in **Table 4.1** below. In addition, reference tables of the relevant statutory requirements for the Project, and where these have been addressed in the EIS, are provided in **Appendix 3**.

Table 4.1 Statutory Context

Category	Relevant Statutory Requirements
Permissibility *Upper Hunter Local Environmental Plan 2013* and *State Environmental Planning Policy (Resources and Energy) 2021*	The Project Area is located within the Upper Hunter Shire LGA and is subject to the provisions of the *Upper Hunter Local Environmental Plan 2013* (LEP). As previously noted, the Project comprises development for the purposes of an extractive industry. The Project Area is zoned RU1 Primary Production under the LEP (refer to **Figure 1.2**) and extractive industries are permitted with consent. Notwithstanding this, clause 2.9(3) of the *State Environmental Planning Policy (Resources and Energy) 2021* (Resources and Energy SEPP) also provides that development for the purpose of an extractive industry may be carried out with consent on land on which development for the purposes of agriculture is permissible (with or without consent). Extensive agriculture and intensive plant agriculture are permitted without consent in the RU1 zone. The proposed quarry development is therefore permissible with consent under current planning controls applicable to the and development consent under Part 4 of the EP&A Act is required.
Power to grant approval *Environmental Planning and Assessment Act, 1979* and *State Environmental Planning Policy (Planning Systems) 2021*	Section 4.36 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) provides for the declaration of a project as SSD. Under the EP&A Act, the declaration of a project as SSD can be made by meeting the requirements of a SEPP or by being so declared by the Minister for Planning and Public Places. Clause 7(1) of Schedule 1 of *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP) prescribes that development for the purpose of extractive industries is declared to be SSD if it extracts more than 500,000 tpa of extractive material or extracts from a resource of more than 5 million t. The Project will extract up to 700,000 tpa of extractive material and accordingly the Project is SSD and the development assessment processes will be subject to the requirements of Division 4.7 of the EP&A Act. The development application will be lodged with the Planning Secretary of the Department of Planning, Housing and Infrastructure (DPHI). The consent authority for SSD projects is either the Minister for Planning and Public Places or, if certain conditions are satisfied, the NSW Independent Planning Commission (IPC). Section 4.5(a) of the EP&A Act provides that the IPC is the consent authority for SSD where it is declared to be the consent authority under an environmental planning instrument (EPI). Under clause 2.7 of the Planning Systems SEPP, the IPC is declared to be the consent authority for SSD development in the following circumstances: • where the Council of the relevant area within which the Project is proposed has objected to the development within the exhibition period • where at least 50 submissions objecting to the development have been made within the exhibition period • where the applicant has made a reportable political donation under section 10.4 of the EP&A Act. The Proponent has not made a reportable political donation.

Category	Relevant Statutory Requirements
Consistent approvals (section 4.42 of the EP&A Act)	***Protection of the Environment Operations Act 1997*** **(POEO Act)** An Environment Protection Licence (EPL) will be required for the operation of the Project as it meets the definition of an extractive industry under clause 19(3) of Schedule 1 of the POEO Act, as it involves the extraction or processing of more than 30,000 tonnes of extractive materials per year. Section 4.42(1)(e) of the EP&A Act applies to SSD projects and requires that the granting of an EPL must not be refused if the development work or activities to be the subject of the EPL are necessary for carrying out an approved project and is to be substantially consistent with the consent.
Consistent approvals (section 4.42 of the EP&A Act)	***Roads Act 1993*** **(Roads Act)** The consent of the relevant roads authority is required under section 138 of the Roads Act for works or structures that disturb the surface of a public road or connect a road to a classified road. However, section 4.42(1)(f) of the EP&A Act applies to SSD projects and requires that a consent under section 138 of the Roads Act must not be refused, if the works are necessary for carrying out an approved project and are substantially consistent with the consent. The Project will require the establishment of site access off Rotherwood Road and hence a consent under section 138 of the Roads Act will be required.
Commonwealth approvals	***Environment Protection and Biodiversity Conservation Act 1999*** **(EPBC Act)** Under the EPBC Act, the approval of the Commonwealth Minister for the Environment is required for any action that may have a significant impact on prescribed matters of national environmental significance (MNES). On 15 August 2024, the Project was determined to be a Controlled Action, requiring approval under the EPBC Act due to its potential impact on listed threatened species and ecological communities. The Project will therefore be assessed under the bilateral agreement between the Commonwealth and NSW Governments.
Other legislation	***Water Management Act 2000*** **(WM Act)** The Aquifer Interference Policy (AIP) requires that, where an activity will take water from a source covered by a water sharing plan (WSP), a water access licence is required under the WM Act to account for this loss of water. No groundwater was encountered during investigative drilling of the proposed quarry resource and based on standing water levels in levels nearby groundwater bores, groundwater levels in the vicinity of the site are well below the base of proposed extraction. Further, there is little to no opportunity for horizontal flow within groundwater systems towards the proposed quarry pit. The Project has been designed to remain well within the limits of the low permeability hard rock resource, thereby limiting potential for interaction with groundwater. Given the unlikely interactions with groundwater, a detailed Groundwater Impact Assessment has not been prepared. A Surface Water Impact Assessment has been prepared to assess licensing requirements in relation to surface water resources (refer to **Section 6.5.1** and **Appendix 9**). Section 4.41 of the EP&A Act identifies authorisations that are not required for SSD. Under these provisions, the Project does not require a water use approval under section 89; a water management work approval under section 90; or an activity approval under section 91.
Other legislation	***Biodiversity Conservation Act 2016*** **(BC Act)** Under the BC Act, biodiversity assessment in accordance with the Biodiversity Assessment Method (BAM) is required for any SSD project. The Project (as SSD) triggers the need to prepare a Biodiversity Development Assessment Report (BDAR) in accordance with the BAM which must be considered by the consent authority before development consent may be granted (refer to **Section 6.6** and **Appendix 11**).

Category	Relevant Statutory Requirements
Other legislation	***National Parks and Wildlife Act 1974* (NPW Act)** Under section 86 of the NPW Act, it is an offence to harm an Aboriginal object, except where authorised by an Aboriginal heritage impact permit issued under section 90 of the Act. As SSD, pursuant to section 4.41 of the EP&A Act, it is not necessary for the Project to obtain an Aboriginal heritage impact permit under the provisions of section 90 of NPW Act, however assessment of potential impacts on Aboriginal cultural heritage is still required and an Aboriginal Cultural Heritage Assessment (ACHA) has been completed for the Project (refer to **Section 6.7.1** and **Appendix 12**).
Other legislation	***Explosives Act 2003* (Explosives Act)** Under the Explosives Act a licence is required for any storage of explosives. Explosives will not be stored on site and, as such, a licence for the storage of explosives is not required. The transport and management (including all licensing requirements) of all explosives used on site will be managed by the relevant contractor.
Pre-conditions (refer to **Appendix 3** for details)	*State Environmental Planning Policy – (Resources and Energy) 2021* Chapter 2 – Mining, Petroleum Production and Extractive Industries The relevance of each of these SEPPs to the Project is discussed in **Appendix 3**.
Pre-conditions (refer to **Appendix 3** for details)	*State Environmental Planning Policy (Biodiversity and Conservation) 2021* – Chapter 3 and Chapter 4 Koala Habitat Protection The relevance of each of these SEPPs to the Project is discussed in **Appendix 3**.
Pre-conditions (refer to **Appendix 3** for details)	*State Environmental Planning Policy (Resilience and Hazards) 2021* – Chapter 3 Hazardous and Offensive Development The relevance of each of these SEPPs to the Project is discussed in **Appendix 3**.
Pre-conditions (refer to **Appendix 3** for details)	*State Environmental Planning Policy (Transport and Infrastructure) 2021* – Chapter 2 Infrastructure The relevance of each of these SEPPs to the Project is discussed in **Appendix 3**.
Mandatory matters (refer to **Appendix 3** for details of where addressed in this EIS)	Section 1.3 EP&A Act – Objectives of the EP&A Act
Mandatory matters (refer to **Appendix 3** for details of where addressed in this EIS)	Section 4.15(1) EP&A Act – Matters for consideration by the consent authority in assessing the SSD application, including the requirements of environmental planning instruments

Category	Relevant Statutory Requirements
Mandatory matters (refer to **Appendix 3** for details of where addressed in this EIS)	Part 8 Division 2 of the EP&A Regulation – Assessment requirements for SSD development
Mandatory matters (refer to **Appendix 3** for details of where addressed in this EIS)	Part 8, Division 5 of the EP&A Regulation – Form and content of an EIS.

5.0 Engagement

The SEARs require the EIS to detail the engagement undertaken and demonstrate how it is consistent with *Undertaking Engagement Guidelines for State Significant Projects* (DPE, 2022) (SSD Engagement Guidelines).

Tilt Renewables and ARDG undertook consultation with Government and Community Stakeholders (including Warrumbungle Shire Council (WSC) and the Upper Hunter Shire Council (UHSC)) regarding the construction and operation of the Project concurrently with the engagement undertaken in relation to the LRWF Mod-1 Project and the proposed temporary workforce accommodation. It is noted that at the time this consultation was undertaken, it had been contemplated that the Quarry would form a component of an amended LRWF Mod-1 application along with the Temporary Workforce Accommodation (TWA). This consultation included communicating the results of environmental assessment studies undertaken in relation to the proposed Quarry.

Most of the community engagement during the scoping phase of the Project was delivered through in-person meetings with neighbouring landholders, key stakeholder meetings and through three drop-in community sessions held over three days between 24 and 26 October 2023 in the local townships of Cassilis and Coolah. The engagement conducted during this period specifically covered details regarding the quarry aspects of the (at that time proposed) LRWF Mod-1 application. While stakeholders could provide feedback or ask questions about the broader LRWF project, the engagement was specifically related to the quarry which now forms the Project.

It was observed during the Scoping phase that community interest and concerns about the proposed Quarry were limited; however, it was also acknowledged that the engagement in the Scoping phase covered both the Quarry and the proposed temporary workers accommodation in the context of the broader LRWF project which may have detracted focus away from the Quarry. Additional efforts to engage with a range of stakeholders were therefore made during the preparation of the EIS to elicit focussed feedback on the Project. This additional consultation focused solely on the quarry to ensure relevant stakeholders had additional space, time, and opportunity to provide feedback on the Project without the wider consultation on the LRWF project.

The majority of this engagement was delivered through in-person meetings and phone calls with neighbouring landholders, meetings with Upper Hunter and Warrumbungle Shire Councils, and through two community drop-in sessions held on 30 April and 1 May 2024 in the local townships of Coolah and Cassilis.

In addition to the stakeholders referenced above, additional stakeholders consulted included:

- Cassilis District Development Group
- NSW Government Departments
- Department of Climate Change, Energy, Environment and Water (DCCEEW) - Commonwealth
- Aboriginal people registered for the aboriginal Cultural heritage assessment processes undertaken for the LRWF project and involved in surveys of the Project Area when initially assessed as part of the LRWF Mod-1 application.

The additional engagement undertaken during the EIS phase indicates that community interest in the Project remained low. A likely contributing factor to this is the recency of the engagement conducted for the scoping phase and the fact there was no material change to the Project since that time. The SIA concludes that the outcome of the engagement undertaken, while low in terms of response, is proportionate to the level of broader community interest and concern associated with the Project. Additionally, the consultation was undertaken to provide key community stakeholders and individuals with the opportunity to provide feedback on the Project on its own.

Outcomes from the consultation activities are detailed in the following sections and discussed further in the Social Impact Assessment, refer to **Appendix 15**.

5.1 Agency Consultation

Agency and government consultation undertaken to-date in relation to the Project is provided in **Table 5.1**.

No significant issues were raised during consultation with any of the agencies, however, guidance was provided on matters to be assessed in this EIS. Consultation included Project briefings, discussion of the scope of the specialist assessments and SEARs requirements and reporting of specialist assessment results.

Table 5.1 Government Agency Consultation

Agency	Notes	Relevant EIS Section
DCCEEW – Commonwealth	DCCEEW advised via email that an additional project briefing was not required prior to submitting the referral.	NA
DCCEEW NSW – Heritage	Heritage advised via email that based on the information presented in the Scoping Report, Heritage NSW did not require a project inception meeting or similar. However, advised that should any issues relating to Aboriginal cultural heritage arise as the assessment progresses, to contact them to arrange a meeting.	**Section 6.7.1**
Environment Protection Authority (EPA)	ARDG and Umwelt met with the EPA in April 2024 and provided a project overview, justification and overview of EIS assessment results including exclusion of air quality monitoring. EPA advised Site Audit Statement for contamination originally included in SEARs letter is not required for this Project. However, advised the EIS should include overview of risk of contamination and inclusion of appropriate response in EMP should contamination be encountered during operations.	**Section 6.4** **Section 6.11.3**
DCCEEW – Biodiversity, Conservation and Science (BCS)	ARDG and Umwelt met with BCS in May 2024 and provide a project overview, biodiversity survey results and an overview of the approach to preparing the Biodiversity Development Assessment Report (BDAR). BCS provided the following comments/advice: • Advice in relation to development of species polygon for the Striped Legless Lizard (*Delma impar*). • It was noted by BCS that consultation is required in relation to the survey methodology for the Striped Legless Lizard. • BCS requested that way points of sample locations for flora specimens sent to the herbarium for identification are included to demonstrate adequate sampling across the site.	**Section 6.6**

Agency	Notes	Relevant EIS Section
	• BCS requested the BDAR to provide evidence of Serious and Irreversible Impacts (SAII) consideration with regards to proposed impacts to Box Gum Woodland Critically Endangered Ecological Community (CEEC). • BCS also provided advice in relation to survey effort.	
DCCEEW – NSW Water	DCCEEW were contacted several times to organise a meeting to discuss the Project, a response was received indicating that due to resourcing constraints a meeting was not possible unless there was a specific issue that needed to be discussed, which was to be outlined in an email for review.	**Section 6.5**
Crown Lands	ARDG and the Umwelt Team met with Crown Lands to discuss the interaction of the Project with the unnamed crown road within the Project Area. Due to the timeframes associated with closing or transferring the crown road (being potentially longer than the operation of the Project) the project layout was refined to cross the crown road only (not upgrade a length of the crown road). This approach was then discussed with Crown Lands via email following the meeting.	NA
TfNSW	ARDG, Umwelt and Constructive Solutions met with TfNSW in May 2024. The meeting focussed on the potential traffic impacts of the project. TfNSW raised matters related to use of the Golden Highway / Vinegaroy Road intersection for mobilisation of plant and equipment.	**Section 6.8 and Appendix 11**
Warrumbungle Shire Council	ARDG and Umwelt met with Warrumbungle Shire Council (WSC) in April 2024. Key comments from council included: • WSC was focused on the impact to Warrumbungle Shire • Queried the references to Part 5 approvals and Ancillary development meant in the scoping report – ARDG confirmed the Project seeks approval to supply the construction of the LRWF only and does not seek consent for any other purpose • WSC advised they would like to be consulted further regarding the TIA and want transparency on tonnage and where it will be hauled with detail relating to assumptions to be outlined in the TIA (note an additional meeting was offered to Council however the meeting did not occur) • WSC requested a full explanation of the relationship between ARDG and Tilt and commercial arrangements • WSC advised they will seek a planning agreement based on tonnage hauled (not CIV), if continuing with commitments within the LRWF project consent, the EIS must outline in detail the approach to road upgrades and requirements of Tilt Renewables • WSC acknowledged the Benefits of the project and removal of trucks • WSC referred to their Planning Agreement guideline relating to renewable energy however do not have one relating to extractive industries, advised the EIS and TIA are utilised to determine impact and quantum of contribution • WSC are concerned about the potential cumulative impact of the Project and renewable energy development.	**Section 6.8**

Agency	Notes	Relevant EIS Section
Upper Hunter Council	ARDG and Umwelt met with Upper Hunter Council (UHC) in April 2024. Key comments from council included: • UHC noted the benefits of the project • UHC the operating timeframe and whether the quarry was planned to be available for maintenance – ARDG confirmed this was not proposed • UHC is interested in having access to the resource for UHC road works (however noted this is not being proposed) • UHC queried the difference in traffic movements and how that corresponds with what Tilt Renewables is proposing in the amendment TIA for the LRWF project • UHC queried the workforce numbers and housing of workforce • Contribution plan – UHC queried the approach to contributions and referenced their extractive industries contribution plan – ARDG advised that contributions associated with traffic movements are covered by the LRWF project development consent, no additional contribution is proposed.	**Section 6.8**

5.2 Community Consultation

As previously discussed, community interest and concern in the Project was low. From the sample of the community that completed the Project survey, 6 of the 13 sample respondents consisted of residents residing within 5 km of the Project Area (indicating that multiple residents from at least one of the 5 proximal dwellings responded). Given the small number of respondents and the multiple engagement mechanisms that were used to elicit responses, it can be concluded confidently that there was less interest in the Project across the wider social locality, but increased interest from residences near to the Project Area.

The community consultation undertaken during the EIS phase is outlined in **Table 5.2**.

Table 5.2 EIS Phase – Community Engagement Mechanisms

Mechanism	Description	Target Stakeholders	Timing / Responsibility	No. of People Consulted / Informed
Proximal landholder meetings (neighbours within 5 km)	Ongoing face-to-face discussions and phone calls with neighbouring landowners.	Neighbouring residents (Neighbours identified shared a boundary with the Project)	Since May 2023 ARDG	3
Community Groups meeting	Phone discussion with Chair of Cassilis District Development Group.	Broader Community Community Groups	7 May 2024 ARDG	1
Community Drop-in Sessions	Two community drop-in sessions were conducted by ARDG and Umwelt to engage with and solicit feedback from the broader community. One session was held in a premises on Binnia Street in Coolah (the town's main street), and one session was held at the Cassilis Bowling Club in Cassilis. Both locations were chosen as convenient and locally recognisable locations to maximise traffic and opportunities for feedback. These sessions were publicised in local newspaper advertorials and the Project Community Information Sheet (refer below for further details).	Broader community	30 April and 1 May 2024 Hosted by ARDG Attended by Umwelt	Total 6 attendees
Community Survey	Paper feedback surveys for the Project were provided during the community drop-in sessions. A link to the online feedback survey, hosted by Umwelt, was also circulated and available via the Project website and QR codes for participants to complete either then or at a later date were also included on the Community Information Sheet described below. The survey is provided as Appendix A of the SIA, refer to **Appendix 16**.	Broader Community Community Groups	Online survey live from 22 April – 17 May Umwelt	4 online 0 paper
Project Website	Project information is included on ARDG's website. The website was updated in early 2024 to reflect the change of proponent from Tilt Renewables to ARDG.	Broader community	Ongoing – updated regularly ARDG	Unknown

Mechanism	Description	Target Stakeholders	Timing / Responsibility	No. of People Consulted / Informed
Media and Communications	An advertisement for the Community Information Sessions was made in the Coolah District Diary newspaper, including notice of the Quarry's change of proponent from Tilt Renewables to ARDG.	Broader community	24 April ARDG	Reach of approx. 3,500 people
Community Information Sheet	ARDG's Quarry Community Information Sheet issued to 25 households on Rotherwood Road, Vinegaroy Road and Yarrawonga Road to communicate the change of Project proponent from Tilt Renewables to ARDG, the requirement for additional consultation, details about the proposed Quary, assessment processes, and upcoming community drop-in sessions. The sheet also included a QR code to the online survey. The Community Information Sheet is provided as Appendix B of the SIA, refer to **Appendix 16**.	Neighbouring residents	22 April ARDG	25 households

5.3 Key Community Issues

The use of a local source of quarry material for the LRWF project is a direct response to comments received by community members and other stakeholders during the consultation and public exhibition processes for the LRWF EIS and Mod-1 application regarding potential impacts associated with construction traffic on the broader road network. As noted in **Section 5.2** community views have also been considered in design and assessment of Project. Consistent with the requirements of the SSD Engagement Guidelines (DPE, 2022), these community views have been grouped into the following categorised:

- the strategic context, including identifying the key natural and built features that are valued in the area and could be affected by the Project
- the design of the Project and any alternatives considered
- any relevant statutory issues
- community engagement (e.g. the level or quality of engagement carried out during the preparation of the EIS, the community engagement that should be carried out if the Project is approved)
- the economic, environmental and social impacts of the Project
- the justification and evaluation of the Project as a whole (e.g. consistency of project with Government plans, policies or guidelines; merits of the Project)
- issues that are either beyond the scope of the Project (e.g. broader policy issues) or not relevant to the Project.

Based on the community consultation undertaken to inform the SIA (refer to **Section 6.14**), the key themes in community concern centre around the environmental and social impacts of the Project. Stakeholders were most concerned about potential amenity impacts of the Project such as air quality, noise, visual amenity and traffic.

Perceived positive impacts associated with the Project were also noted and included the benefit of reduced traffic movements (relative to the approved LRWF project), local procurement and employment opportunities and community support/funding.

Refer to **Table 5.3** for further detail.

Table 5.3 Perceived community concerns and benefits

Category	Concerns	Section Addressed	Benefits	Section Discussed
Strategic Context	-	-	• Future opportunity for the quarry to be used for other purposes (subject to additional approval requirements)	**Section 5.0**
Justification and Evaluation of the Project	-	-	• Procurement opportunities for local business • Employment opportunities for local workers • Opportunity to support local community initiatives • Reduced traffic movements	**Section 6.0 and Section 7.0**
Community Engagement	• Information transparency and communication	**Section 5.0**	-	**-**
Economic, Environmental, and social impacts of the Project	• Air quality • Visual amenity • Traffic impacts • Noise and Vibration • Waste management • Agricultural impacts • Property devaluation	**Section 6.0**	• Reduction in traffic leading to increased traffic and road safety • Increased economic security for host landholder	**Section 6.0**
Project Design	-	**-**	• Project design has sought to minimise environmental impact	**Section 6.0 and Section 7.0**
Issues that are beyond the scope of the Project	• Perceived inequity of benefit and impact distribution	**Section 6.14**	-	**-**

5.4 Ongoing Engagement

Ongoing community engagement relating to the Project will be guided by the following industry and government standards and frameworks including the Engagement Guidelines for State Significant Projects (DPE, 2022a).

Should the Project be approved, ARDG will prepare a Community and Stakeholder Engagement Plan (CSEP) prior to construction commencing. The CSEP will guide ongoing regular consultation with the community to provide transparent information relating to the Project, particularly in relation to management and monitoring. The CSEP will also be reviewed regularly to capture new stakeholders and update the key project messages as the Project progresses. ARDG will also communicate Project developments through engagement with the Community Consultation Committee (CCC) for the wider LRWF project. Further details regarding the CSEP are contained in **Section 6.14** and the SIA, refer to **Appendix 15.**

6.0 Assessment and Mitigation of Impacts

6.1 Preliminary Environmental Risk Analysis

Following on from the scoping process, the identification of key environmental and community issues to be considered in this EIS was refined based on:

- the environmental and strategic context for the locality (refer to **Section 2.0**)
- outcomes of the stakeholder engagement process (refer to **Section 5.0**)
- the SEARs for the Project (refer to **Appendix 2**)
- specialist assessments completed as part of the preparation of this EIS (refer to the remainder of this section)
- a risk analysis of potential environmental and social impacts.

The key issues identified included:

Noise – potential noise disturbance to surrounding landholders associated with quarry operations, also noise associated with changed traffic movements associated with the Project (refer to **Section 6.2**).

Blasting – potential vibration impacts on surrounding landholders from blasting activities associated with quarry operations (refer to **Section 6.3**).

Air Quality and Greenhouse Gas – potential air quality impacts associated with the Project on surrounding landholders (refer to **Section 6.4**)

Water Resources – potential for quarry operations to impact on surface water (refer to **Section 6.5**)

Biodiversity – the Project will require the removal of native vegetation and potential loss of fauna habitat (refer to **Section 6.6**)

Heritage – ground disturbance associated with the Project has the potential to impact on Aboriginal Cultural Heritage (refer to **Section 6.7**)

Traffic and Transport – the Project represents an overall reduction in traffic movements (relative to the approved LRWF project) however does require additional traffic movements along a section of Rotherwood Road. This reduction in traffic and proposed change in movements along Rotherwood Road required further detailed assessment (refer to **Section 6.8**)

Land Resources – the Project has the potential to impact on soil and land capability, geotechnical stability and surrounding land uses (refer to **Section 6.9**)

Hazard and Risk – assessment of potential hazards associated with the Project is required including storage of hazardous materials, bushfire threat and contamination (refer to **Section 6.11**)

Visual Amenity – the Project introduces built form and disturbance into the landscape with potential to impact on existing visual amenity (refer to **Section 6.12**)

Social Impact – The Project has the potential to result in both positive and negative social and economic impacts. The Project is proposed to support construction of the LRWF project directly reducing the cumulative impact of traffic generation and impact on local services, however, has the potential to impact on the amenity of nearby landholders (refer to **Section 6.14**)

Economic Impact – The Project will provide a range of economic benefits to different stakeholders which will also flow through to the Local and NSW Economy. Any adverse economic impacts will be offset through landholder agreements or through management and mitigation measures (refer to **Section 6.15**)

Rehabilitation and Final Landform – Rehabilitation of the quarry will address the long-term stabilisation of both quarried and disturbed areas. A Quarry Closure Plan will be detailed in the EMP prepared for the Project. Both the conceptual final landform and the Quarry Closure Plan will be based on a final land use focused on promoting the re-establishment of grazing activities on the site consistent with landowners current rural/grazing land use (refer to **Section 6.16**)

6.2 Noise

An Environmental Noise Assessment was undertaken by Sonus Pty Ltd (Sonus) to determine the likely construction, operational and transportation noise impacts of the Project. Consistent with the requirements of the SEARs, the assessment was undertaken in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009), *Noise Policy for Industry* (NPfI) (EPA, 2017) and the *NSW Road Noise Policy* (RNP) (DECCW, 2011), and having regard to the *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (VLAMP) (NSW Government, 2018).

A copy of the Environmental Noise Assessment report is provided in **Appendix 5** and a summary of the key outcomes is provided below.

6.2.1 Background Noise Environment

The Project and surrounding area are zoned as RU1 – Primary Production and background noise levels in rural areas are typically low. Background noise monitoring was undertaken at nearby locations, representative of the local receiver environment, from 13 October 2020 to 27 November 2020 and from 2 August 2023 to 12 September 2023.

The background noise levels included noise from natural sources, such as wind in trees, insects and birds. Background noise levels were measured at less than 35 dB(A) during the day and less than 30 dB(A) during the evening and night.

6.2.2 Assessment Criteria

6.2.2.1 Operational Noise

The operational noise criteria applicable to the Project have been derived in accordance with the NPfI, based on measured background noise levels.

The NPfI sets out two noise criteria to assess the potential noise impacts resulting from industrial activity. The first is used to control short-term intrusive noise and its impacts on residences, while the second is used to protect against cumulative noise impacts and maintain noise level amenity for particular land uses including residences.

The Project Noise Trigger Levels (PNTLs) derived in accordance with the NPfI are the lower (that is, the more stringent) values of the Project Intrusiveness Noise Level (PINL) and Project Amenity Noise Level (PANL) in terms of $L_{eq,15\ min}$ noise levels. Applying the more stringent of the two as the PNTL ensures that intrusive noise is limited, and amenity is protected and that no single industry can unacceptably change the noise level of an area.

The PNTLs provide a benchmark or objective for assessing a proposal or site. The PNTL is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response, for example, further investigation of mitigation measures.

A summary of PNTLs for the Project derived in accordance with the NPfI is provided in **Table 6.1**. The criteria represent the lowest (i.e. most stringent) criteria applicable to industrial development under the NPfI.

Table 6.1 Project Noise Trigger Level Summary – Receiver Type – (Residential – Rural)

Time of day	Minimum Project Intrusiveness Noise Level (Leq,15min)	Project Amenity Noise Level (Leq,15min)	Project Noise Trigger Level (Leq,15min)
Day	40 dB(A)	48 dB(A)	40 dB(A)
Evening	35 dB(A)	43 dB(A)	35 dB(A)
Night	35 dB(A)	38 dB(A)	35 dB(A)

Note: Day period is 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.

6.2.2.2 Construction Noise

Noise related to the construction and decommissioning of the Project is assessed in accordance with the ICNG. Standard hours for construction work within the ICNG are recommended as the following:

- Monday to Friday – 7am to 6pm
- Saturday – 8am to 1pm
- No work on Sundays or public holidays.

The ICNG provides an emphasis on the implementation of feasible and reasonable noise reduction measures and does not set mandatory objective criteria, instead it sets management levels based on the existing background noise environment. As discussed above, background noise levels were measured at less than 35 dB(A) during the day and less than 30 dB(A) during the evening and night, therefore the minimum Rating Background Levels (RBLs) have been applied, resulting in the Noise Management Levels (NMLs) provided in **Table 6.2**.

Table 6.2 Construction Noise Management Level Summary – Residential Land Use

Hours	Time of day	RBL	NML
Recommended standard hours	Monday to Friday – 7am to 6pm Saturday – 8am to 1pm	35 dB(A)	45 dB(A)
Outside recommended standard hours	Saturday – 7am to 8am and 1pm to 6pm Sunday or Public Holidays – 7am to 6pm	35 dB(A)	40 dB(A)
Outside recommended standard hours	Evening – 6pm to 10pm	30 dB(A)	35 dB(A)
Outside recommended standard hours	Night – 10pm to 7am	30 dB(A)	35 dB(A)

The ICNG defines some activities as 'particularly annoying' and if any of the activities are to be undertaken, 5 dB(A) should be added to the predicted noise levels to factor in the greater annoyance that may be caused. For the assessment of the Project, Sonus assumed that some equipment considered to be annoying may be used, including beeper style reversing alarms, and as such a 5 dB(A) penalty was applied to the assessment.

NMLs guide the need to apply work practices to minimise noise impacts, but it is not mandatory to meet these noise levels. Where NMLs are exceeded, all feasible and reasonable work practices should be applied to meet the NMLs. In addition, all potentially impacted residents should be informed of the nature of the works to be carried out, the expected noise levels and durations, as well as relevant contact details in the event of a complaint.

6.2.2.3 Sleep Disturbance

There are no objective criteria provided for sleep disturbance by the ICNG, and the NPfI provides 'screening levels' which are intended as a guide to identify the likelihood of sleep disturbance occurring. The ICNG requires an analysis of the maximum noise level (Lmax), where construction is proposed to extend over more than two consecutive nights. In the absence of any objective criteria, the ICNG refers to the NSW Environmental Criteria for Road Traffic Noise (ECRTN) for guidance, although it is noted that the ECRTN has since been superseded by the RNP.

The NPfI provides the following screening levels for the assessment of the likelihood of sleep disturbance:

- Leq,15min 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- Lmax 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

Based on the RBLs, the relevant sleep disturbance screening levels adopted for the Project, in accordance with the NPfI, are Leq,15min 40 dB(A) and Lmax 52 dB(A). As the NMLs derived in **Section 6.2.2.2** and the PNTLs derived in **Section 6.2.2.1** are both more onerous than the Leq,15min screening level for sleep disturbance, the relevant sleep disturbance screening level for the purpose of this assessment is Lmax 52 dB(A) (i.e. achieving the night time NMLs and PNTLs will ensure the Leq,15min sleep disturbance screening level is also achieved). It is noted that activities proposed during the night-time period when sleep

assessment criteria apply will be limited to maintenance activities and are unlikely to be audible at the nearest residences to the Project.

6.2.2.4 Road Traffic Noise

The RNP sets out criteria for road traffic noise through the provision of a framework that addresses traffic noise issues associated with new developments, new or upgraded road developments, or planned building developments. The Project can be defined as a new traffic-generating development. The RNP defines the criteria to be used in assessing the impact of such noise. The assessment criteria are defined by road categories, the type of project or land use and the time of day under which the noise is created. The road traffic noise assessment criteria relevant to the Project are provided in **Table 6.3**.

Table 6.3 Road Traffic Noise Assessment Criteria

Road Category	Type of Project/land use	Day (7am to 10pm)	Night (10pm to 7am)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	LAeq, (1 hour) 55 (external)	LAeq, (1 hour) 50 (external)

6.2.2.5 Voluntary Land Acquisition and Mitigation Policy

The VLAMP describes rights that may be voluntarily exercised by non-associated landholders in the event that compliance with assessment criteria is not possible.

The applicant must first demonstrate that all reasonable and feasible avoidance and mitigation measures are incorporated into the project and that viable alternatives have been considered. The impact of any residual exceedance is characterised by the amount the predicted noise levels exceed the PNTLs and any cumulative impact from other nearby industries. Where it can be demonstrated that the PNTLs are able to be achieved at non-associated residences the provisions of the VLAMP relating to noise will not apply.

6.2.3 Impact Assessment

6.2.3.1 Operational Noise

The operational noise assessment considered a range of quarrying equipment noise sources operating concurrently throughout a 15-minute assessment period (as nominated by the NPfI). Four scenarios were considered for the operational noise assessment:

- Scenario 1 – the worst-case (highest possible) 15-minute noise levels at the commencement of the Project (i.e. surface level work from Day 1) (refer to **Figure 6.1**)
- Scenario 2 – the typical 15-minute noise levels expected for most of the time at the commencement of the Project (refer to **Figure 6.2**)
- Scenario 3 – the worst-case (highest possible) 15-minute noise levels once equipment is operating within the pit (i.e. normal operation) (refer to **Figure 6.3**)
- Scenario 4 – the typical 15-minute noise levels expected for most of the time once equipment is operating within the pit (refer to **Figure 6.4**).

The typical noise levels are based on the expected utilisation of equipment over the course of the works being conducted for the Project and provide a useful indication of the average levels of noise that a receiver may experience. A full list of plant and equipment and utilisation percentages modelled is provided in Appendix A of the Environmental Noise Assessment in **Appendix 5**.

The assessment assumed that operations would only occur during the daytime hours nominated by the NPfI and that all on-site equipment would be fitted with broadband or white noise reversing alarms (in lieu of tonal reversing alarms). It also assumed that a forward-in forward-out arrangement would be applicable for all off-site traffic movements such that on-site reversing is not required during normal operations. Based on these assumptions, none of the noise sources were considered to have annoying noise characteristics and therefore no correction factor was applied.

As shown in the above figures, operational noise criteria will be exceeded at Receivers 2 and F8-1 at the commencement of operations when the equipment is not yet located within the quarry pit and hence topographic shielding is not being provided by the quarry walls. It is noted that Receiver F8-1 is an associated residence and therefore the assessment criteria do not apply, and it is assumed that a higher noise level would be agreed for this residence prior to commencement of quarry operations. Predicted noise levels for Receiver 2 are provided in **Table 6.4.** At all other receivers the noise levels predicted were less than the daytime PNTL.

Table 6.4 Noise Level Predictions, Receiver 2

Model scenario	Predicted Daytime Noise Levels at Receiver 2 (dB(A))
Project Noise Trigger Level (PNTL)	40
Scenario 1 – Quarry commencement, worst case operations	**42**
Scenario 2 – Quarry commencement, typical operations	38
Scenario 3 – In-pit quarrying, worst case operations	23
Scenario 4 – In-pit quarrying, typical operations	20

Bold entries indicate exceedance of PNTL

Based on the exceedance at Receiver 2, reasonable and feasible mitigation measures must be considered. A review of noise sources identified that crushing activities located on the surface during the early stages of the project were the primary driver of the modelled exceedance at Receiver 2. Once crushing activities are relocated into the pit during later stages, the pit wall provides effective shielding of crushing activities resulting in lower predicted impacts under modelled scenarios 3 and 4. Shielding located between the crusher and Receiver 2 was modelled under Scenario 1 conditions and identified that this was effective in enabling the Project to meet the PNTL at all receivers. With the above mitigation in place, the “worst-case” (highest possible) 15-minute predicted noise level at Receiver 2 is 39 dB(A), which is below the 40 dB(A) day time PNTL applicable to the period when the crusher will be in operation refer to **Figure 6.5**.

Consistent with the recommendations in the NPfI, shielding (shipping containers or equivalent) located on the receiver 2 side of surface crushing activities close to crusher is recommend. These mitigation measures to address the potential exceedance of PNTLs at Receiver 2 are discussed further in **Section 6.2.4.**

It is noted that some maintenance activities may need to be undertaken during the evening or nighttime periods, however these activities would only include the use of light vehicles and hand tools, therefore noise levels would be significantly lower than the predicted day time noise levels for typical operations and able to achieve the PNTL of 35 dB(A) at Receiver 2 (and all other modelled Receivers).

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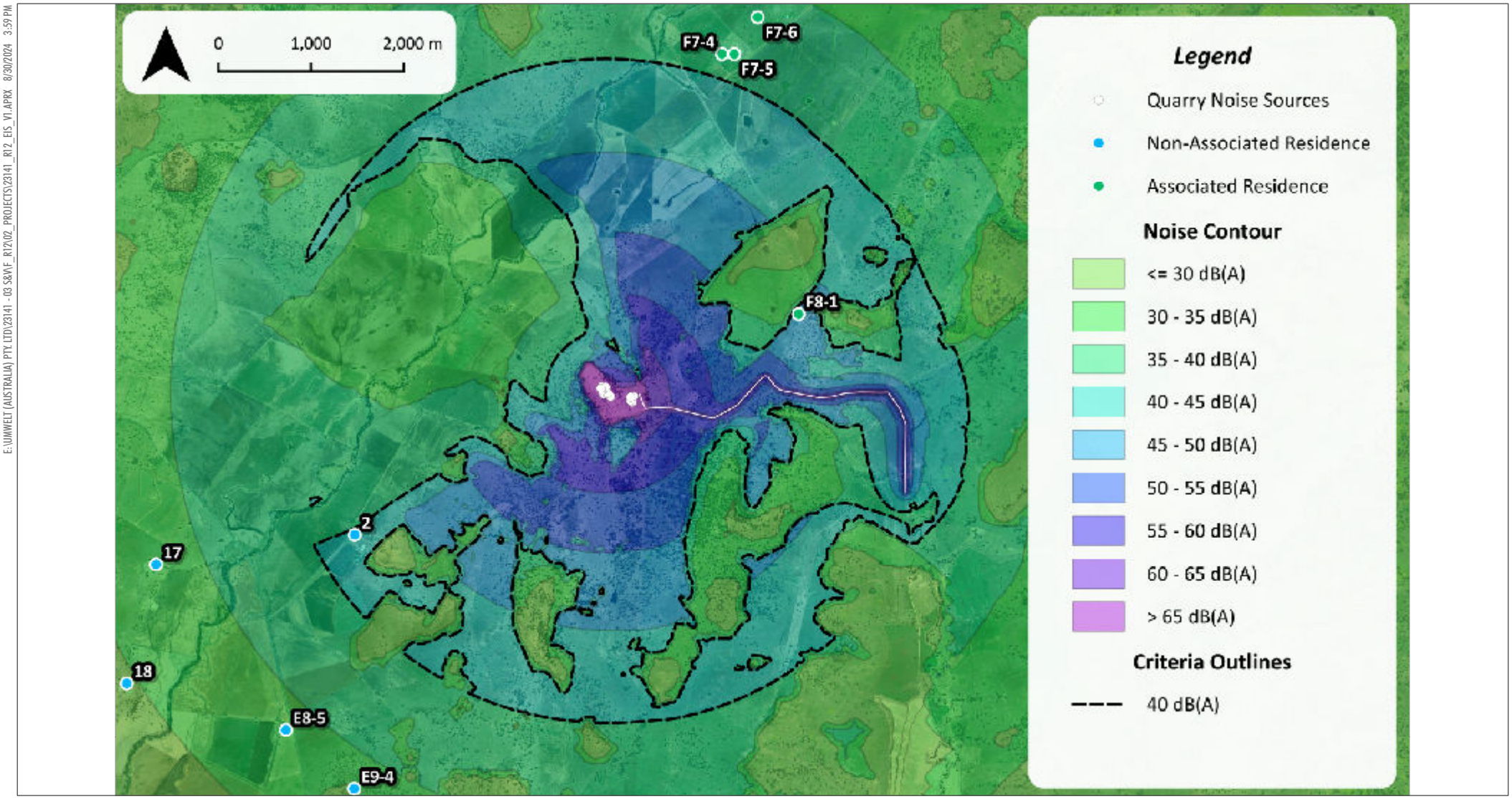


FIGURE 6.1

Noise Contours
Scenario 1

Image Source: Data source:

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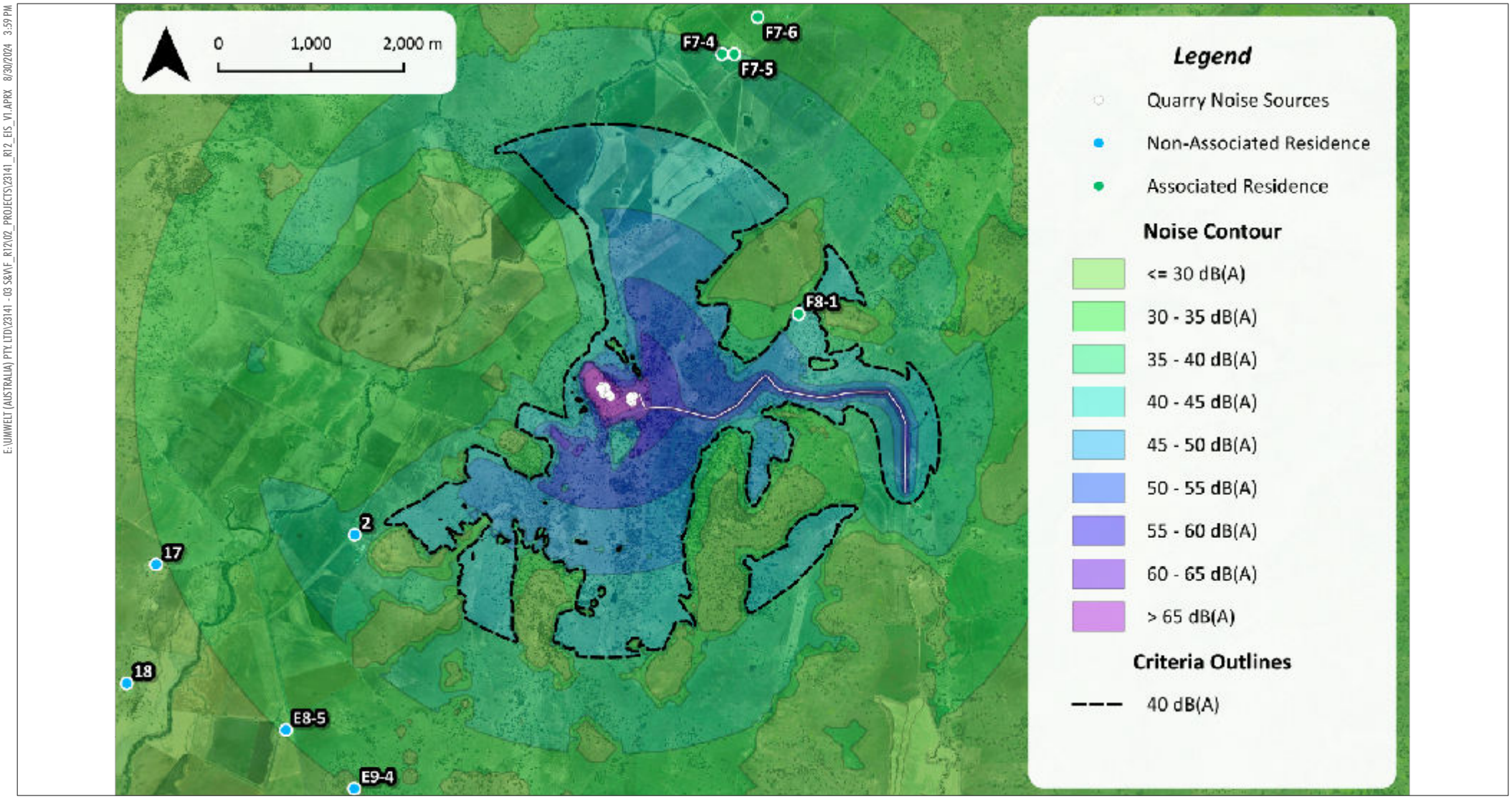


FIGURE 6.2

Noise Contours
Scenario 2

Image Source: Data source:

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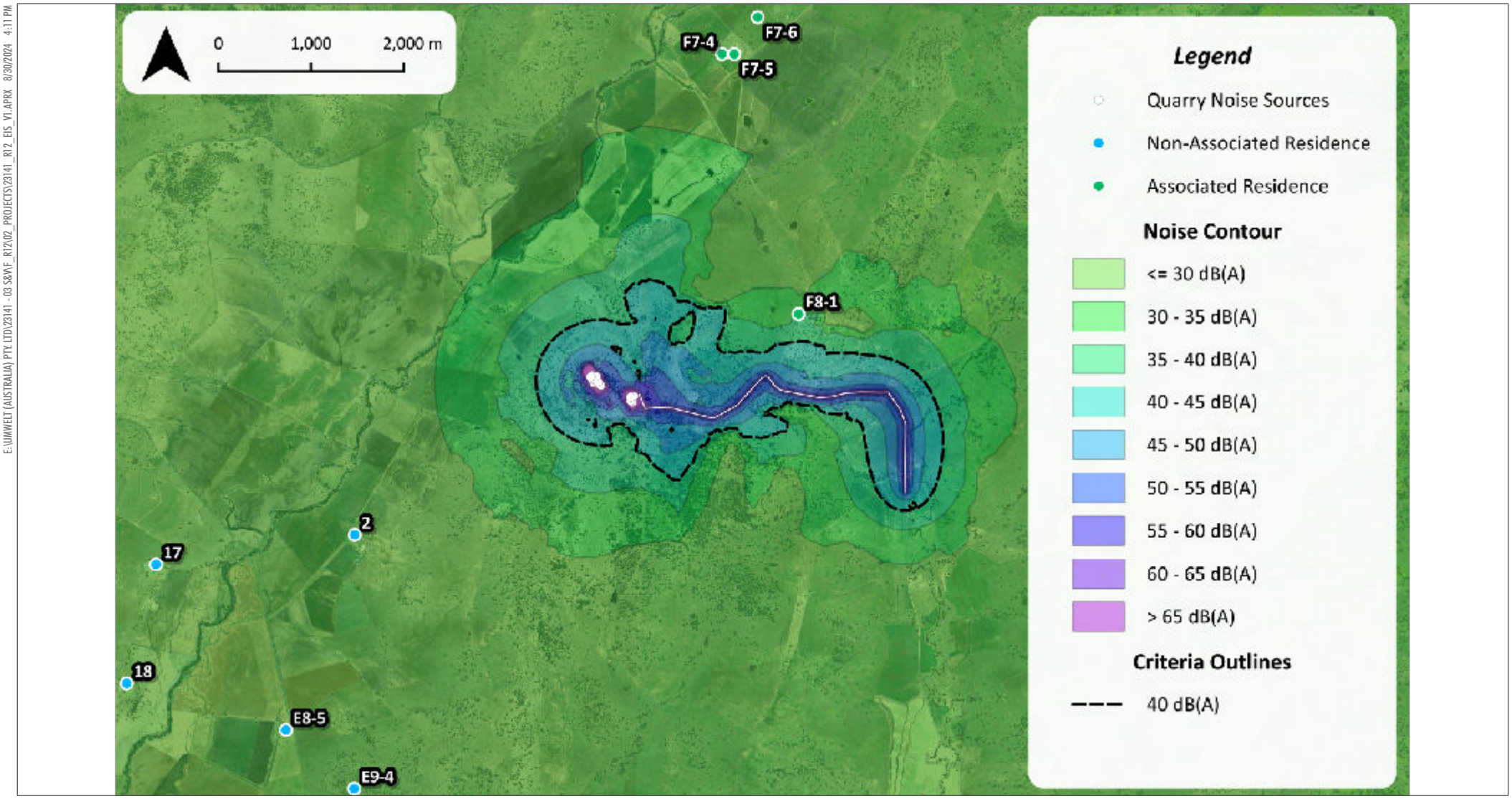


FIGURE 6.3

Noise Contours
Scenario 3

Image Source: Data source:

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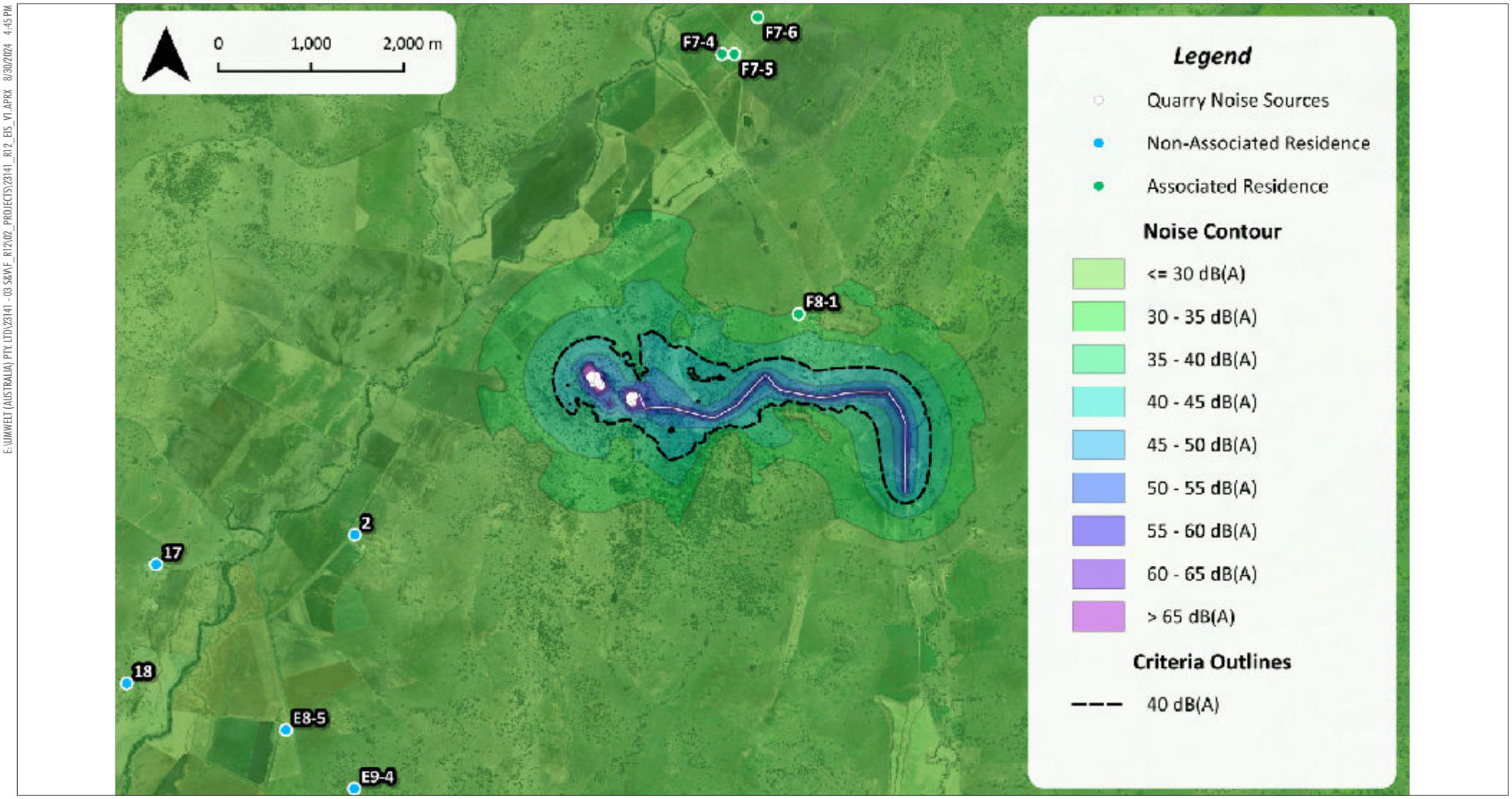


FIGURE 6.4

Noise Contours
Scenario 4

Image Source: Data source:

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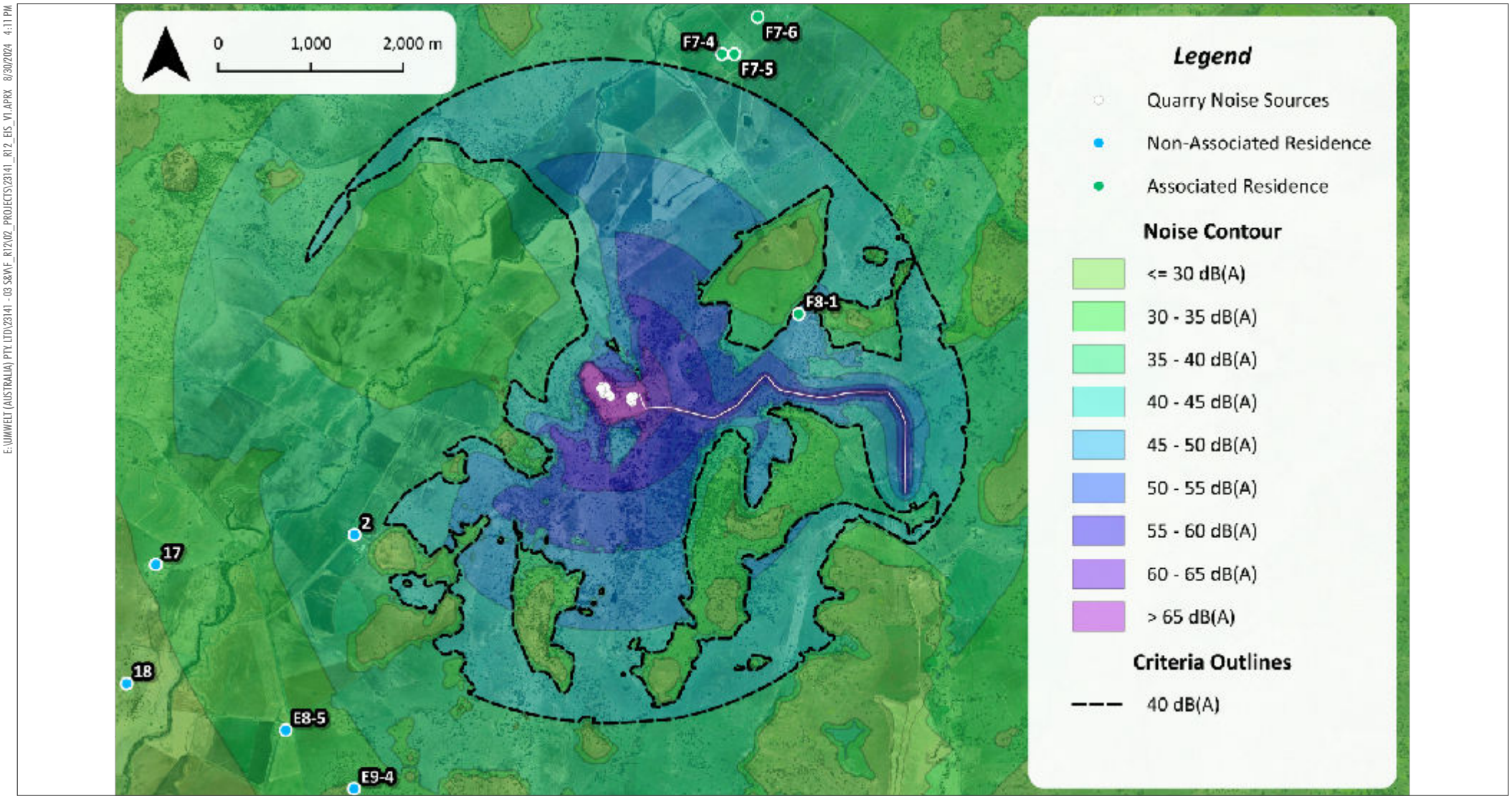


FIGURE 6.5

Commencement of Quarry Operations, Worst-Case Noise Levels – with Mitigation Scenario 1

Image Source: Data source:

6.2.3.2 Construction and Decommissioning Noise

Construction and decommissioning activity will be limited where possible to the recommended standard hours of operation (i.e. Monday to Friday 7am to 6pm and Saturday 8am to 1pm). In doing so, the relevant NML to be achieved is 45 dB(A). After accounting for potentially annoying noise sources (such as 'beeper' style reversing alarms), the effective noise limit becomes 40 dB(A), which is the same noise limit that applies during operations (refer to **Section 6.2.2**).

The construction and decommissioning of the Project will use similar equipment to that proposed for the operations phase to form the access road and clear the site on commencement and to return the site to a safe and stable landform on completion. However, the activity level during construction and decommissioning will be less intensive than during Scenario 1 operations and, as such, is expected to easily achieve the construction NMLs during the recommended standard hours of operation.

6.2.3.3 Sleep Disturbance

As noted above, only maintenance activities will be undertaken during the evening or night time periods, and these activities would only include the use of light vehicles and hand tools, No dwellings are predicted to experience noise greater than the 52 dB(A) Lmax external screening noise level for sleep disturbance. The highest predicted noise level is at associated Receiver F8-1, where the maximum noise level is predicted to be less than 20 dB(A) during maintenance work at night.

6.2.3.4 Road Traffic Noise

As previously discussed, the Project provides a supply source closer to the LRWF project and avoids noise impacts associated with quarry haulage outside the immediate LRWF project area. However, would result in an increase in heavy vehicle movements along a section of Rotherwood Road (between the Project Area and Vinegaroy Road) relative to the level of heavy vehicle movements assessed for the LRWF project. The NIA has focused on this section of road and associated increase in traffic movements. As a result of the Project, heavy vehicle traffic on all other roads would either reduce or remain unchanged from that assessed for the approved LRWF project.

There are six non-associated receivers located along Rotherwood Road that may be adversely impacted by traffic noise associated with the Project. The Transport for NSW document "*Construction Noise and Vibration Guideline (Roads)*" specifies that where noise increases are 2 dB(A) or less then no further assessment is required, however where noise levels increase by more than 2 dB(A) (i.e. 2.1 dB(A)) further assessment is required.

Based upon the projected daily trips during construction, and the initial screening test, the construction traffic was expected to result in more than a 2 dB(A) increase of the existing Rotherwood Road traffic noise levels. Despite the predicted increase relative to existing conditions, the assessment indicates that applicable road traffic noise criteria can be met at the nearest sensitive receiver with both the existing traffic volumes and the proposed Project traffic volumes on Rotherwood Road.

6.2.3.5 Cumulative Noise

Other industrial noise sources in the vicinity of the Project include the approved LRWF project and the proposed Valley of the Winds wind farm project. While wind turbines associated with the wind farms are assessed under different criteria to the Project, ancillary infrastructure (such as substations and BESS components) associated with the wind farms would also be subject to the NPfI.

Noise associated with LRWF project ancillary infrastructure was assessed by Sonus, and predicted noise levels were less than 20 dB(A) at all receivers. Similarly, the acoustic assessment for the Valley of the Winds was also reviewed by Sonus, which showed ancillary infrastructure relating to the wind farm would not contribute noise levels greater than 21 dB(A) at any receiver considered in the assessment of the Project.

As the highest predicted noise levels from any nearby infrastructure are more than 10 dB(A) below the relevant PNTLs (both day and night), no adverse cumulative noise impacts are predicted as a result of the Project.

6.2.4 Mitigation and Management Measures

A summary of noise mitigation measures to be implemented by ARDG include:

- Shielding on the Receiver 2 side of the mobile VSI Barmac Crusher will be implemented for all crushing activities located on the surface. The shielding will take the form of a standard 20-foot or 40-foot shipping containers (min. 2,590 mm high) or other acoustically equivalent screening measure with similar dimensions (i.e. minimum height). The shielding should be positioned within 25 metres of the crusher and located to block the direct path between the crusher and Receiver 2. When the crusher is located within the fully developed pit the walls of the quarry would act as a noise barrier and provide sufficient acoustic attenuation to achieve the criteria at all locations and the shielding can be removed.
- Construction and decommissioning activities should be limited where possible to the recommended standard construction hours (Mon-Fri 7am to 6pm and Sat 8am to 1pm).
- Based on the above, it is recommended that noise monitoring be conducted at times when the Project is expected to operate at its loudest (when the processing plant is operating at or near the surface, or when the method of acoustic attenuation is altered as the Project progresses). Specifically, the following noise monitoring periods are proposed:
    - To ensure the acoustic shielding of the mobile VSI Barmac Crusher is effectively reducing noise levels to achieve the relevant criteria at Receiver 2, noise monitoring should be conducted at the commencement of operation of the Project 2) (i.e. immediately after the construction phase) at (or close to) Receiver 2 and during operation of the VSI Barmac crusher.
    - Once processing plant (particularly the mobile VSI Barmac Crusher) is moved into the pit, noise monitoring should be conducted before the shipping containers are removed from site to ensure the depth of the pit is sufficient to provide the required acoustic attenuation.
- The noise monitoring should be conducted at Receiver 2, or at an alternative or intermediate location such that the recorded noise levels can reasonably be assumed to be the equivalent or higher than that which would be recorded at the residence.

6.3 Blasting

As the Project will require the use of drill and blast operations to extract hard rock material, a Blasting Impact Assessment (BIA) was undertaken by Enviro Strata Consulting Pty Limited (Enviro Strata) to assess potential ground vibration, airblast overpressure and flyrock impacts. The BIA was undertaken in accordance with the guidelines presented in the Australian and New Zealand Environment Council

Guideline *Technical Basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZECC, 1990) and Australian Standard AS 2187.2-2006.

The BIA report is provided in **Appendix 6** while key findings are summarised below. It is noted that blasting impacts associated with fume and particulate matter emissions have been assessed in the Air Quality and Greenhouse Gas Assessment (refer to **Section 6.4**).

6.3.1 Assessment Methodology

6.3.1.1 Receivers

The BIA addressed the impact of the proposed quarry blasting on identified sensitive receptors including private residences and infrastructure. The assessment covered a 4 km impact radius, beyond which the potential blasting impact is considered negligible (i.e., well beyond human perception levels).

The area surrounding the Project is sparsely populated with only four residential receptors identified within a 4 km radius. Note that receptors F7-5, F8-1, F7-4 and F7-6 (which is located just outside the 4 km radius) are associated with the quarry project (i.e., properties/residences owned by the quarry site landowner). Receptor 2(F) is currently a non-associated residence.

There is limited public infrastructure in this area at present, although additional infrastructure is proposed as part of the establishment of the CWO REZ and the LRWF project. Infrastructure (existing and proposed) potentially impacted by blasting within a 4km radius of the areas where blasting associated with the Project will occur include:

- Public roads: Rotherwood Road located in excess of 2 km from the quarry extraction boundary.
- 11 kV powerlines running parallel and approximately 360 m to the west of Rotherwood Road.
- Telecommunication: underground lines along Rotherwood Road approximately 2.5 km from the quarry extraction boundary.
- Proposed Energy Co. 330 kV transmission line easement located approximately 1.2 km from the extraction boundary.
- Proposed Energy Co. substation located approximately 3.4 km from the extraction boundary.
- Proposed LRWF project substation located approximately 3.6 km from the extraction boundary (north and adjacent to Energy Co. substation).
- Proposed LRWF project turbines located approximately 2.9 km from the extraction boundary.

Two private registered groundwater bores are also located in close proximity to the Project Area:

- GW007044 (Collar RL 635 m AHD), located approximately 390 m to the west of the Main Pit
- GW012325 (Collar RL 654 m AHD), located approximately 390 m to the west of the Main Pit.

6.3.1.2 Project Blasting Parameters

The geological characteristics of the Project Area and surrounds have been determined using available published mapping, detailed surface mapping and a downhole percussion and diamond drilling program undertaken by ARDG in 2023.

The extraction method to be employed for the Project will involve drilling and blasting operations. Based on the quarry design parameters, it is anticipated that maximum 12.5 m benches will be targeted, which corresponds to a maximum instantaneous charge (MIC) mass for blasting in the order of 100 kg per hole or 300 kg where 3 holes are fired simultaneously.

Blasting will be undertaken Monday to Friday (between 9am and 5pm) and drilling activities will be undertaken Monday to Saturday (between 7am and 6pm). It is anticipated that the quarry will fire a limited number of blasts per year (approximately 6 to 12 blasts per year) dependent on product demand.

6.3.1.3 Modelling

As the quarry has not yet commenced operations, the ground vibration and airblast overpressure models for the specific quarry conditions have not yet been developed. To overcome this issue, models from a mining operation comparable to the proposed quarry have been utilised which are considered as appropriate analogues. These models were originally developed for one of the smaller coal mines in the Hunter Valley. The mine used similar blasting parameters to that proposed by the Project i.e., the mine used charge masses in the order of 42-225 kg, covering various blasts that included overburden and interburden blasts.

The modelling involved simulations incorporating charge masses of 100 kg and 300 kg, derived from the blasting parameters proposed for the quarry. Modelling accounted for the worst-case scenario, i.e., blasting from the edge of the quarry, which corresponds to the minimum distance between the blasting area and the receptors. Results therefore highlight the maximum ground vibration and airblast overpressure levels that will be generated at these receptors over the lifetime of the Project.

6.3.1.4 Blast Emission Criteria

A summary of blast emission criteria used in the BIA is presented in **Table 6.5**, based on the Guidelines on vibration limits for infrastructure provided in Australian Standard AS 2187.2-2006 *"Explosives – Storage and Use – Part 2: Use of Explosives".*

Table 6.5 Blast Emission Criteria

Item	Vibration criteria (mm/s)	Airblast criteria (dBL)
Private residences [1] **Limit applicable to 95% of blasts over a 12-month period** **Limit not to be exceeded**	5 10	115 120
Unoccupied public infrastructure, including: • **public roads and bridges** • **timber power poles** • **buried communication cables** • **groundwater bore / pipelines**	100	n/a
HV power line (330 kV)	25	n/a
zone substation (330 kV)	100/50[2]	n/a
wind turbines[3]	100	n/a

Note: 1 – applies to buildings and sheds only (after ANZECC (1990))

2 – 100 mm/s applies to suspension towers, 50 mm/s applies to tension towers

3 – to be verified against wind turbine manufacturer's guidelines for specific vibration tolerance limits.

6.3.2 Assessment Results

6.3.2.1 Community Impacts

The ground vibration and airblast overpressure modelling results for residential receptors are summarised as follows:

- The potential maximum ground vibration exposure for the two modelled scenarios was estimated to be in the range of 0.1 to 0.6 mm/s at all modelled residential receptors. These estimates are well below the applicable limits specified as 5 mm/s (for 95% of blasts) and 10 mm/s (not to be exceeded).
- The potential maximum airblast overpressure exposure for the two modelled scenarios was estimated to be in the range of 95 to 106 dBL. These estimates are well below the applicable limits specified as 115 dBL (for 95% of blasts) and 120 dBL (not to be exceeded).
- As the predicted vibration and overpressure impacts are within the applicable criteria, additional management measures are not considered to be warranted. Due to the limited number of private residences in the area, the monitoring system for private residences should consist of two (2) monitoring stations to capture ground vibration and air blast overpressure impacts from blasting at the Project site at locations representative of impacts at the two nearest residences (2 and F8).

6.3.2.2 Infrastructure Impacts

The results of the ground vibration modelling for infrastructure are provided in **Table 6.6** below.

Table 6.6 Ground Vibration Modelling Results, Infrastructure

Receptor	Min. distance (m)	Estimated max. ground vibration (mm/s) MIC (kg) 100	Estimated max. ground vibration (mm/s) MIC (kg) 300	Applicable vibration criteria (mm/s)
Rotherwood Road	2,500	0.2	0.5	100
11 kV power poles	2,200	0.3	0.6	100
300 kV transmission line	1,260	0.6	1.5	10/50
Energy Co. substation (proposed)	3,400	0.1	0.3	25
LRWF substation (proposed)	3,600	0.1	0.3	25
Underground lines	2,500	0.2	0.5	100
LRWF towers (proposed)	2,900	0.2	0.4	100
Groundwater bores	390	4.1	9.8	100

The results above demonstrate that predicted vibration impacts from the two modelled blast MICs are all well within applicable criteria. Accordingly, no additional blast control measures are required to comply with the ground vibration criteria for public and private infrastructure, and monitoring is not considered to be warranted at infrastructure locations given the predicted impacts are well within applicable criteria.

6.3.2.3 Flyrock Impacts

The positioning of the Project Area, being in excess of 2 km from private residential receptors and public infrastructure, creates particularly favourable conditions to manage blasting risks that include flyrock.

For the identified closest points of interest, the BIA concludes:

The closest private residential receptor (approximately 2.2 km) and the closest public infrastructure (1.2 km) the flyrock risk is negligible.

Flyrock risk will be further mitigated and managed such that it is contained within the boundary of Lot 89 by adhering to the following:

- implementing a blast methodology that ensure blasting heaves material in an easterly direction (i.e. away from neighbouring properties, in particular Lot 90 located to the south west).
- adopting more conservative values (compared to those detailed in Table 1 of the BIA) for blast hole spacing and diameter, stemming and powder factor.
- construction of a 2 – 3 m high earth mound along the Project disturbance boundary, located adjacent to the southern end of the pit in the vicinity of Lot 90.

Further, as pit development progresses to the north (and deeper into the second bench), the risk associated with flyrock is further reduced and the blast parameters will be amended accordingly.

In accordance with standard operating procedures, a site-specific Blast Management Plan will be prepared by the proponent and drill and blast contractor that will address all occupational health and safety (OH&S) requirements, including procedures for neighbour notification of blasting.

Based on the location of the pit and proposed mitigation strategies outlined above, the flyrock impact can be adequately managed and potential risks are considered to be negligible.

6.3.2.4 Impacts on Animals

The Project is located on, and adjacent to, grazing land within a rural setting.

ANZECC guideline limits which apply to private residences are designed to protect human comfort and, as such, it can be inferred that blasting impacts will be fully managed in relation to pets/animals within these properties.

Studies undertaken to assess potential impacts from blasting on feedlots have identified that blasting impacts have little to no impact on domestic stock (Nelson, 2011). Similar effects would be expected for native fauna and, anecdotally, it is noted that many fauna species have been recorded adjacent to active mining operations where larger and more frequent blasts than those proposed for the Project are undertaken. Due to the periodic (once every 6 to 8 weeks) and very short duration (1 to 2 seconds) of blasting proposed, blasting associated with the Project is not anticipated to have any significant impacts on domestic or native fauna.

The estimated ground vibration and airblast overpressure for the feedlot area on Lot 90 DP 750749 (located approximately 3,000 m from the Project) are no higher than 0.4 mm/s and 102 dBL, which are below the applicable ANZECC criteria for human health and well below the levels of impact considered in Nelson (2011).

6.3.3 Mitigation and Management Measures

The following blast emission control and management measures, as recommended by the BIA, will be implemented for the Project:

- Control measures for ground vibration and airblast:
    - use of appropriate charge mass design and avoid overcharging holes
    - use of an appropriate initiation sequence to minimise the possibility of blast-hole interactions i.e., ideally aiming for single hole initiation
    - apply appropriate quality stemming material and stemming height to enable correct confinement of explosive charges and therefore, minimise airblast overpressure emission.
- Control measures for flyrock:
    - ensure appropriate quality of stemming material and stemming height to facilitate explosives confinement to minimise the possibility of stemming ejection and/or flyrock incidents.
- Blast Monitoring System: Due to the limited number of private residences in the area, the monitoring system for private residences should consist of two monitoring stations to capture ground vibration and airblast overpressure impacts from blasting at the Project site (including residences 2(F) and F8-1).
- Pre-blast Assessment Protocol: ARDG will establish an appropriate protocol (including consideration of weather impacts) to manage blasting (including positioning of blasting sentries) to minimise the impacts on the surrounding area.

- Public Notification: Adjoining landowners will be notified (notification preference [e.g. phone/text/email] to be determined with each landowner) of the scheduled blast dates and times, at least one day prior to each blast, with confirmation provided on the day of each blast, several hours prior.

6.4 Air Quality and Greenhouse Gas

Emissions to air from the Project could occur from a variety of activities including material handling, material transport, processing, and wind erosion from exposed areas. These emissions will primarily occur during the operational phase, as limited construction works will be required. The main emission to air from quarry activities is dust, also referred to as particulate matter.

An Air Quality and Greenhouse Gas Assessment (AQGHGA) was prepared by Airen Consulting to identify key air quality issues and quantify the potential impact of the Project on local air quality. Greenhouse gas emissions were also estimated in accordance with recognised methodologies.

The AQGHGA is provided in **Appendix 7** and the key outcomes are summarised below.

6.4.1 Assessment Criteria

The EPA has developed assessment criteria for a range of air quality indicators including particulate matter and NO2. These criteria are outlined in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (EPA, 2022).

The Project has been assessed in terms of its ability to comply with the relevant air quality criteria set by the EPA as part of the Approved Methods. These criteria are outlined in **Table 6.7** and apply to existing and potentially sensitive receptors, where the Approved Methods defines a sensitive receptor as including "a location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area".

Table 6.7 EPA Air Quality Assessment Criteria

Air quality indicator	Averaging time	Criterion
Particulate matter (PM_{10})	24-hour	50 µg/m^3
Particulate matter (PM_{10})	Annual	25 µg/m^3
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m^3
Particulate matter ($PM_{2.5}$)	Annual	8 µg/m^3
Particulate matter (TSP)	Annual	90 µg/m^3
Deposited dust	Annual (maximum increase)	2 g/m^2/month
Deposited dust	Annual (maximum total)	4 g/m^2/month
Nitrogen dioxide (NO_2)	1-hour	164 µg/m^3
Nitrogen dioxide (NO_2)	Annual	31 µg/m^3

Source: Table 11 of the Approved Methods

The EPA air quality assessment criteria relate to the total concentration of pollutants in the air (that is, cumulative) and not just the contribution from project-specific sources. Therefore, some consideration of background levels needs to be made when using these criteria to assess the potential impacts.

The AQGHGA also considered the VLAMP (NSW Government, 2018) which provides the NSW Government's policy for voluntary mitigation and land acquisition to address dust (particulate matter) impacts from State significant mining, petroleum and extractive industry developments.

It should be noted that there are no specific criteria for which to assess the significance of projected greenhouse gas emissions from individual projects. In May 2024, the EPA issued a draft policy on climate change assessment requirements for large emitters (EPA, 2024a) (draft CCARs) and a draft NSW EPA Guide for Large Emitters (EPA 2024b). Under the draft CCARs, an SSD project that is likely to emit 25,000 t CO2e or more Scope 1 and 2 must apply the requirements of the EPA Guide for Large Emitters as part of the assessment of GHG emissions for a project. As detailed in **Section 6.4.5**, this threshold is not exceeded by the Project and the draft CCARs and NSW EPA Guide for Large Emitters therefore do not apply to the assessment processes for the Project.

6.4.2 Existing Environment

6.4.2.1 Meteorology

Meteorological conditions are important for determining the transport of emissions, and the potential influences on air quality. In addition, meteorological data are often used with concurrent air quality data to determine potential contributions from sources of interest.

Two meteorological stations have been in operation near the Project (one since 2019 and one since 2021) to collect data to inform the design of the LRWF project. Analysis of the data from these stations by Airen Consulting determined that Station LVP10, located 7 km north-east of the Project, would provide data suitable for use in air quality modelling for the proposed quarry, based on the proximity to the Project, similar elevation and high data capture rate exceeding the EPA's 90% complete requirement.

6.4.2.2 Background Air Quality

A detailed review of the existing environment was carried out including an analysis of historically measured concentrations of key quality indicators from the EPA regional monitoring station in Merriwa, located approximately 50 km to the south-east of the Project. The review showed that air quality in many parts of NSW, including the Upper Hunter, is heavily influenced by climatic conditions such as drought. However, due to the absence of any significant sources of air pollution, the concentrations of key air quality indicators near the Project are expected to be well below acceptable levels.

Assumed background levels derived from the EPA Merriwa station are provided in **Table 6.8** and have been added to Project contributions to determine potential cumulative air quality impacts.

Table 6.8 Assumed Background Levels

Air quality indicator	Averaging time	Assumed background level	Notes
Particulate matter (PM_{10})	24-hour	27 µg/m^3	Maximum 24-hour average PM_{10} from Merriwa in 2022

Air quality indicator	Averaging time	Assumed background level	Notes
Particulate matter (PM_{10})	Annual	11 µg/m^3	Annual average PM_{10} from Merriwa in 2022
Particulate matter ($PM_{2.5}$)	24-hour	14 µg/m^3	Maximum 24-hour average $PM_{2.5}$ from Merriwa in 2022
Particulate matter ($PM_{2.5}$)	Annual	3.4 µg/m^3	Annual average $PM_{2.5}$ from Merriwa in 2022
Particulate matter (TSP)	Annual	28 µg/m^3	Estimated annual average TSP from Merriwa in 2022
Deposited dust	Annual	1.2 g/m^2/month	Estimated annual average deposited dust from Merriwa in 2022
Nitrogen dioxide (NO_2)	1-hour	57 µg/m^3	Maximum 1-hour average NO_2 from Merriwa in 2022
Nitrogen dioxide (NO_2)	Annual	5.6 µg/m^3	Annual average NO_2 from Merriwa in 2022

6.4.3 Methodology

The key air quality issue for the Project was identified as dust (particulate matter) generated during quarry operations, in the form of PM_{10}, $PM_{2.5}$, total suspended particulates (TSP) and deposited dust. This was the focus of the assessment, along with the potential emissions from post-blast fume (NO_2), diesel exhaust (PM_{10}, $PM_{2.5}$ and NO_2) and greenhouse gas emissions.

6.4.3.1 Operational Dust

Operational dust emissions were quantified by modelling, using the CALPUFF model to predict ground-level particulate matter concentrations and deposition levels due to the Project and other sources at sensitive receptor locations for comparison with relevant air quality assessment criteria.

Total dust emissions were estimated for the Project using the material handling schedule, equipment listing, and site layout plans combined with emission factors from:

- Emission Estimation Technique Manual for Mining (NPI, 2012)
- Compilation of Air Pollutant Emission Factors, AP-42 (US EPA, 1985 and updates).

The quarry operations were represented by a series of volume sources located according to the location of activities for each modelled scenario.

6.4.3.2 Post-Blast Fume

Blasting activities have the potential to result in fume and particulate matter emissions. Particulate matter emissions from blasting were predicted by the modelling discussed in **Section 6.4.3.1** above. Post-blast fume has also been quantified by modelling, using a single volume source in a location indicative of the centre of the quarry and assuming worst case formation conditions for nitrogen dioxide.

6.4.3.3 Diesel Exhaust

The modelling for operational dust (described in **Section 6.4.3.1** above) has considered emission factors that represent the contribution from both wheel-generated particulates and exhaust particulates (as PM_{10} and $PM_{2.5}$).

Emissions of NO_x from diesel exhausts have been estimated using fuel consumption data, provided by ARDG, and an emission factor from the EPA Air Emissions Inventory for 2008 (EPA, 2012).

6.4.3.4 Greenhouse Gas

Greenhouse gas (GHG) is a collective term for a range of trace gases that are known to trap radiation in the upper atmosphere, where they have the potential to contribute to the greenhouse effect (global warming). Greenhouse gases include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. It is common practice to aggregate the emissions of these gases to the equivalent emission of carbon dioxide, providing a simple figure for comparison of emissions against targets. The resulting number is expressed as carbon dioxide equivalent (or CO2-e).

GHG emissions that form an inventory can be split into three categories known as 'scopes' which are defined by the Greenhouse Gas Protocol (GHG Protocol) and can be summarised as:

- Scope 1 – Direct emissions from sources that are owned or operated by the organisation (e.g., combustion of diesel in company owned vehicles or on-site generators)
- Scope 2 – Indirect emissions associated with the import of energy from another source (e.g., importation of electricity)
- Scope 3 – Other indirect emissions (other than Scope 2 energy imports) which are a direct result of the operations of the organisation but from sources not owned or operated by them (e.g., product usage).

The purpose of differentiating between the scopes of emissions is to avoid the potential for double counting, where two or more organisations assume responsibility for the same emissions.

Future projections of fuel usage in both on-site equipment and product transportation vehicles, provided by ARDG, were used to determine the greenhouse gas emissions from the Project.

6.4.4 Air Quality Impact Assessment

6.4.4.1 Operational Dust

The modelling showed that the Project would not cause exceedances of the EPA assessment criteria for 24-hour average or annual average PM_{10}, 24-hour average or annual average $PM_{2.5}$, TSP or deposited dust, at any sensitive receptor.

6.4.4.2 Post-Blast Fume

Post-blast fume modelling results show that, under worst-case meteorological conditions with a rated 3 fume, the maximum 1-hour average NO_2 concentrations will not exceed the EPA's criterion at any off-site sensitive receptor.

6.4.4.3 Diesel Exhaust

Modelled maximum 1-hour average and annual average NO_2 concentrations due to diesel exhaust emissions (conservatively assuming 100% of NO_x is NO_2 at the locations of maximum ground level concentrations) are in compliance with EPA criteria at all sensitive receptors, including with consideration of maximum background concentrations.

6.4.5 Greenhouse Gas Assessment

The direct emissions from the Project (i.e. Scope 1) were estimated to average 2,198 t CO2-e per year. Comparisons in a State and national context using the DPE Net Zero Emissions Dashboard data and DCCEEW (2022) projections show that the Project emissions would be in the order of:

- 0.0019% to 0.0020% of NSW emissions, depending on policy measures
- 0.0004% of Australia's emissions.

It is also relevant to note that the Project will provide a more efficient option for supplying materials to the LRWF project, compared to sourcing materials from more distant, existing quarries. Specifically, the Project is located approximately 3 km from the closest LRWF project sites whereas materials from existing quarries would need to be transported a distance of 150 km or more. From these distances, the transport of a notional 1.7 Mt of construction materials from the Project is estimated to save in the order of 17,185 t CO2-e.

6.4.6 Mitigation and Management Measures

The modelling showed that off-site dust concentrations and deposition levels would be well below the relevant EPA assessment criteria. Therefore, an appropriate air quality management strategy would include standard mitigation measures such as:

- minimising the area of disturbed land at any one time
- adopting controls for unsealed haul road dust emissions
- use of water sprays when drilling if/as required
- use of water sprays on stockpile areas if/as required
- visual monitoring to identify excessive dust generation.

Mitigation of greenhouse gas emissions will be inherent in the development of the quarry plan as diesel use is the primary source of greenhouse gas emissions and there are financial benefits for the Proponent in reducing diesel use. The mitigation measures to minimise the level of greenhouse gas emissions from the Project will include:

- planning and designing of operations to minimise fuel usage and to maximise energy efficiency
- maintenance of plant and equipment to minimise fuel consumption and associated emissions
- training staff on improvement strategies to minimise fuel usage and maximise energy efficiency.

6.5 Water Resources

The SEARs for the Project require:

- a detailed site water balance, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply infrastructure and water storage structures
- identification of any licensing requirements or other approvals under the *Water Act 1912* and/or *Water Management Act 2000*
- demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP)
- a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant WSP or water source embargo
- an assessment of any likely flooding impacts of the development
- an assessment of the likely impacts on the quality and quantity of existing surface and ground water resources, including a detailed assessment of proposed water discharge quantities and quality against receiving water quality and flow objectives
- an assessment of the likely impacts of the development on aquifers, watercourses, riparian land, water-related infrastructure, and other water users; and o a detailed description of the proposed water management system (including sewage, wastewater and stormwater), water monitoring program, erosion and sediment control measures, and other measures to mitigate surface and groundwater impacts.

A Surface Water Impact Assessment (SWIA) was undertaken for the Project by Engeny (refer to **Appendix 8**) with the results summarised in **Section 6.5.1**. An assessment of potential groundwater impacts is outlined in **Section 6.5.2**.

6.5.1 Surface Water

6.5.1.1 Existing Environment

The Project is located within both the Macquarie-Bogan River Catchment, and the Hunter Catchment areas (refer to **Figure 2.3**). The majority of the Project Area (and all of the extraction areas and associated final voids) is located within the Macquarie-Bogan River Catchment (11 ha). Approximately 8.5 ha of the Project Area falls within the Hunter Catchment which lies toward the east of the Great Dividing Range and contains an area of approximately 21,000 km^2. The total catchment area for the Project equates to 0.0001% of the Macquarie-Bogan River and Hunter Catchments. Any reductions in downstream flow as a result of the Project is therefore likely to be negligible.

As the Project Area is situated upon an elevated ridge, there are no defined drainage features within the Project Area. Several first and second order drainage lines surround the Project Area, with the closest waterbody being the perennial Talbragar River approximately 1.5 km northwest of the site in the

Macquarie-Bogan Catchment (refer to **Figure 2.3**). There are six farm dams located near the Project Area, these farm dams are shown in **Figure 2.3**.

Soil property data from the 'Sharing and Enabling Environmental Data in NSW' (SEED) Portal indicate that the Project Area soils are:

- moderately erodible
- low of instream EC
- slightly acidic / weakly basic pH
- moderately fertile, indicated by a moderate to high CEC and low to moderate organic carbon concentration.

Water Sharing Plans (WSPs) have been developed under the *Water Management Act 2000* to protect the environmental health of water sources, whilst securing sustainable access to water for all users. The Project Area crosses two water sharing plan areas and two associated water sources, including:

- The Upper Talbragar River Water Source in the Macquarie-Bogan Unregulated and Alluvial Water Source (2012) WSP
- The Munmurra River Water Source that is part of the Hunter Unregulated and Alluvial Water Source (2022) WSP.

NSW Water Quality Objectives (WQO) have been developed to guide plans and actions to achieve healthy waterways. The WQOs are based on measurable environmental values (EVs) for protecting aquatic ecosystems, recreation, primary industries, drinking water and industrial water (ANZECC & ARMCANZ, 2000). The Macquarie-Bogan Catchment and Hunter Catchment have the same WQOs, and the aquatic ecosystem WQOs considered relevant to the Project Area due to nearby farm dams, the livestock water supply guidelines are also considered relevant. Comparison of the aquatic ecosystem and livestock water supply WQOs included in the SWIA, shows that the guideline values for oxides of nitrogen (NOx) and total dissolved solids (TDS)/electrical conductivity (EC) (noting that EC is indicative of TDS) for livestock water supply are several orders of magnitude higher than those for protection of aquatic ecosystems. No site-specific water quality data has been captured.

6.5.1.2 Proposed Water Management System

The proposed Water Management System (WMS) will manage both clean water and sediment water. Clean water is natural rainfall and runoff from existing undisturbed catchment areas. Clean water is generally diverted away from the Project Area through the use of bunds and drains to prevent contamination. Sediment water is runoff from disturbed areas (topsoil stockpiles and areas cleared of topsoil) and are expected to contain increased levels of sediment. Sediment water is managed through the use of erosion and sediment controls.

During operation the Project water management system (WMS) will be comprised of one sediment dam and a series of drains and bunds to contain sediment water on the site, refer to **Figure 6.6**. During the construction phase, erosion and sediment controls (ESCs) will be used to minimise erosion and reduce the risk of sediment laden runoff reporting off-site. Construction phase ESCs will be designed and implemented

generally in accordance with requirements outlined in Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Volume 2E – Mines and quarries (DECC, 2008) (the 'Blue Book').

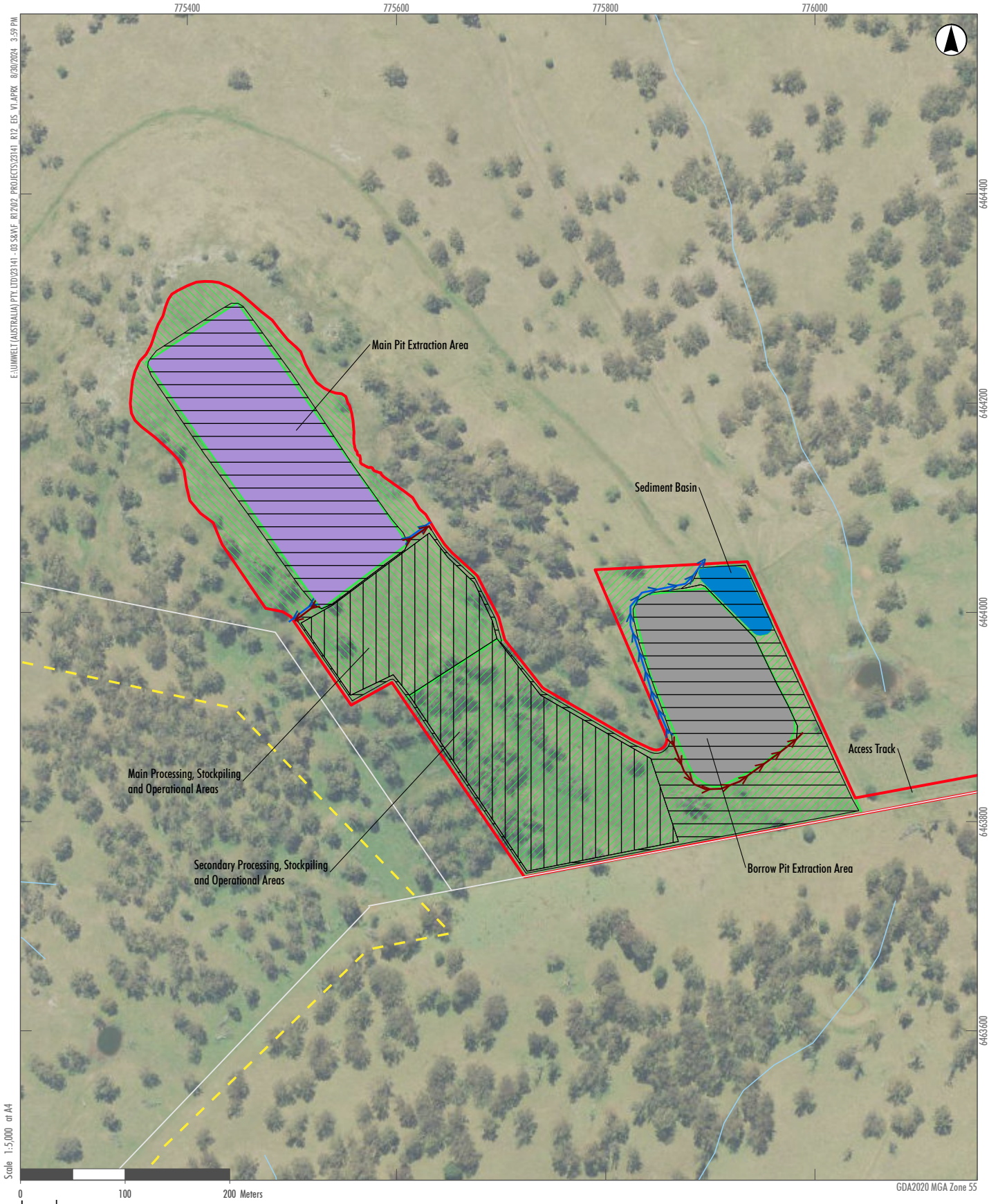
Drains and Bunds – a perimeter bund will be used to contain runoff from disturbed areas on site. Drains will be used as required to divert water away from the Main Pit and Borrow Pit and towards the Sediment Basin. Clean water diversions will be constructed to divert undisturbed catchment away from site. These features will be designed to meet the requirements outlined in the Blue Book (Landcom, 2004 and DECC, 2008).

Sediment Basin – one sediment basin will be used to capture and contain runoff from disturbed areas to manage risks associated with elevated sediment loads in runoff from disturbed areas. The Proposed Sediment Basin has been sized based on the upslope disturbed catchment area reporting to the basin in accordance with requirements outlined in the 'Blue Book'. The proposed Sediment Dam is located immediately downslope of the proposed Borrow Pit and is located upslope from a first order stream. **Appendix 8** for further detail of the proposed Sediment Dam.

Pumps and Pipelines – pumps will be used to dewater the Main Pit and Borrow Pit via pipeline to the Sediment Basin when the basin has available storage capacity. The Sediment Basin will dewater to Main Pit as required to ensure that the required capacity is maintained.

Controlled Release Infrastructure is not expected to be required. Water captured on site will be used to meet operational demands and will be stored in pit when required to maintain freeboard requirements. Should controlled release be required due to excessive accumulation of the sediment water impeding operations, ARDG will apply for a license discharge point to be added to the site environmental protection license (EPL) with appropriate discharge criteria.

Potable Water Supply and Wastewater Management – Potable water for amenities will be supplied to the site by water tanker. Wastewater from amenities will be collected in a tank and removed from site by a licensed waste contractor as required.



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Drainage Line
- Surveyed Cadastre
- Borrow Pit Extraction Area
- Main Pit Extraction Area
- Main Processing and Stockpiling Area
- Secondary Processing and Stockpiling Area
- Sediment Basin

Land Use

- Disturbed
- Stockpile

Proposed Diversion

- Clean
- Dirty

FIGURE 6.6

Proposed Water Management System

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)

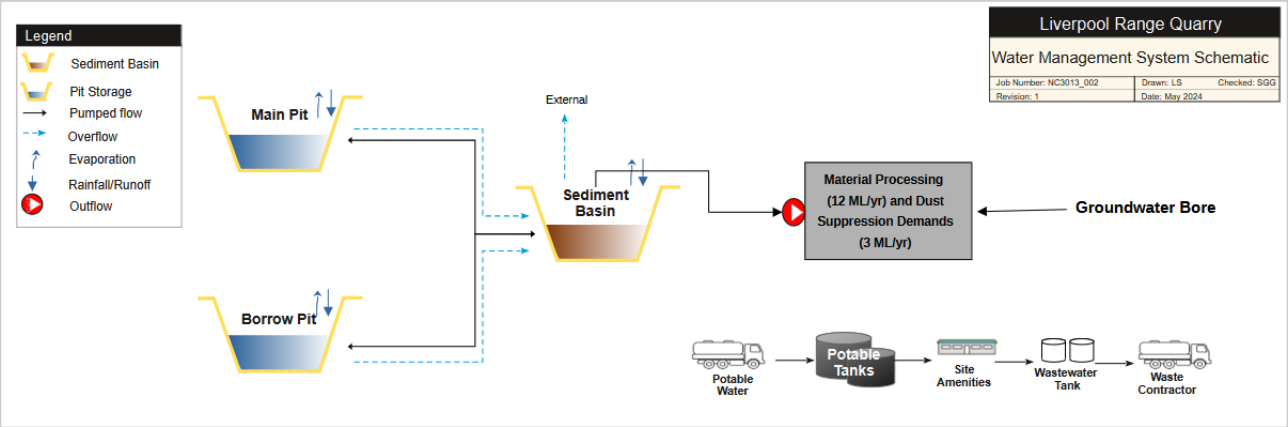


Figure 6.7 Water Management System Schematic

Water management inflows, outflows and internal transfers associated with the Project are outlined in **Table 6.9** and shown on **Figure 6.7**.

Table 6.9 Water Management System Inflow and Outflows

Type	Description
Rainfall and runoff	Rainfall and runoff captured by the WMS
Groundwater from Bores	Groundwater extracted from bores to be used as a supplementary water source for dust suppression and process demands if these demands cannot be met by the Sediment Basin
Potable Water Supply	Potable water supplied via tanker truck
Evaporation	Evaporative losses from the water storage surfaces (including water stored in-pit)
Dust suppression	Water applied to roads and disturbed areas within the Project Area. This water will be supplied from the Sediment Basin and supplemented with water extracted from groundwater bores as required
Process Water Demands	Water used for production of quarry products. This water will be supplied from the Sediment Basin and supplemented with water extracted from groundwater bores as required
Pit Dewatering	The Main Pit and Borrow Pit will be dewatered to the Sediment Basin when the basin has available storage capacity
Sediment Basin Dewatering	The Sediment Basin will dewater to the Main pit or Borrow Pit as required to maintain adequate freeboard

6.5.1.3 Impact Assessment

As a result of the Project, four of the six farm dams will have a reduction in catchment of less than 1%. The largest reduction in catchment is 26.3% (farm dam 2) which is located on the same property as the quarry. Farms dams 4, 5 and 6 (located on neighbouring properties) all have insignificant reduction in catchment area (0 – 0.4 %) and therefore any reduction in flow reporting to these dams, as a result of the Project, would have no measurable impact on the efficacy of water storage in these dams.

As the Project Area is located on a ridge line and away from hydrological features, no flood impacts are expected. A small farm dam is located approximately 150 m to east of the proposed Borrow Pit, in a shallow depression that separates the proposed quarry pits from a basalt ridge further east. This dam drains through an ephemeral gully to another farm dam approximately 800 m to the north which drains via a narrow incised ephemeral channel to the Talbragar River.

The potential for adverse water quality impacts on downstream receiving waters during construction and closure of the Project can be satisfactorily mitigated by the implementation of ESCs in accordance with the Blue Book. The potential for adverse water quality impacts on downstream receiving waters during the operational phases are considered negligible. Reductions in rainfall runoff volumes reporting to downstream users due to the Project WMS catchment area are considered negligible.

The Project will have an adequate and reliable water source (i.e., captured rainfall runoff and groundwater bore) to support the required construction and civil aspects of the Project.

6.5.1.4 Water Balance

The total site water demand is estimated to be 15 ML per year. This volume is inclusive of 12 ML that is intended to be used for dust suppression and 3 ML that will be used to meet process demands. These demands will be met by:

- Surface water runoff captured by the WMS.
- Groundwater as required if water demands cannot be met by the Sediment Basin.

A water balance model (WBM) representative of the proposed water management system was developed using the GoldSim software. The model simulates inflows from rainfall and runoff (including direct rainfall on water surfaces), outflows for dust suppression and process demands, and evaporative losses to assess future inventories and the likelihood of uncontrolled releases occurring from the site.

The WBM was simulated for 133 climate realisations to conduct a probabilistic Monte Carlo assessment using historic climate data. The WBM was simulated for four years, representative of the life of quarry. Each modelled realisation uses four years of actual historic data, cycling through the historic dataset.

Modelling results indicate site water demands cannot be met by the Sediment Basin during the life of quarry. An average yearly shortfall of 6 ML and a maximum yearly shortfall of 13 ML is predicted. This indicates that 13 ML is likely to be required to ensure site water demands can be met during dry years.

Model results indicate that there is an 83% chance that an overflow from the Sediment Basin will occur during the life of quarry (four years). The average number of modelled overflow events per year is 0.6. This is notably less than the 1 – 2 spills per year indicated in Volume 2E of the 'Blue Book' as being typical of sediment basins sized to contain runoff from a 5 day 95th percentile rainfall event. It should be noted that all modelled overflows are from the Sediment Basin and that Main Pit and Borrow Pit do not overflow in any of the modelled realisations.

6.5.1.5 Licensing, Monitoring and Reporting

Licensing

As discussed in **Section 4.0**, the Project will require an EPL. At this stage, the inclusion of a licensed discharge point on the EPL to permit controlled discharges from the WMS is not considered to be required as the key pollution risk is turbidity and this can be adequately managed through the proposed water management system which meets 'Blue Book' standards.

Capture of surface water runoff by the WMS is proposed to prevent the contamination of a water source and all proposed sediment control structures are located on, or upslope from a minor stream (first or second order stream). As such, all Project water storages are considered as excluded works under Schedule 1 of the *Water Management (General) Regulation 2018* and therefore, exempt from requiring a Water Access Licence under Schedule 4 Clause 12 of the *Water Management (General) Regulation 2018*.

Surface water take associated with any final voids and/or other water storages that will remain after closure of the operations will be licensed as required with consideration of the harvestable rights entitlement for the landholding. These licensing requirements will be communicated to any future landholders.

Water demands for the project will be supplemented (via private agreement) from a nearby licenced bore (Water Supply Work 80CA706124) and associated entitlement (WAL 27888 – 320 ML), both registered to the landowner. The licenced bore is approved for use (irrigation) on Lot 89 DP750749 and water from the bore is currently pumped to two (2) tanks located approximately 280 m to the east of the Project Area. Water would be pumped from these tanks to holding tanks located on the site to meet the controlled allocation and usage of groundwater sufficient for the demands of the Project. A change to the approved use of this WAL to enable use for dust suppression purposes will not be required.

Monitoring

Surface water monitoring is proposed to be undertaken at two locations, the proposed Sediment Basin and Farm Dam 1. Monitoring would occur in the event of a spill occurring from the Sediment dam. Farm Dam 1 has been selected as a proposed surface water monitoring site because if an overflow event form the Sediment Basin was to occur, overflow volumes would report to this dam. Impact assessment criteria for receiving water quality downstream of the quarry will be developed in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018). Given the agricultural land use that also contributes rainfall runoff flows to Farm Dam 1, elevated concentrations of nitrogen (possibly including NOx) are likely to be present in Farm Dam 1 water and may indicate potential quarry impacts where there are none. ARDG will undertake water quality monitoring prior to commencement of quarry construction to establish baseline water quality for Farm Dam 1.

As the Project Area is located on a ridge line with no watercourses within the proposed disturbance area and there are no proposed controlled discharges from the WMS, it is considered that stream stability monitoring is not required.

ARDG will implement an inspection and water quality testing program for potable water stored in tanks on site (delivered by water tanker) to ensure amenities water quality meets the Australian Drinking Water Guidelines – Version 3.5 (ADWG) (National Health and Medical Research Council, 2011).

Reporting

ARDG will be required to complete and submit an Annual Return that it is anticipated to include a summary of an uncontrolled water discharges, monitoring, any complaints and a statement of compliance with EPL conditions. The Annual Review will also include a summary of the quarry WMS performance. It is anticipated that the Annual Review will include the annual site water balance results, water quality monitoring results and details of any incidents or complaints. If an environmental incident involving surface water occurs the relevant authorities (including DPHI and the EPA) will be notified and reports provided as required.

6.5.2 Groundwater

6.5.2.1 Existing Environment

As discussed in **Section 2.3**, the Project Area is located on a prominent ridge comprised of a complex sequence of basaltic lava and fragmental volcanic rocks of Tertiary-age. The crest of the ridge on which the Quarry pits are located is effectively surrounded by air, with little to no catchment from which an elevated groundwater table could be sourced.

Field observations around the flanks and base of the ridge indicate an absence of any springs or water flow at the contact of the overlying basalt and underlying older lithology. This is in contrast to observations of numerous other locations in the area where spring flow occurs at the contact of the overlying basalt and underlying older lithology, albeit these sites have significant area of elevated terrain located above, with potential for recharge and hence discharge at the contact during prolonged rainfall events. Consequently, given the lack of land mass above the ridge, the local groundwater table in the vicinity of the proposed quarry pits is located at elevations below the base of the basalt ridge.

GHD undertook a geotechnical assessment of the Quarry site (refer to **Appendix 12** and **Appendix 13**) which assessed the groundwater table using information from the Australian Groundwater Explorer System developed by the Australian Government Bureau of Meteorology, accessed in August 2023. Within a 2 km radius of the proposed quarry pit there have been seven drilled boreholes recorded in the Groundwater Explorer System, refer to **Figure 2.3**.

Of the seven boreholes identified in the geotechnical assessment, only one bore indicates the depth of the water table measured over time. This borehole (i.e. GW012325) is located less than 500 m to the southwest of the Project Area. Based on the available groundwater data, there have been no significant fluctuations in the groundwater profile over time, with the data from this borehole indicating that the average groundwater level is approximately at 651 m AHD. This level is 25 m below the proposed pit floor for the Main Pit, and 10 m below the pit floor for the Borrow Pit.

The absence of groundwater within the strata of the ridge at elevations proposed for extraction of rock was confirmed by extensive drilling of both the Main Pit and Borrow Pit extractions areas. This drilling included drill holes to depths up to 10 m below the proposed pit floor levels and no groundwater was encountered in any holes, consistent with expectations based on preliminary analysis.

A schematic representation of the local groundwater environment based on this information and drilling data from the Project Area, relative to the proposed floor level of the quarry pit, is shown in **Figure 2.1**.

Given that extensive drilling of the site did not intersect any groundwater and the proposed extraction activities within the extraction footprints will be confined to depths well above the measured depth of groundwater in the vicinity of the site (refer **Figure 2.1**), extraction activities in the Main Pit and Borrow Pit areas are highly unlikely to intersect the local groundwater table and as such, detailed groundwater modelling of the Quarry site (either analytical or numerical) is not warranted. In addition, given the elevated nature of the Quarry site, with no significant area of recharge located at elevations above the extraction areas, groundwater inflow into both the Main Pit and Borrow Pit associated with localised recharge is expected to be negligible.

The size of the quarry area (14.1 ha), including Main Pit (3.17 ha) and Borrow Pit (1.84 ha) compared to the size of the Liverpool Ranges Basalt MDB Groundwater Source area (286,000 ha) (NSW DPI, 2012) is insignificant with respect to potential for the quarry to measurably reduce groundwater recharge of the aquifer. The Project will not involve the extraction of material that is considered likely to present a risk to groundwater quality.

Consequently, impacts on groundwater quality or quantity are considered unlikely during construction and operation and no groundwater interactions or adverse impacts to aquifers are predicted as a result of the Project. In addition, there are no known groundwater issues (e.g. contamination) in the vicinity of the Project Area.

6.6 Biodiversity

A Biodiversity Development Assessment Report (BDAR) was prepared by Umwelt to assess the potential biodiversity impacts associated with the construction, use and decommissioning of the Project. The BDAR was prepared in accordance with the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Biodiversity Assessment Method (BAM) (DPIE, 2020a) in consultation with DPHI.

The Project SEARs require the assessment of biodiversity including:

- accurate predictions of any vegetation clearing on site
- a detailed assessment of the likely biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems, undertaken in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report
- a detailed consideration of the potential for off-site and in-direct impacts on local biodiversity and surrounding ecological corridors or habitat
- a strategy to offset any residual impacts of the development in accordance with the Biodiversity Offsets Scheme.

The area of direct impact assessed by the BDAR is referred to as the disturbance area. The Project is located wholly within the LRWF project area and the disturbance area covers approximately 19.5 ha. The disturbance area intersects with the development corridor of the LRWF project and the CWO REZ Transmission Line where an approximately 1 ha of overlap occurs. It is noted that this BDAR assesses the impacts across the full extent of the Project despite the assessment of the CWO REZ Transmission Line likely having assessed partial impacts within this overlap area. The area of overlap with the development

corridor of the LRWF project (approximately 0.5 ha) was not assessed as part of the LRWF development footprint.

The boundaries identified in this BDAR are therefore defined as:

- Disturbance area: (referred to as the development footprint in the BDAR) the area of land that is directly impacted by the Project, including access roads and areas used to store construction materials.
- LRWF project development corridor: is a buffer area in which the LRWF indicative development footprint is to be located. It is noted that only the LRWF project development corridor intersects with the disturbance area assessed by the BDAR for the Project and the biodiversity impacts within this overlap was not assessed by the LRWF project.
- CWO REZ Transmission Line: is the indicative area assessed for partial direct impacts for the EnergyCo CWO REZ Transmission Line Infrastructure project. The area of intersect between the CWO REZ Transmission Line and the Development Footprint addressed the direct impacts in full for the Project.

On 15 August 2024, a delegate of the Minister for the Environment determined that the Project is a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) based on likely impacts to threatened species and communities listed under that Act. The Project will be assessed under the Bilateral Agreement between the State and the Commonwealth. As such the Commonwealth has also provided its assessment requirements for the Matters of National Environmental Significance (MNES) relevant to the Project.

A full copy of the BDAR is provided in **Appendix 9** and a summary of key outcomes is provided below.

6.6.1 Methodology

The BDAR was prepared in accordance with the BAM (DPIE, 2020a) and the Biodiversity Assessment Method Operational Manual – Stage 1 (DPIE, 2020b). The BAM has been endorsed as the assessment method for MNES under the Bilateral Agreement made under the EPBC Act.

Broadly, the methods used in preparing the BDAR were:

- Landscape features and site context – desktop review of appropriate data sources including relevant mapping products, aerial photography and GIS layers in accordance with Section 3.1 of the BAM, confirmed during field surveys.
- Native vegetation assessment – including literature and database review, digital aerial photo interpretation, floristic and vegetation integrity surveys, and meandering transects to inform vegetation mapping, Plant Community Types (PCT) allocation and threatened ecological communities (TEC) delineation.
- Threatened species assessment – including literature and database review, ecosystem-credit and species-credit species assessments, habitat constraints assessments, and targeted diurnal fauna surveys.

The portion of the disturbance area which overlaps with the LRWF development corridor is considered to meet the definition of Category 1 – exempt land under Part 5A of the *Local Land Services Act 2013*. The area of Category 1 – exempt land (approximately 0.5 ha) extends west from Rotherwood Road and is

bounded by an artificially constructed bund that extends to the adjacent property containing cropped land. This area was also mapped as Category 1 – exempt land within the LRWF development corridor but is not located within the LRWF development footprint (Umwelt 2023). The approximate 0.5 ha of Category 1 – exempt land identified within the disturbance area has been excluded from the biodiversity assessment in accordance with the BAM (DPIE 2020).

The remaining 19.0 ha of native vegetation within disturbance area has been assessed by the BDAR prepared for the Project.

Further detail regarding the methodology, including detailed survey information, is included in Section 2.0 of the BDAR (refer to **Appendix 9**).

6.6.2 Landscape Features and Site Context

The Project Area lies within the Brigalow Belt South Interim Biogeographic Regionalisation for Australia (Version 7) (IBRA) Bioregion and the Brigalow Belt South – Liverpool Range sub-region.

The Assessment Area was defined by a 1,500 m buffer zone surrounding the disturbance area (refer to **Figure 6.8**). This 1,500 m buffer area contains a mixture of primary agricultural areas (cropping and livestock grazing), intact and regrowth vegetation, named watercourses, as well as infrastructure and residential areas. Approximately 87% of the approximately 1800 ha Assessment Area (1568.8 ha) is covered by native vegetation in various condition states from primary agricultural land mixed introduced/native grassland communities to intact woodland.

The disturbance area does not intersect any rivers, streams, estuaries or wetlands. The Talbragar River is located approximately 1.3 km to the north-west and is within the Assessment Area. No karst landforms, caves, crevices, cliffs, rocks or other geological features of significance occur within the disturbance area, nor does it contain any areas of outstanding biodiversity value, as identified under the BC Act.

Category 1 – Exempt Land occurs within that part of the disturbance area that overlaps with the LRWF development corridor and hence is not dealt with further in the biodiversity assessment for the Project.

6.6.3 Assessment

6.6.3.1 Native Vegetation Assessment

Surveys of the disturbance area identified one PCT in two condition types, as detailed in **Table 6.10** and illustrated in **Figure 6.9** below.

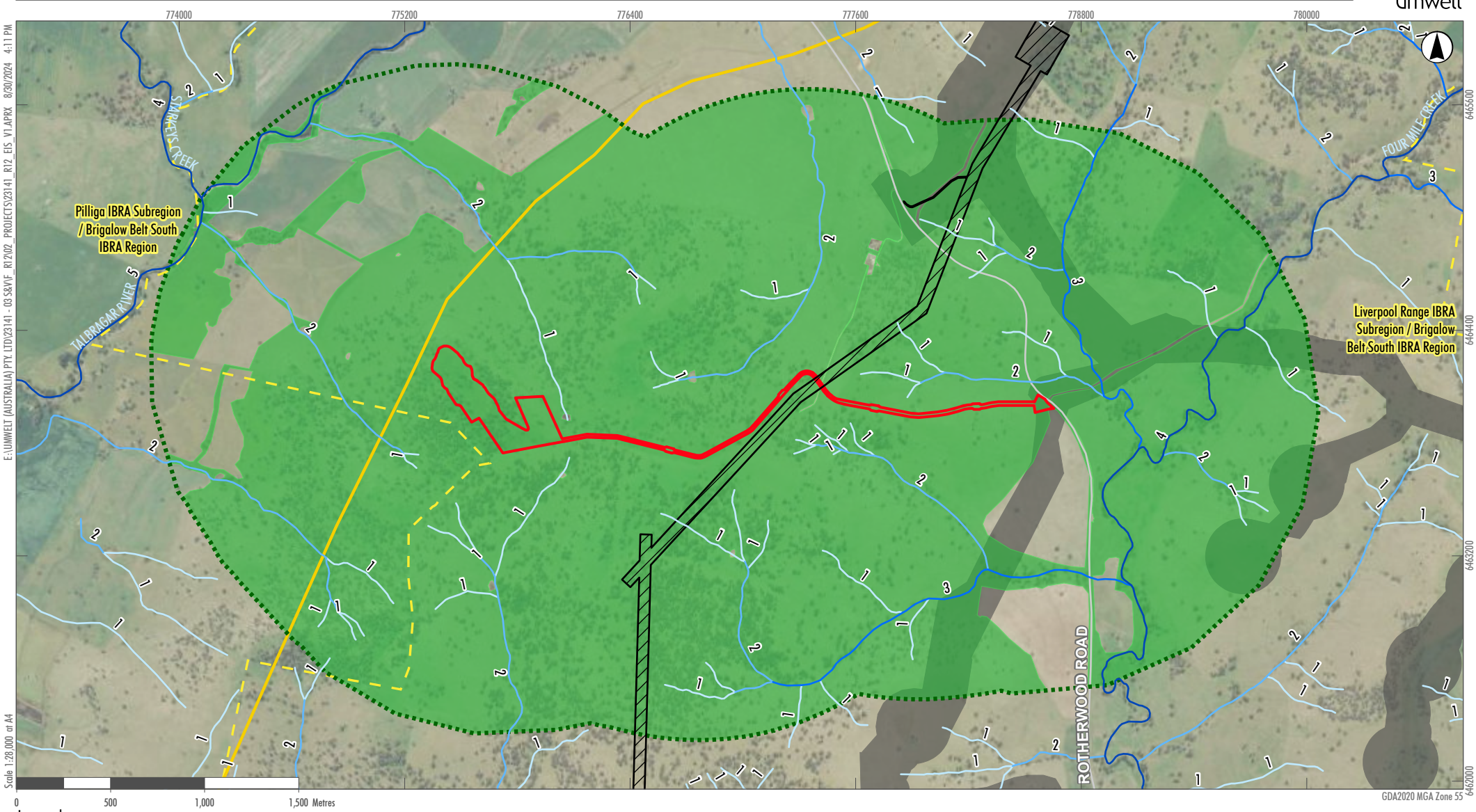
Table 6.10 Vegetation Zones

Zone	PCT No.	PCT Name	Condition	Area (ha)
1	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Low	3.2
2	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Derived Native Grassland (DNG)	15.1
			Total Area	**18.3**

Detailed descriptions of each PCT and further details on the number of BAM plots (floristic and vegetation integrity survey plots) required and completed for each vegetation condition zone are provided in the BDAR (refer to **Appendix 9**) along with vegetation integrity scores.

6.6.3.2 Threatened Ecological Communities

A detailed analysis of the potential occurrence of TECs within the Disturbance Area was undertaken against the relevant approved conservation advice and key diagnostic characteristics. The result of this detailed analysis against the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (CEEC) listed under both the BC Act and EPBC Act found that Vegetation Zone 1 conforms to both the NSW and Commonwealth listings for the CEEC. A total of 3.2 ha will be impacted within the Indicative disturbance area, as illustrated in **Figure 6.10**. Vegetation Zone 2 does not conform to the condition thresholds outlined in the final determination or listing advice of either TEC.



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Liverpool Range Wind Farm Project Development Corridor – Wind Farm
- Liverpool Range Wind Farm Project Development Corridor – External Transmission Line CWO REZ
- Native Vegetation
- 1500m Buffer
- IBRA Subregion / Region
- Road

Stream Order:

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream or Higher

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)

FIGURE 6.8

Landscape Features



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Liverpool Range Wind Farm Project Development Corridor – External Transmission Line CWO REZ
- Liverpool Range Wind Farm Project Development Corridor – Wind Farm
- Road
- Watercourse

PCTs

- Category 1 - Exempt Land
- VZ 1 - PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley - Low
- VZ 2 - PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley - DNG

FIGURE 6.9

PCTs and Vegetation Zones

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Liverpool Range Wind Farm Project Development Corridor – External Transmission Line CWO REZ
- Liverpool Range Wind Farm Project Development Corridor – Wind Farm
- Road
- Watercourse

BC Act

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

EPBC Act

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

FIGURE 6.10

Threatened Ecological Communities

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)

6.6.3.3 Threatened Species Assessment

The BAM calculator used for the BDAR predicts the species that may occur and prescribes species which must be considered in the assessment. The BAM prescribes specific survey requirements for particular species and, in the absence of surveys being undertaken in accordance with BAM assessment requirements, the presence of the species is to be assumed. A full list of the ecosystem-credit species and the species-credit species predicted to occur by the BAM Calculator and/or the literature review and consideration of their likelihood of occurrence in the vegetation zones within the Project Area is provided in the BDAR (refer to **Appendix 9**).

Targeted surveys were undertaken for bluegrass (*Dicanthium setosum*) and koala (*Phascolarctos cinereus*) and additional surveys will commence in September 2024 for pink-tailed legless lizard (*Aprasia parapulchella*) and striped legless lizard (*Delma impar*).

No threatened species were observed during the targeted surveys completed for bluegrass and koala and there is also no suitable habitat present for threatened raptors. In March 2024, one potential call sequence of a barking owl (*Ninox connivens*) was heard approximately 65 m east of the proposed quarry operations area and given the presence of suitably sized hollow bearing trees and associated PCTs in the disturbance area, a species polygon has been prepared for this species.

The NSW BAM categorises threatened species as either ecosystem-credit species or species-credit species. Credits are required for impacts on species-credit species but not for ecosystem-credit species as the impacts to these species are considered to be offset by credit requirements generated for impacts on native vegetation and, in some cases, the presence of the species trigger higher ecosystem credits calculated for impacts to vegetation communities.

In the absence of targeted surveys (in accordance with the BAM), the following candidate threatened fauna species-credit species have been assumed present within the disturbance area:

- barking owl (*Ninox connivens*)
- pink-tailed legless lizard (*Aprasia parapulchella*)
- striped legless lizard (*Delma impar*).

All three species are listed as ‘vulnerable’ under the BC Act with the pink-tailed worm lizard and striped legless lizard are both listed as vulnerable under the EPBC Act. The Barking Owl is not listed as threatened under the EPBC Act.

As noted above, targeted surveys for pink-tailed legless lizard (*Aprasia parapulchella*) and striped legless lizard (*Delma impar*) will be undertaken in September and October to confirm the presence or absence of these species.

6.6.4 Avoidance of Impacts

The Project design has endeavoured to avoid wooded areas which meet the BC Act and EPBC Act listed Box Gum Woodland CEEC listings where possible. However, due to the physical location of the quarry resources and limitations on the alignment of the access track relating to land tenure and the planned design of the CWO REZ Transmission Line, total avoidance was not achievable.

The initial access road design would have avoided all trees and Vegetation Zone 1 which aligns with BC Act and EPBC Act Box Gum Woodland CEEC. However, in early 2024, the access road route had to be revised to allow for the proposed design of the CWO REZ Transmission Line and land tenure restrictions, resulting in impacts to a small patch of woodland (Vegetation Zone 1) in the central portion of the access road. The final access road design will undergo further micro-siting to avoid hollow bearing trees and non-habitat trees where practical.

As the resource to be quarried is location-specific, the extraction of the quarry resource cannot easily restrict disturbance to areas of no or low biodiversity value. However, the quarry components have been strategically located to avoid impacts to ecological values where practicable by focusing on areas that have been historically cleared for agriculture. The quarry design aims to minimise the direct impacts to woodland vegetation by avoiding the removal of remnant trees where possible. The location of the Main Pit does not require the removal of any trees and the Borrow pit requires the removal of only four trees (two *Eucalyptus albens* and two *Brachychiton populneus*).

The disturbance area has been designed to be situated in an area of lower biodiversity value compared to surrounding habitats, resulting in a strategically small area of disturbance to native vegetation or fauna habitats.

The Project will substantially reduce heavy vehicle movements on the broader road network relative to alternative approved sources of quarry material suitable for use for the LRWF project. Haulage of material from other quarries would necessarily have involved additional truck movements to and from those quarries during higher vehicle strike risk periods for fauna such as early morning and evening; these risks are substantially mitigated and/or avoided by sourcing quarry material that is local to the LRWF project.

6.6.5 Impact Assessment

6.6.5.1 Direct Impacts

The Project will result in direct impacts to native vegetation communities and threatened species habitats within the disturbance area as a result of clearing works for infrastructure and quarry establishment as detailed in **Table 6.11**.

Table 6.11 Direct Impacts on Biodiversity

Entity	BC Act status	EPBC Act status	Timing of impact	Total direct impact area
PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley (Low condition)	CEEC	CEEC	Construction	3.2 ha
PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley (DNG)	-	-	Construction	15.1 ha
barking owl (*Ninox connivens*)	Vulnerable	-	Construction	2.8 ha
pink-tailed legless lizard (*Aprasia parapulchella*)	Vulnerable	Vulnerable	Construction	5.2 ha
striped legless lizard (*Delma impar*)	Vulnerable	Vulnerable	Construction	13.8 ha

6.6.5.2 Indirect Impacts

The Project has the potential to result in indirect impacts on biodiversity values of surrounding lands through a number of factors including noise, dust and blasting impacts and risk of weed invasion. These are discussed below in **Table 6.12**.

Table 6.12 Indirect Impacts on Biodiversity

Indirect impact	Intensity	Frequency/ Duration	Timing	Likelihood and consequence
Increased site occupation	Moderate	Frequent/ Approx. 4 – 5 years	Construction/ Operation	Likely to occur, consequences are likely to include reduction in habitat suitability for threatened fauna in immediately adjoining areas.
Connectivity and corridors	Low	Frequent/ Ongoing	Construction, operation and once decommissioned	Will occur, consequences include reduced wildlife connectivity. Wildlife connectivity will be maintained through retention of suitable corridor areas surrounding the disturbance area.
Noise impacts	Low to Moderate	Frequent (day time only)/ Approx. 4 – 5 years	Construction and operation	Will occur, consequences likely to include reduction in suitability of retained and close adjoining habitats for noise sensitive fauna species. Noise from the Project will be minimal during early morning, evening and night time periods when noise sensitive fauna species are more likely to be active.
Air quality impacts	Low to moderate	Frequent (day time)/ Approx. 4 – 5 years	Construction and operation	Potential to occur within the immediate vicinity of the quarry pit but will be managed by appropriate dust suppression. Consequences include physical injury to airways of fauna species and short term reduced photosynthetic capacity for impacted flora. Controls for human health will also be applied to the Project.
Vibration impacts	Low	Frequent (machinery) Infrequent (blasting)/ Approx. 4 – 5 years	Construction and operation	Potential to occur within the immediate vicinity of the quarry pit due to the operation of heavy machinery and the movement of heavy vehicle traffic throughout the disturbance area as well as blasting. It is considered that the Project would have a negligible impact to the functionality of adjacent habitats from vibration during operation.

Indirect impact	Intensity	Frequency/ Duration	Timing	Likelihood and consequence
Weed invasion	Low	Infrequent/ long term	Construction, and operation and ongoing once decommissioned	Due to the long history of intensive agricultural land use weed species are already widespread in these areas. Further spread of weed species has the potential to occur, particularly where aggregates are being transported throughout the broader locality during the construction of LRWF project. Consequences include introductions of weeds, reduction in habitat suitability and competition with native species from areas of lower quality vegetation during the construction of Project. Managed through proactive site weed management.
Pest animal species	Low	Infrequent/ long term	Construction and operation	Populations of feral fauna species such as goats, foxes, rabbits and cats can increase and quickly populate new areas as a result of disturbance. While no feral species were observed during surveys, goats, foxes and rabbits were observed throughout the disturbance area. It is considered a low potential for increased impacts, consequences include reduced habitat suitability and predation, grazing and/or trampling of threatened species as a result of feral fauna beyond the current land management regime.
Erosion	Low	Infrequent/ Medium Term	Construction and operations	Given the position of the quarry within the landscape there is a low likelihood of erosion impacts to adjacent habitats from quarry operations beyond the current land management regime.
Cumulative impacts	High	Medium-term	Construction and operation	Reduction in threatened species and plant community resilience in the locality due to fragmentation and isolation of patches of intact vegetation and habitats at a landscape level. Reduction of fauna refuges in an already highly modified landscape.

These indirect impacts are manageable with appropriate management and mitigation measures that would be formalised through the preparation of a Biodiversity Management Plan. No indirect impacts are expected to occur in relation to surrounding connectivity, corridors or habitat fragmentation, considering the already disturbed nature of the disturbance area. No indirect impact zones have been identified for this assessment.

6.6.5.3 Prescribed Impacts

Two prescribed impacts that are considered relevant to the Project are habitat connectivity and vehicle strike.

Habitat connectivity

The Project has the potential to affect habitat connectivity for flora and fauna species through vegetation clearing. Habitat connectivity between the disturbance area and the surrounding vegetation is moderate as the quarry occurs within a mosaic of native woodland and grasslands modified by an extensive history of agriculture. Species utilising these areas for connectivity are already highly mobile and disturbance tolerant.

Impacts to habitat connectivity are considered to be minor where development is situated within a larger patch of habitat associated with a broader corridor extending through the landscape. The Project has been designed to minimise impacts to areas of higher biodiversity value, with the proposed quarry generally located within low quality native grassland. Wildlife connectivity will be maintained through retention of suitable corridor areas surrounding the Project throughout the use of the quarry.

Vehicle strike

The Project will result in an increase to daytime vehicle movements along the access road during the four years when the quarry is in operation. Speed limits and signage on the access road and within quarry operational areas will be employed and it is unlikely that vehicle strikes within the disturbance area will result in significantly increased mortality levels for native fauna.

The Project will mitigate the broader impact resulting from vehicle strikes by offering a local supply of quarry material that would otherwise need to be sourced from more distant locations. Material sourced from Dubbo (the most likely alternate source of quarry material for the LRWF project) would involve an additional 270 km (return) journey for trucks hauling quarry material to the LRWF project. Based on a 2 Mt production, this equates to a reduction in over 16 million kilometres of heavy vehicle movements relative to the project not proceeding. This would include significant vehicle movements during early morning and evening periods. The Project will avoid this additional travel distance with a commensurate reduction in risk of vehicle strike.

6.6.5.4 Serious and Irreversible Impacts

One Serious and Irreversible Impact (SAII) entity was recorded during surveys for the Project: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions CEEC (BC Act). No other SAII entities or habitat critical for their survival are considered to be impacted by the Project.

The current geographic extent of this CEEC across its range is estimated by Tozer and Simpson (2020) (reproduced from TSSC 2006) as 576,654 ha, which includes an area of occupancy of 250,729 ha within NSW. This estimate does not include the derived native grassland component of the ecological community.

Based on the State Vegetation Type Mapping (SVTM), the pre-1750 area of NSW Box Gum Woodland CEEC is estimated at between 1,895,058 ha and 2,403,693 ha and the current SVTM extent of NSW Box Gum Woodland CEEC is estimated at between 1,267,603 ha and 1,639,571 ha. The variance in the SVTM upper

estimate is due to some mapped PCTs being identified as only partly being associated with the NSW Box Gum Woodland CEEC. Based on the SVTM there has been a 33.1 – 31.75% reduction in NSW Box Gum Woodland CEEC since 1750. The Project's impact represents a further reduction in extent of the Box Gum Woodland CEEC of less than 0.0003% of the current area based on the lower SVTM estimate.

It is also noted that hard rock quarry resources, such as those required for the LRWF project, located in the vicinity of the CWO REZ are generally associated with basalt or other volcanic rock sources. The vegetation associated with the higher quality soils derived from these volcanic rock material typically conform with the Box Gum Woodland CEEC. Accordingly, alternative sources of rock material for the LRWF project (or sources for rock material for other projects displaced by the LRWF project using existing quarries) are also likely to involve some degree of disturbance to Box Gum Woodland CEEC or derived grassland communities. In this regard, while the Project represents a small increase in the areas of Box Gum Woodland impacted as a result of the LRWF project, it also likely mitigates or avoids a similar level of impact to the CEEC at other locations, either as a direct result of avoiding an alternative new quarry for direct supply or additional disturbance to meet the increased demand for quarry products associated with the LRWF project.

It is also noted that impacts to this SAII entity will be offset based on credits calculated in relation PCT 483 for both Zone 1 and Zone 2. Only Zone 1 meets the CEEC listing criteria, yet it is likely that the credits associated with Zone 2 will also contribute to the improvement of areas of CEEC. While these are not deemed to be additional and appropriate measures to mitigate a potential SAII, they are considered critical to mitigating impacts on the SAII entity.

6.6.6 Matters of National Environmental Significance

The BDAR (refer to Section 8.4 of Appendix E of **Appendix 9**) includes specific consideration of potential impacts to threatened species and communities listed.

Only one entity listed under the EPBC Act has been recorded in the Project Area which has the potential to be significantly impacted by the Project, being the White Box-Yellow Box-Blakeley's Red Gum Grassy Woodland and Derived Native Grassland CEEC (Commonwealth Box Gum Woodland CEEC). As discussed in **Section 4.0**, the Project was referred to DCCEEW and determined to be a controlled action.

The CEEC is associated with PCT 483 Vegetation Zone 1 in the disturbance area. The Project has been designed to avoid and minimise impacts to the Commonwealth Box Gum Woodland CEEC, particularly high-quality patches, through both site selection and project design. It is anticipated that the Project may impact up to 3.2 ha that meets the Class A – good condition criteria and represents approximately 17.5% of the disturbance area.

While 3.2 ha represents a very small portion of the Commonwealth Box Gum Woodland CEEC across its range, it is essential to consider its impact within local landscape context. On face value alone, removal of 3.2 ha of critical habitat may still be considered an insignificant impact as this represents a decline of approximately 0.0002% to the area of occupancy in NSW (151,100 ha) (TSSC, 2006). However, considering the context of this Project within the landscape, the overall likelihood of a significant impact depends on cumulative impacts occurring in the immediate locality.

In the immediate locality, the LRWF project will remove 31.6 ha (including 17.3 ha to be partially impacted by canopy clearing only) of Commonwealth Box Gum Woodland CEEC that was identified as habitat critical

to the survival of this ecological community (Umwelt, 2024). The LRWF project Public Environment Report (Umwelt, 2024) considered the impact of up to 31.6 ha of habitat for the LRWF project to constitute a significant impact on this CEEC.

The immediate cumulative impacts relating to the LRWF project and the Project will result in a total of 34.8 ha of the CEEC being impacted. While both projects are assessed separately, the impacts of both projects are related, with patches of the CEEC within the disturbance area extending through the LRWF project Area. Through consideration of this assessment, the cumulative impacts of the Project and the LRWF project will potentially have a significant impact on the Commonwealth Box Gum Woodland CEEC.

6.6.7 Mitigation of Residual Impacts

The EMP will include will describe the avoidance, mitigation and management measures that will be undertaken to manage potential environmental impacts related to biodiversity, in accordance with best practice control methods.

The following specific measures will be incorporated into the EMP:

- Salvage of biodiversity features including habitat resources (e.g., hollow logs, fallen timber and rocks/boulders). Salvaged features will be relocated outside of the active operations areas but within the disturbance area.
- Implementation of pre-clearance procedures to minimise the potential for impacts on hollow-dependent and ground-dwelling native fauna species (focussing on threatened species).
- Weed management including weed suppression within the disturbance area and thorough cleaning of all equipment and machinery prior to entering the site to ensure it is free from pathogens and weeds.
- Fencing and access control to prevent uncontrolled entry by people and livestock and accidental disturbance to retained vegetation/habitat.
- Installation of temporary erosion and sediment controls to protect water quality.

6.6.8 Biodiversity Credit Impact Summary

Following the application of avoidance and mitigation measures, the BAM assessment identified that biodiversity credits are required to offset the impacts of the Project for the entities detailed in **Table 6.13**.

Table 6.13 Impacts Requiring Offset

Entity	Area of impact (ha)	Impact credits generated
PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	3.2	113
barking owl (*Ninox connivens*)	2.8	79
pink-tailed legless lizard (*Aprasia parapulchella*)	5.2	95
striped legless lizard (*Delma impar*)	18.3	240

As discussed in **Section 6.6.3.3** the offset liability for the Pink-tailed Legless Lizard and Striped Legless Lizard are based on assumed presence and further surveys are proposed in September 2024 to confirm presence or absence. Should the species not be identified as being present within the disturbance area in these surveys, the credit liabilities for these species identified in **Table 6.13** will not apply. The results of these surveys will be confirmed during the SSD assessment phase of the Project and will be communicated to both BCS and DPHI when available.

6.6.9 Biodiversity Offset Strategy

A comprehensive biodiversity offset strategy will be developed for the Project in accordance with relevant NSW legislation and/or policies, in consultation with the NSW DPHI. The NSW and Commonwealth governments agree that endorsement of the NSW Biodiversity Offset Scheme to avoid, minimise and offset biodiversity impacts on both NSW and Commonwealth listed entities provides for the best biodiversity and streamlining outcomes. The Commonwealth government supports the use of the BAM (DPIE, 2020a) as the underpinning methodology for calculating biodiversity credit requirements.

To meet offsets required for Commonwealth listed entities for controlled actions under the NSW BOS, the following options are under investigation:

- establishment of Biodiversity Stewardship Sites to generate biodiversity credits
- retirement of credits sourced by the NSW Credit Supply Taskforce (CST) via a credit demand expression of interest
- sourcing and purchase credits available on the market
- payment into the Biodiversity Conservation Fund (BCF) for any residual credits not obtained via methods described above.

6.7 Heritage

6.7.1 Aboriginal Cultural Heritage

As part of site investigations undertaken for the LRWF project (Mod-1), an Aboriginal Cultural Heritage Assessment (ACHA) was prepared by Umwelt (Umwelt, 2022). The ACHA identified potential impacts on Aboriginal cultural and archaeological heritage in consultation with the Aboriginal community and was submitted as part of the development application for LRWF project.

An ACHA has since been prepared to assess any changes to impacts and management of Aboriginal cultural heritage that may occur as a result of the Project. Primarily the ACHA sought to identify additional areas not assessed as part of the LRWF project Mod-1 ACHA (Umwelt 2022), determine where archaeological survey was required (in alignment with the established predictive model), and review and update the impact assessment (if required) based on the results of additional archaeological survey. It also aimed to update Registered Aboriginal Parties (RAPs) about the Project, involve RAP representatives in survey, and provide RAPs with documentation of the assessment.

The ACHA was not revised following the removal of the Project from the LRWF project as the change to a separate approval pathway did not change the Project details or the outcome of the assessment. The ACHA also assessed the Project specifically and did not include any re-assessment of any aspect of the LRWF

project. However, further consultation was undertaken with the RAP representatives to inform them of the change to the assessment pathway for the Project, which has been documented in the ACHA.

The ACHA is provided as **Appendix 10** with a summary of results is provided below.

6.7.1.1 Existing Heritage Environment

In general terms, the majority of landforms within the Project Area are not conducive to extended occupation by Aboriginal people, with ridgelines and crests typically being used transiently and moderate to steep slopes used mainly in transitioning between areas. Key landforms suitable for occupation are gently inclined slopes bordering the major watercourses which are not found within the Project Area.

In terms of other resources, prior to historical landscape modification, the area would have been relatively well resourced with an array of plant and animal species. Vegetation clearance on slopes and crests has increased erosion, thereby further reducing the depth of the already shallow soil profiles in these areas.

6.7.1.2 Consultation

The RAPs remained unchanged from the original registration process undertaken for the LRWF Mod-1 ACHA. The registration of Aboriginal parties for that project was completed in accordance with Part 5, Division 2 Clause 60 of the *National Parks and Wildlife Regulation 2019*. 20 Aboriginal parties registered as having cultural knowledge in the LRWF project Mod-1 application were consulted regarding the Project.

RAPs were notified about the requirements for further assessment as part of the quarry Project, including archaeological survey methodology, and RAP representatives were invited to participate in the survey program completed for the ACHA. Representatives from seven RAPs attended the survey (refer to **Section 6.7.1.3** for survey results).

The RAPs were also provided with a copy of the draft ACHA report to provide review comments. The RAPs were also notified regarding the change to the assessment pathway for the Project and invited to provide feedback.

6.7.1.3 Desktop and Archaeological Surveys

A search of the NSW Aboriginal Heritage Information Management System (AHIMS) database was conducted on 25 October 2023 (Client Service ID 832819) for the quarry Project Area. This search confirmed that no AHIMS sites are located either within the Project Area or within 2 km of the Project Area boundary. The distribution of sites recorded in the wider vicinity of the Project Area are localised around perennial watercourses and are comprised of predominantly atypical site types for the region (open artefact sites and modified trees).

An archaeological field survey of the Project Area was undertaken by Umwelt with assistance from RAP site officers on 27 September 2023. The survey covered all of the proposed extraction and processing areas and the majority of the access route. A small area of the proposed access route revised after the survey was completed was not directly surveyed but was in close proximity to the broad survey transect area. No scarring or other cultural modification was observed in the survey area. No Aboriginal objects and/or sites and/or areas of potential archaeological deposit were identified in the survey area during visual inspection. No significant features of cultural heritage within the Project Area were identified by RAPs consulted on the Project, including those involved with the field survey.

With reference to the archaeological context of the local area, the evaluation of the soil profile and the predictive model established for the LRWF project, the quarry Project Area was assessed as having a low archaeological potential. Areas of low archaeological potential are areas that may have been utilised by Aboriginal people in the past, but at a low intensity compared to other areas within the region. The density of artefacts deposited within these areas would therefore be low.

6.7.1.4 Mitigation and Management Measures

Based on the environmental and social context of the Project Area and the archaeological survey results, the ACHA concluded that no Aboriginal cultural heritage objects or sites were identified as part of the survey and there is a low potential for unknown sites to be present within the Project Area.

The EMP for the Project will include the following relevant measures including:

- all employees and contractors will be made aware that it is an offence under Section 86 of the NPW Act to harm or desecrate an Aboriginal object unless that harm has been subject to approval as part of the necessary approvals process
- protocols to be followed in the event that additional ground disturbance works are required outside the area surveyed, this includes minor changes to the access road alignment identified after the survey was undertaken
- procedures for the management of any new Aboriginal archaeological sites or skeletal remains that may be identified over the course of construction or operational activities
- appropriate monitoring and reporting requirements.

These management and mitigation measures will be implemented through the EMP.

6.7.2 Historic Heritage

The SEARs also require the identification of historic heritage in the vicinity of the Project and an assessment of the likelihood and significance of impacts on heritage items.

There are no listed heritage items in the vicinity of the Project Area. The closest heritage item is the Turee Vale Cemetery, located approximately 9.5 km west of the Project Area. This site is locally listed within the Warrumbungle LEP. There are a number of locally listed heritage sites within Coolah, there is also one site listed on the State Heritage Register (Coolah Old Police Station and Courthouse). No historic heritage features were identified during the Aboriginal cultural heritage survey. Given there are no heritage sites within the vicinity of the Project Area or in close proximity to haulage routes associated with the Project, there will be no impact to any heritage listed items.

Given the Project will not impact on any heritage items no specific mitigation or management measures are proposed, however, the EMP will include an unexpected finds management procedure in the unlikely event that potential items of heritage value are uncovered during construction works.

6.8 Traffic and Transport

A Traffic Impact Assessment (TIA) was prepared by Constructive Solutions Pty Ltd (CSPL) to assess the potential traffic and transport impacts associated with the Project, in accordance with the SEARs and

incorporating consultation feedback from Upper Hunter Shire Council, Warrumbungle Shire Council and Transport for NSW (Dubbo Regional Office). The TIA also considered the requirements of Part 2.22 of the Resources and Energy SEPP in relation to transport issues associated with mining and extractive industries.

A key principle of the TIA is that all haulage traffic generated by the Project forms part of the construction traffic of the LRWF project (as would be the case for any haulage traffic from existing quarries located in the region). The TIA therefore builds on previous traffic and transport assessments undertaken by CSPL for the LRWF project including the LRWF Supplementary TIA (CSPL, 2023) which accompanied the Submissions Report for the application to modify Development Consent SSD 6696 (Mod-1 Application) and the LRWF Addendum TIA (CSPL, 2024) which made changes to the traffic model to include the TWA Facility as part of the Submissions Report for the TWA Amendment to SSD 6696.

As the Project will solely provide quarry materials for the LRWF project, the traffic assessment is considered within the context of the LRWF project traffic modelling. In this regard, the Project does not create any additional quarry material movements relative to that assessed for the LRWF project but rather changes the source location for this material. The only additional traffic movements associated with the Project are heavy vehicle movements associated with delivery of plant and equipment to site (which will occur before other construction activities associated with the LRWF project) and additional vehicle movements associated with employee arrival and departure and delivery of fuel and other maintenance supplies (including blasting products) to the site. In general, employee movements associated with the Project will not overlap with Project related heavy vehicle movements as these will typically occur before heavy vehicle movements commence or after heavy vehicle movements have finished.

A copy of the TIA for the Project is provided in **Appendix 11** with a summary of key findings provided in the section below. The LRWF Supplementary TIA and Addendum TIA are both available on the DPHI Major Projects website (https://www.planningportal.nsw.gov.au/major-projects/projects/mod-1-turbine-and-infrastructure-changes).

6.8.1 Existing Environment

6.8.1.1 Road network

The Project Area will be accessed via a single access point off Rotherwood Road. Loaded trucks will exit the site via the access point on Rotherwood Road and turn either (predominately) left or right, depending on destination. As previously described in **Section 3.2.4**, quarry transportation vehicles will travel only on existing approved haulage routes of the LRWF project.

6.8.1.2 Background traffic volumes

Background traffic data used in the TIA was based on traffic count data provided by WSC. An assumed growth rate of 1.0% per annum was applied to determine the Annual Average Daily Traffic (AADT) for 2026 (anticipated peak period of construction). The applied growth rate is consistent with the Golden Highway Corridor Strategy (TfNSW, 2016) which predicts an annual growth of 1-2% across the region, refer to **Table 6.14**. The applied growth rate was considered to be conservative by CSPL as Rotherwood Road is a local road and several TfNSW traffic count stations in the region reflected zero growth in the area.

Table 6.14 Rotherwood Road Background Traffic

Location	AADT 2017 [1]	AADT 2023 [2]	Peak hour (vph) [3]	AADT 2026 [4]	Peak hour (vph) [3]
Rotherwood Road (LRWF substation (SAP ID# 39) to quarry entrance (SAP ID# 15)	43	46	5	47	5

Notes: 1. February 2017 traffic count data provided by WSC
2. Existing background traffic using 1.0% growth rate
3. Calculated as 11% of the AADT in accordance with Austroads (2000) Part 6 Figure 3.25.

6.8.1.3 Public transport

Rotherwood Road currently services a single school bus terminating at the Yarrawonga Road intersection, although this may be subject to change based on the number of school aged children living in the area during the construction period.

6.8.2 Project Traffic Parameters

6.8.2.1 Vehicle movements

Mobilisation of Plant and Equipment

The initial establishment of the quarry will require approximately 20 to 30 heavy vehicle movements over a period of approximately two to three months to mobilise crushing and screening plant, mobile plant and site infrastructure (including demountable office/crib room, self-bunded fuel storage containers and noise bunding).

Mobilisation would occur via the Golden Highway, Vinegaroy Road and Rotherwood Road, with site access initially provided through the landowner's existing property entrance off Rotherwood Road and internal farm tracks. Mobilisation of plant and equipment would occur under escort where required, with movements to site to occur outside the AM and PM peak hour periods, specifically in relation to the intersection of the Golden Highway and Vinegaroy Road.

As the quarry is required to be operational before any significant construction works begin for the LRWF project, mobilisation of quarry plant and equipment is not expected to overlap with mobilisation for LRWF project construction and will not coincide with OSOM vehicle movements associated with the LRWF project.

Quarry Operations

Tilt Renewables estimates that up to approximately 1.75 Mt of rock, gravel and sand product will be required for wind farm Construction and public road upgrades for the LRWF project. Based on a typical haulage vehicle for quarry product being a truck and dog with a 33 tonne pay load, approximately 61,000 one-way heavy vehicle movements will be required to transport approximately 1.75 Mt of quarry product over the 4-year construction program. The Project seeks approval for up to 2 Mtpa to allow for unexpected additional construction material requirements however the peak daily vehicle movements under a higher total volume scenario will be consistent with that projected by Tilt for the 1.75 Mt quarry product requirement schedule (i.e. even if higher total volumes are required over the 4 year period, the peak quarry material requirements are unlikely to exceed the 700,000 tpa projection for year 2 due to other operational restrictions).

There will be no OSOM vehicle movements associated with the quarry operations.

Apart from deliveries of fuel and other consumables, the quarry will generate between eight and twelve light vehicle movements related to staff travel each day. As noted above, staff vehicle movements would typically occur at the start and end of each day's operation and therefore would not coincide with heavy vehicle movements to and from the quarry.

Decommissioning

Upon completion of LRWF project construction, demobilisation of all plant and equipment will occur via Rotherwood Road, Vinegaroy Road and the Golden Highway with a similar number of movements to the mobilisation phase. As the quarry will remain operational until road repairs associated with LRWF project construction activities have been completed, the demobilisation movements will not coincide with construction impacts associated with the LRWF project.

The landowner has requested that the access track to the quarry be retained and accordingly the site access intersection at Rotherwood Road will also be retained.

6.8.3 Impact Assessment

6.8.3.1 Vehicle Movements

The TIA compared the traffic generation model for the LRWF Addendum TIA (which assumed sourcing of quarry materials from an external supplier near Dubbo) (Scenario 1) with the predicted traffic generation model for the LRWF project using the proposed on-site quarry (Scenario 2). While the overall traffic movements do not change between the two scenarios, the origin and destination assumptions for heavy vehicles do change, and as a result the distribution of traffic over some parts of the local road network is impacted, as shown in **Table 6.15**.

Table 6.15 Comparison of Heavy Vehicle Movements

Road section	Scenario 1 LRWF with external quarry source	Scenario 2 LRWF with the Project	Change (%)
Vinegaroy Road – Golden Highway to Rotherwood Road	72,373	33,369	-54%
Rotherwood Road – Vinegaroy Road to E-cluster entrance (Site Access Point (SAP) ID#10)	29,154	58,225	+100%
Rotherwood Road – E-cluster entrance (SAP ID#10) to F-cluster substation entrance (SAP ID#39)	20,390	57,852	+184%
Rotherwood Road – F-cluster substation entrance (SAP ID#39) to proposed quarry entrance (SAP ID# 15)/F-cluster (SAP ID# 55)	21,673	64,042	+195%

Note: The number of heavy vehicles travelling on other road sections does not change depending on the quarry location and therefore they are not shown in this table.

As shown in **Table 6.15**, relative to an alternative external source of quarry material, the Project will result in:

- a reduction in total heavy vehicle traffic movements on Vinegaroy Road between the Golden Highway and Rotherwood Road by approximately 54%
- an increase in traffic on Rotherwood Road between Vinegaroy Road and the quarry entrance ranging between 100% and 195% (depending on the timing of LRWF project construction and destination of materials)
- no other wind farm access roads are impacted, and heavy vehicle movements remain unchanged.

The only area of the road network which will experience an increase in vehicle movements is the section of Rotherwood Road between the access road intersection and Vinegaroy Road. This results in an increase in right turn out of Rotherwood Road onto Vinegaroy Road but a significant reduction in the right turn into Rotherwood road relative to modelled movements for the LRWF Mod-1 assessment.

Sourcing quarry materials from within the LRWF project area effectively transfers the quarry component of LRWF project construction traffic from the higher volume regional road network to the lower volume existing approved haul route of the LRWF project. By avoiding the need to haul quarry products from existing quarries at Dubbo (the most likely alternative source of material), the Project has the effect of reducing the total/return haulage distance between the quarry site and the LRWF project on the public road network by approximately 17,000,000 km over the construction period.

The peak daily one-way LRWF project vehicle movements along Rotherwood Road at the quarry entrance over the duration of the 4-year construction program, which includes vehicle movements related to the supply of quarry product (based on a peak supply of approximately 700,000 tpa) occurs in year 2 of the LRWF project 4 year construction period and has been calculated at 153 vehicle movements per day (vm/d). The 153 vm/d consists of 118 heavy vehicles, 29 light vehicles and six OSOM movements per day during the peak of wind farm construction for this section of road (week 54 to week 114 of the anticipated 200-week construction period). Thiis peak also coincides with the predicted peak vehicle movements through the Rotherwood Road/ Vinegaroy Intersection during the LRWF project construction period.

6.8.3.2 Public Road and Intersection Upgrades

As transport of materials from the proposed quarry would only occur on the approved construction haulage routes of the LRWF project, the maintenance and upgrade of public roads and intersections would be undertaken by Tilt Renewables in accordance with the existing LRWF project development consent.

The agreed road and intersection upgrades, treatments and maintenance for Vinegaroy Road from the Golden Highway to Rotherwood Road and for Rotherwood Road between Vinegaroy Road and the quarry entrance (SAP ID#15) are summarised in **Table 6.16** and **Table 6.17**.

Table 6.16 Agreed Road Upgrades/Treatments – Vinegaroy Road (Golden Highway to Rotherwood Road)

Segment ID	Existing Road Conditions	Primary Upgrade/Repair Treatment [1, 2]	Design Pavement Width (m)
10	Sealed, 7.5 m wide Minor road failures	Minor stabilised patching to target road failures	7.5 m (existing)

Segment ID	Existing Road Conditions	Primary Upgrade/Repair Treatment [1, 2]	Design Pavement Width (m)
20	Sealed, 6.2 m wide Minor road failures	Shoulder widening to provide 8.0 m wide pavement	8.0 m
30	Sealed, 8.6 m wide Minor road failures	Moderate stabilised patching to target road failures	8.6 m (existing)
40	Sealed, 8.0 m wide Minor road failures	Moderate stabilised patching to target road failures	8.0 m (existing)
50	Sealed, 6.6 m wide Very poor/failed pavement	Pavement rehabilitation to Austroads Standard	8.0 m
60	Sealed, 8.0 m wide Minor road failures	Shoulder reconstruction to 8.0 m wide sealed pavement	8.0 m

Notes: 1. In addition to the primary upgrade/repair treatments, general pavement repairs will be completed on existing road failures across all road segments.
2. Tilt Renewables will be responsible for completing regular maintenance activities for the duration of the wind farm construction period, relevant to the roads in use by construction traffic.

Table 6.17 Agreed Road Upgrades/Treatments - Rotherwood Road (Vinegaroy Road to quarry entrance (SAP ID# 15)

Segment	Existing Road Conditions	Primary Upgrade/Repair Treatment [1, 2]	Design Pavement Width (m)
10	Sealed, 4.5 m wide Minor road failures	Shoulder widening and gravel sheet to provide 7.2 m wide unsealed pavement	7.2 m
20	Sealed, 5.0 m wide Minor road failures	Shoulder widening and gravel sheet to provide 7.2 m wide unsealed pavement	7.2 m
30	Sealed, 4.5 m wide Major road failures	Shoulder widening and gravel sheet to provide 7.2 m wide unsealed pavement	7.2 m
40	Sealed, 4.5 m wide Major road failures	Shoulder widening and gravel sheet to provide 7.2 m wide unsealed pavement	7.2 m
50	Sealed, 4.5 m wide Major road failures	Shoulder widening and gravel sheet to provide 7.2 m wide unsealed pavement	7.2 m
60	Sealed, 4 – 5 m wide Poor/failing pavement	Shoulder widening to provide 6.2 m wide pavement	6.2 m
70	Unsealed, 6 – 9 m wide Rough surface, loss of gravel	Gravel re-sheet to provide 6.2 m wide pavement	6.2 m

Notes: 1. In addition to the primary upgrade/repair treatments, general pavement repairs will be completed on existing road failures across all road segments.
2. Tilt Renewables will be responsible for completing regular maintenance activities for the duration of the wind farm construction period, relevant to the roads in use by construction traffic.

The material associated with the road upgrades would be able to be supplied by the Project and no upgrades to the road network are required for Project itself with existing intersections along the mobilisation route capable of handle vehicles used for mobilisation without any need for augmentation.

The Project would not result in any changes to traffic using proposed road access points for the LRWF project or other LRWF project approved haulage route intersections considered under the LRWF Mod-1 Application other than the Golden Highway-Vinegaroy Road intersection (reduction in heavy vehicle traffic) and the Vinegaroy Road-Rotherwood Road intersection.

Intersection assessments were completed in the LRWF Supplementary TIA Report and revised in the LRWF Addendum TIA Report with consideration given to TWA traffic and quarry material traffic to determine the turn treatments to accommodate the peak hour traffic demand. These assessments had assumed quarry product material would be sourced from alternative quarry sources, with all quarry product required for the LRWF project being transported to the LRWF project area via the Golden Highway (i.e., from a Dubbo quarry). The assessments determined that a CHR(S)/BAL intersection turn treatment would be required at the Golden Highway-Vinegaroy Road intersection and a BAR/BAL intersection turn treatment would be required at the Vinegaroy Road-Rotherwood Road intersection.

With the inclusion of the on-site quarry and the resulting reduction in wind farm construction traffic turning at the Golden Highway-Vinegaroy Road intersection, there is no requirement to alter the proposed CHR(S)/BAL turn treatment. It is noted however that this treatment is not considered necessary prior to mobilisation of equipment for the Project and there are significant logistical and traffic impact reasons for sourcing material necessary for this intersection upgrade from the Project rather than alternative sources located much further afield.

The Vinegaroy Road-Rotherwood Road intersection assessed BAR/BAL turn treatment is also deemed sufficient due to the reduced number of right hand turn movements from Vinegaroy Road into Rotherwood Road. While there will be increased right hand turn movements from Rotherwood Road into Vinegaroy Road associated with the quarry, this does not warrant a change in intersection performance. The detailed design of this intersection will have regard to the increased number of heavy vehicle turning movements and this may warrant additional pavement strengthening.

The quarry entrance intersection was evaluated for the AM peak hour traffic inward movements (which are greater than the PM peak hour movements) from Rotherwood Road with the peak daily wind farm construction traffic of 153 vm/day which includes the workforce light vehicle distribution from the proposed TWA. Results of the assessment (refer to **Figure 6.11**) indicated that the AM peak hour construction related traffic demand requires the intersection to have basic right-turn (BAR) and basic left-turn (BAL) treatment. This is consistent with the previously proposed treatment for this intersection for the LRWF project. As the Quarry presents a logical source of material for construction of this intersection, these works are not considered to be required prior to quarry operation but should be completed prior to deliveries of product from the quarry for the broader LRWF project (including other public road upgrades).

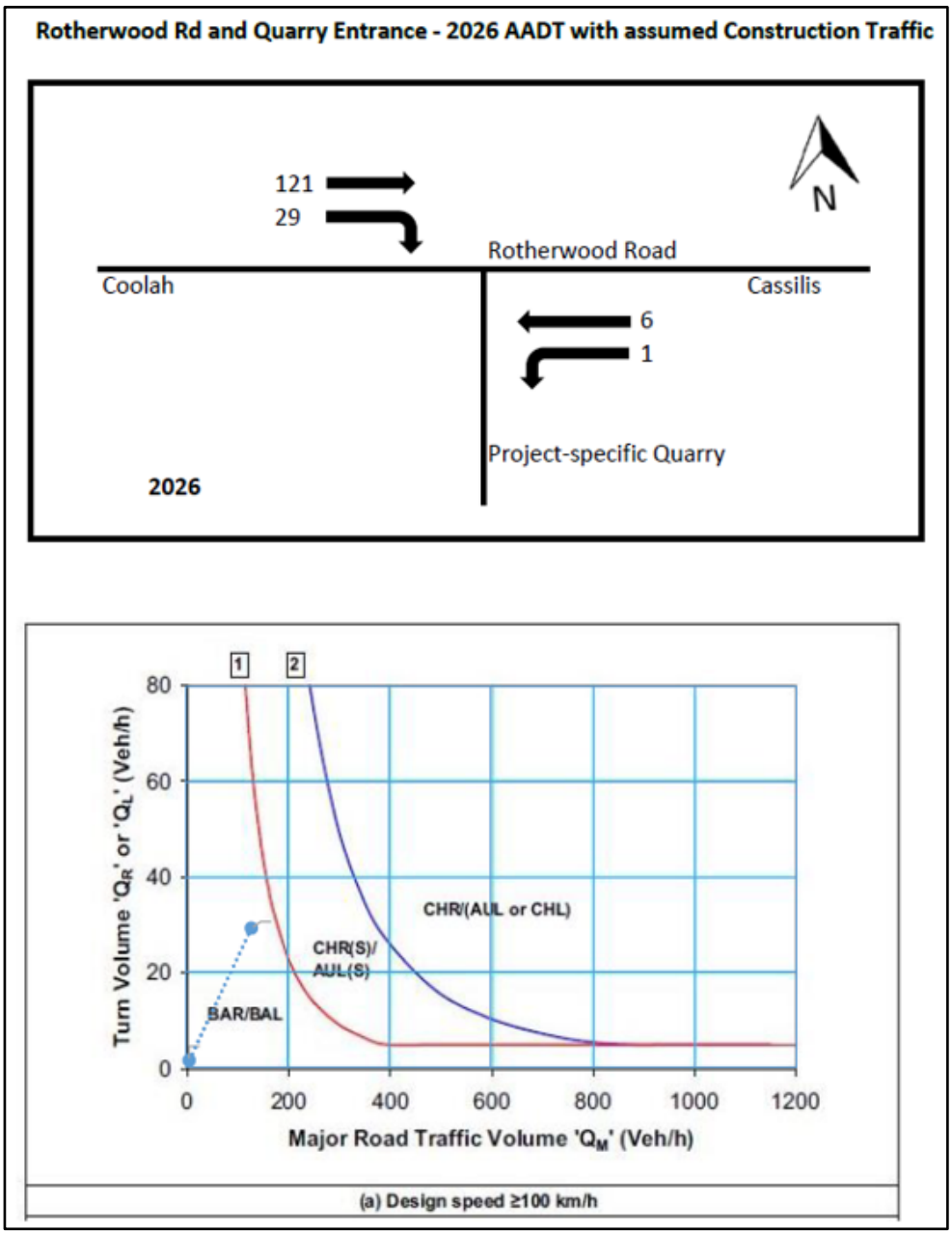


Figure 6.11 Rotherwood Road – Quarry Entrance intersection analysis

6.8.4 Mitigation and Management Measures

Sourcing materials from the Quarry would be expected to result in several significant benefits from a traffic and transport perspective, including:

- Improved road safety:
    - Driver fatigue will be reduced with shorter commutes for haulage drivers between the wind farm work fronts and the quarry compared to the travel distances required from external commercial quarries in the Dubbo area, which has a return haulage distance of approximately 300 km. The shorter return haul route to the LRWF project from the quarry would result in a reduction in the total haulage distance on the public road network by approximately 17,000,000 km, compared to the alternative of sourcing all quarry material from Dubbo.
    - Reduced number of potential interactions between heavy and light vehicles. Existing traffic is significantly lower on Rotherwood Road compared to Vinegaroy Road and the Golden Highway, reducing vehicle interactions and the subsequent probability of road safety incidents with the public.
- Local relationships:
    - Most of the landholdings along Rotherwood Road are associated with the LRWF project. This gives Tilt Renewables and the Proponent the ability to communicate potential traffic impacts more effectively to landowners along Rotherwood Road to mitigate safety incidents when compared communication with non-associated residents further away from the LRWF project area. The Proponent and Tilt Renewables have already been in contact with non-associated landowners on Rotherwood Road throughout the development of both the LRWF project and the quarry project design, and further consultation will continue as the Project progresses.
- Reduced heavy vehicle fleet:
    - The haulage fleet required to accommodate the LRWF project is significantly reduced by the use of an on-site quarry as the number of trips a single heavy vehicle can complete in a day is substantially increased by the reduced haulage distance.

As the Project is solely for the purpose of supplying the LRWF project construction activities, any mitigation necessary to manage impacts of quarry haulage and light vehicle traffic on Council road assets would be undertaken by the LRWF project, in accordance with Development Consent SSD 6696 (as modified). Accordingly, a requirement for the quarry to contribute towards road upgrades or maintenance (e.g., via a haulage levy or VPA) would not be appropriate as it would effectively constitute 'double-dipping'.

Potential traffic and transport impacts will be mitigated and managed through appropriate intersection design and compliance with the LRWF Traffic Management Plan (TMP). Under the TMP special consideration will be provided to public transport and school bus routes impacted by the wind farm construction traffic (including Rotherwood Road). Further detailed traffic generation estimates and vehicle movement plans including trip origins/destinations will be developed by the Balance of Plant (BOP) Contractor with impacts to the public transport services revised. Site specific TMPs will then be implemented accordingly to cater for the public transport services impacted by the wind farm. These are all obligations imposed on Tilt as the proponent for the LRWF project. Haulage of quarry products from the

access road gate will be managed by Tilt subject to the requirements of the LRWF project development consent which include these haulage constraints.

6.9 Land Resources

6.9.1 Soils and Land Capability

Based on the soil and land capability mapping (Department of Planning and Environment, 2021) (SEED Portal) the land and soil capability (LSC) classifications across the Project Area are Class 3 (high capability land) and Class 4 (moderate capability land). Class 3 land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation. Class 4 land has moderate to severe soil limitation, where the land is "generally not capable of sustaining high impact land uses unless using specified management practices with high knowledge, expertise, inputs and investment" (DPE, 2021).

Notwithstanding the DPE mapped LSC classification, the surface environment of the extraction and processing areas of the Project are characterised by a thin veneer of basalt-derived soil, organic material (from grazing activity) and clay interspersed with rubble. This material is in direct contact with an extensive shelf of slightly weathered to unweathered material that comprises the upper basalt flow. Consequently, soil profile development is skeletal (0–0.2 m) in the areas of more resistant geology with occasional pockets (up to 1 m) of heavy clay sitting in direct contact with rock outcrop. In the more highly weathered areas of the site (Borrow Pit) these skeletal soils overly saprolite (extremely weathered in-situ basaltic volcanic rocks) and is more consistent with a LSC classification of Class 6 which reflects these production limitations. The permanent removal of areas for potential production as a result of the extraction areas and associated final voids is therefore considered unlikely to have a significant impact on the productive capacity of land.

The SWIA (refer to **Appendix 8**) includes a review of the soil properties and hydrogeological landscape data (Department of Climate Change, Energy, the Environment, and Water, 2022) relevant to the Project Area. Based on the 'Sharing and Enabling Environmental Data in NSW' (SEED) Portal the soil properties within the Project Area are:

- moderately erodible,
- low of instream EC
- slightly acidic / weakly basic pH
- moderately fertile, indicated by a moderate to high CEC and low to moderate organic carbon concentration.

As outlined in **Section 6.5.1**, appropriate erosion and sediment controls (ESCs) will be implemented to minimise erosion and reduce the risk of on-site erosion and sediment laden runoff reporting off-site. The geotechnical assessment (refer to **Section 6.9.2**) identified that the proposed final landform treatment represent low levels of long term erosion risk. ESCs will be designed and implemented generally in accordance with requirements outlined in Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Volume 2E – Mines and quarries (DECC, 2008) (the 'Blue Book').

6.9.2 Geotechnical Stability

To assess the geotechnical stability performance of the proposed quarry, a geotechnical domain model was compiled by GHD from four component models (geological, structural, hydrogeological and rock mass (material properties)) along with critical instability mechanisms (refer to the Geotechnical Stability Review in **Appendix 12** and **Appendix 13** for further detail on model parameters).

6.9.2.1 Assessment Methodology

RocScience's Limit Equilibrium software suite was used to assess long-term slope stability performance of the proposed quarry pit geometry in terms of the kinematic (structural) stability at the individual bench scale and the overall slope scale. Slope stability performance was measured against nominated Design Acceptance Criteria in line with accepted industry practice as outlined in the NSW Resource Regulator's *Guide – Health and Safety at Quarries* (2018). The Design Acceptance Criteria define the minimum requirements and limits for 'acceptable' risk and consequence levels with respect to the Factor of Safety (FoS) and Probability of Failure (PoF) which were nominated as:

- Wall Class 1 (moderately serious consequence on failure) was adopted for the stability performance analyses at the individual bench scale (design FoS = 1.2, design PoF = 10%).
- Wall Class 2 (serious consequence on failure) was adopted for the overall slope scale (design FoS = 1.5, design PoF = 1%).

The proposed pit geometry for the Main Pit which was analysed for the geotechnical assessment is as follows:

- Overall pit depth of 25 m (pit floor at approximately 675 m AHD) and an overall slope angle of approximately 2.5V:1H.
- Individual batter geometry of 12.5 m high benches with a berm width of 12 m and nominal face angles of 80°.

Upon completion of quarry operations, the site will undergo rehabilitation in collaboration with the landowner to establish a secure and stable landform suitable for sustained rural activities. The exposed faces within the Main Pit will be re-profiled to an overall slope no steeper than 1V:1.5H, which is expected to maintain and/or improve stability performance. Notably, given the specific conditions of the site, which include hard rock quarry and minimal overburden thickness encountered in drilling campaigns, the erosion potential of the excavated batters is expected to be low.

6.9.2.2 Impact Assessment

Slope stability analyses

Results of the slope stability analyses are as follows:

- Under 'expected' conditions, which are the in-situ stress conditions known, or likely to exist at the time of the 2023 drilling campaign, the proposed slope design geometry for the Main Pit ad Borrow Pit would satisfy the nominated design acceptance criteria for the nominated stability sections.

- Under a 1:500 year seismic loading event, the stability performance for the Main Pit and Borrow Pit was calculated to satisfy the design performance objectives. The results of the seismic loading sensitivity analyses highlighted the robustness of the design geometry against increased loading conditions.

- Under worst-case fully saturated conditions at the overall slope scale, the stability performance for the Main Pit and Borrow Pit was calculated to be above FoS = 1.1 for all stability sections. While this is slightly below the criteria for Wall Class 1 (FoS >1.2), as noted in **Section 6.5.2,** the floor of the extraction area is above observed groundwater levels and saturated conditions are not expected to arise in the Main Pit area meaning the saturated conditions scenario is not expected to arise. Irrespective the results indicate that the FoS is above unity (> FoS1).

Kinematic analysis

Kinematic analysis was not undertaken as no information regarding defect mapping was accessible at the time of the assessment due to the absence of exposed walls or outcrops in the vicinity of the Project Area. Available borehole data indicates minimal jointing within the geological sequence.

It is expected that under managed conditions where good blasting and final wall scaling practices are adopted, potential blocks would manifest in small volumes and at individual bench scale. These dislodgments would be retained on the berm below, and therefore are not expected to pose a significant hazard for the pit.

The GHD report recommended that defect mapping on exposed slopes or batters be undertaken in the future to validate and confirm the presence and characteristics of defect sets in the area.

6.9.2.3 Geotechnical Mitigation and Management Measures

- Defect mapping will be undertaken on exposed batters to verify key geotechnical parameters (i.e., defect type and orientation, alteration and potential fracture or fault zones, etc.).

- When quarry operations commence, regular site inspections will be undertaken to observe for signs of adverse geotechnical conditions. Furthermore, where site conditions are observed to deviate from those outlined in the GHD report (refer to **Appendix 12** and **Appendix 13**), additional intrusive investigation will be undertaken. Where a notable deviation in site conditions is observed compared to those predicted in the Geotechnical Stability Review, a full suite of stability analyses with the benefit of additional data obtained from the intrusive investigation and hydrological studies would be undertaken.

6.9.3 Land Use

A land use risk identification and ranking process has been undertaken in accordance with the DPI Land Use Conflict Risk Assessment (LUCRA) Guide (2011). The LUCRA assessment process, utilises a 'probability and consequence' risk assessment matrix (refer to **Table 6.18**) to estimate the potential for land use conflicts. It assesses the environmental, public health and amenity impacts of a proposed development according to the probability of occurrence and consequence of the impact.

Table 6.18 LUCRA Risk Rating Matrix

Consequence	Probability A	Probability B	Probability C	Probability D	Probability E
Consequence 1	**25**	**24**	**22**	**19**	**15**
Consequence 2	**23**	**21**	18	14	10
Consequence 3	**20**	**17**	**13**	9	6
Consequence 4	**16**	**12**	8	5	3
Consequence 5	**11**	7	4	2	1

The risk rating matrix yields a risk ranking from 25 to 1. It covers each combination of five levels of 'probability' (a letter A to E as defined in **Table 6.19**) and five levels of 'consequence' (a number 1 to 5 as defined in **Table 6.20**) to identify the risk ranking of each impact. For example, an activity with a 'probability' of D and a 'consequence' of 3 yields a risk rank of 9.

Table 6.19 Probability Descriptions

Level	Descriptor	Description
A	Almost Certain	Common or repeating occurrence.
B	Likely	Known to occur, or 'it has happened'.
C	Possible	Could occur, or 'I've heard of it happening'.
D	Unlikely	Could occur in some circumstances, but not likely to occur.
E	Rare	Practically impossible.

Table 6.20 Consequence Descriptions

Level	Descriptor	Description
1	Severe	• Severe and/or permanent damage to the environment. • Irreversible. • Severe impact on the community. • Neighbours are in prolonged dispute and legal action involved.
2	Major	• Serious and/or long-term impact to the environment. • Long-term management implications. • Serious impact on the community. • Neighbours are in serious dispute.
3	Moderate	• Moderate and/or medium-term impact to the environment and community. • Some ongoing management implications. • Neighbour disputes occur.
4	Minor	• Minor and/or short-term impact to the environment and community. • Can be effectively managed as part of normal operations. • Infrequent disputes between neighbours.

Level	Descriptor	Description
5	Negligible	• Very minor impact to the environment and community. • Can be effectively managed as part of normal operations. • Neighbour disputes unlikely.

Table 6.21 contains an initial risk evaluation of activities that may cause potential land use conflict, and a risk rating generated in the absence of mitigation or management measures, note this relates to land use conflict and not social related conflict which are addressed in the Social Impact Assessment (refer to **Section 6.14** and **Appendix 15**). A range of risk management strategies (mitigation measures) have been identified in **Table 6.21, Table 6.22** and **Table 6.23** to reduce the risk rating of the potential land use incompatibilities highlighted, and thus reduce the risk associated with land use conflicts for the Project. The objective is to identify and define controls that lower the risk ranking score to 10 or below.

All mitigation measures proposed have resulted in the reduction of risk rating to below 10 for all identified potential land use conflicts (refer **Table 6.21, Table 6.22** and **Table 6.23**).

Table 6.21 Potential Conflicts and Risk Reduction Management Strategies – Construction

Identified Potential Conflict	Risk Rating (unmitigated)	Risk Reduction Management Strategy (mitigation measures)	Risk Rating (mitigated)	Performance Target
Generation of dust due to disturbance and related construction activities potentially impacting human and environmental health.	8	EMP will include air quality management measures to be implemented during construction.	5	No exceedances of dust related air quality criteria
Potential impact to neighbouring occupants and infrastructure associated with blast vibration and overpressure.	12	Appropriate blast management and mitigation measures will be implemented.	9	No exceedance of relevant blast criteria
Excess noise generated during construction of the Project above relevant criteria – impacting amenity.	8	EMP will include development and implementation of noise and vibration management measures. Construction activities will occur during standard construction hours (i.e. daytime only).	5	No unpredicted exceedances of criteria
Land erosion as a result of construction activities resulting in sediment runoff entering nearby water bodies, impacting the surrounding landholder water quality and beneficial use of the water.	8	• Erosion sediment control plans developed as part of the EMP and erosion and sediment controls implemented for construction works. • Implementation of WMS.	5	Sediment and water management system maintains sediment and water on site
Increased bushfire risk from machinery and construction activities on site.	9	A Bushfire Emergency Management Plan (as part of the EMP) will be developed and implemented in accordance with PBP 2019 and in consultation with the RFS.	5	No fires caused by the construction activities

Table 6.22 Potential Conflicts and Risk Reduction Management Strategies – Operations

Identified Potential Conflict	Risk Rating (unmitigated)	Risk Reduction Management Strategy (mitigation measures)	Risk Rating (mitigated)	Performance Target
Increased traffic volumes potentially impacting/ degrading the physical condition of local roads, particularly on	12	• protocol for undertaking road dilapidation surveys including inspection regimes • All heavy vehicle loads will be covered prior to leaving the site (in accordance with TfNSW requirements).	8	Any damage to road network is rectified in a timely manner in

Identified Potential Conflict	Risk Rating (unmitigated)	Risk Reduction Management Strategy (mitigation measures)	Risk Rating (mitigated)	Performance Target
Vinegaroy Road, Rotherwood Road, Turee Vale Road, and Coolah Creek Road.		• Draw bars and tail gates will be inspected for all heavy vehicles prior to leaving the site to ensure that any loose material is removed. • All associated haul roads will be upgraded and maintained in accordance with current requirements under the LRWF project development consent.		consultation with roads authority
Increased traffic movements to and from the Quarry Site potentially resulting in traffic hazard.	**12**	• Reduction in haul routes and associated traffic hazards as approved under the LRWF project development consent. • Implementation of TMP. • measures to be implemented to minimise traffic safety issues and disruption to local road users including consideration of cumulative impacts with other projects • drivers' code of conduct.	8	No traffic incidents during operations
Poor weed and invasive pest management that may spread or impact neighbouring land.	5	• EMP will include controls for weed management including weed inspection and treatment/removal and controls for feral animal management to be implemented should any pest issues be identified. • Onsite rubbish receptacles and waste management activities will be managed to minimise the potential for any food sources to be available to feral animals.	3	Invasive weed species are managed so that no weeds from the site spread. Feral animal populations are kept under control
Loss of local amenity and visual amenity.	9	Due to the low horizontal extent of the quarry and existing vegetation (particularly to the northeast) the visual impact rating is considered negligible/low.	3	Minimisation of visual impact to neighbouring residential dwellings
Increased bushfire risk due to operations.	9	A Bushfire Emergency Management Plan (as part of the EMP) will be developed for the Project in accordance with PBP 2019 and in consultation with the RFS.	5	No fires caused by the quarry operations
Potential noise impacts associated with operation of the Quarry	**17**	Implementation of noise mitigation and management through EMP.	9	no exceedance of noise criteria during operations

Table 6.23 Potential Conflicts and Risk Reduction Management Strategies – Decommissioning/ Closure

Identified Potential Conflict	Risk Rating (unmitigated)	Risk Reduction Management Strategy (mitigation measures)	Risk Rating (mitigated)	Performance Target
Increased traffic volumes potentially impacting/degrading the physical condition of local roads, particularly on Golden Highway, Vinegaroy Road, Rotherwood Road, Turee Vale Road, and Coolah Creek Road.	8	Preparation of quarry closure plan will include review of road condition and development of management and mitigation measures as required.	5	Any damaged or degraded roads caused by increased traffic is to be repaired
Increased traffic movements potentially resulting in traffic hazard.	**13**	• Quary Closure Plan to detail the following for decommissioning phase: • protocol for undertaking road dilapidation surveys including inspection regimes • measures to be implemented to minimise traffic safety issues and disruption to local road users including consideration of cumulative impacts with other projects • drivers' code of conduct.	9	No traffic incidents during decommissioning
Excess noise generated during decommissioning of the Project above relevant criteria – impacting amenity.	8	Continued implementation of noise mitigation and management measures as proposed for construction activities.	5	No unpredicted exceedances of relevant noise criteria
Generation of dust which can impact human and environmental health.	5	Continued implementation of air quality mitigation and management measures as proposed for construction activities.	3	No exceedances of air quality criteria
Inadequate removal of infrastructure including commercial and industrial wastes.	9	Removal of infrastructure (except where certain infrastructure is agreed to be retained with the landholder) and remediation of disturbed areas.	6	All quarry related waste removed. Materials recycled where feasible and practical
Increased bushfire risk from within the Project area due to mechanical failure.	9	Continued implementation of bushfire mitigation and management measures as proposed for construction activities.	5	No fires caused by the closure activities

6.10 Waste Management

The SEARs require the EIS to include an estimate of the quantity and nature of waste streams that would be generated or received by the Project and any measures that would be implemented to minimise, manage or dispose of the waste streams.

The Project will adhere to the following typical waste management principles:

- waste avoidance and reduction at the source
- waste re-use
- waste recycling
- waste removal and disposal

The extraction activities associated with the Project will generate minimal waste as all material produced will be either used in construction of the Project or in stored and utilised for rehabilitation works.

Further, the quarry will generate minimal quantities of general waste. Any general waste would be disposed of or recycled via an appropriately licensed waste contractor. **Table 6.24** summarises the approximate predicted waste streams and proposed management methods. These volumes are an estimate only and will be confirmed through the development of the Waste Management Plan, to be developed should the Project be approved. Wastes have been classified according to the Waste Classification Guidelines – Part 1: Classifying Waste (NSW EPA, 2014).

Table 6.24 Predicted Waste Streams

Material	Waste Classification	Approx. volume per annum	Storage/Use/Disposal
Vegetation	General solid waste (non-putrescible)	<1,000 t in construction stage (Year 1 of operations)	Stockpiled in emplacement areas within the quarry prior to mulching/grinding and use in progressive site rehabilitation.
Topsoil and overburden	General solid waste (non-putrescible)	≈ 60,000 t over project life (average ≈ 15,000 tpa)	Stockpiled in emplacement areas within the quarry prior to use in progressive site rehabilitation or used in sediment dam and bund construction
General waste	General solid waste (putrescible and non-putrescible)	< 5 m^3	Stored in covered bins or skips located within office and workshop areas as required. Where located in open areas, the bins would be fitted with animal-proof lids. Collected on a regular basis by a licensed waste contractor and transported to a licensed waste disposal/recycling facility.

Material	Waste Classification	Approx. volume per annum	Storage/Use/Disposal
General recyclables	General solid waste (non-putrescible)	< 5 m^3	Stored in covered bins or skips located within office and workshop areas as required. Where located in open areas, the bins would be fitted with animal-proof lids. Collected on a regular basis by a licensed waste contractor and transported to a licensed waste disposal/recycling facility.
Waste oil/ grease	Liquid waste	Up to 1 kL	Placed within bunded tank(s) within the work/storage area. Where required, smaller, temporary storage containers may be positioned closer to work areas, with the contents of those containers transferred to a larger storage tank prior to collection. Collected on a regular basis by a licensed waste contractor and transported to an appropriately licensed facility for recycling.
Batteries	Hazardous waste	12 – 24	Used batteries would be placed within a covered and marked storage area until removed from site. Used batteries would be collected for recycling on a regular basis by an appropriately licensed contractor.
Tyres	Special waste	4 – 6 tyres	Tyres would be placed within a marked storage area until removed from site or used for another purpose. Used tyres would be collected on a regular basis by a licensed contractor and transported to a licensed recycling facility.
Scrap metals	General solid waste (non-putrescible)	< 2 t	Scrap metals would be contained within a marked storage area until removed from site. Collected on a regular basis by a licensed contractor and transported to an appropriately licensed facility for recycling.
Sewage	Liquid waste	Up to 24 kL	Wastewater from the amenities will be collected in mobile 'port-a-loos' and removed from the site by a licensed waste contractor as required.

Waste generated from the on-site maintenance and servicing of machinery will be managed by the manufacturer or certified service mechanics. All service materials (including waste grease/oils) and packaging will be removed by the servicing contractor.

The only drill rig proposed to be utilised for operations is a blast hole percussion drill rig, with a dust extraction system. The rig does not use water or any muds / additives to facilitate drilling by lubricating the holes. As such, there would be no 'drillers mud' generated. The small pile of drill cuttings generated by the drilling of each blast hole would be incorporated into the blast.

Any waste generated by the Project requiring disposal will be managed by an appropriately licensed waste contractor. No on-site disposal of general waste will occur. In order to minimise the generation of waste and maximise re-use of waste products, where practicable, the following practices will be implemented:

- Waste streams will be classified and managed in accordance with the principles of the waste management hierarchy and EPA guidelines.

- All waste will be stored in appropriate containers/receptacles that are lidded where practical, within designated waste storage areas.
- All wastes will be collected for reuse/recycling/disposal by appropriately licensed waste contractors.
- Site inductions for employees and contractors will include waste management information.
- Appropriate signage will be provided at all waste storage areas to clearly identify waste segregation and recycling procedures.

All required waste management measures will be developed and implemented through the EMP. With these controls in place, it is expected that the impacts associated with waste generation and disposal resulting from the Project can be effectively managed.

6.11 Hazards and Risk

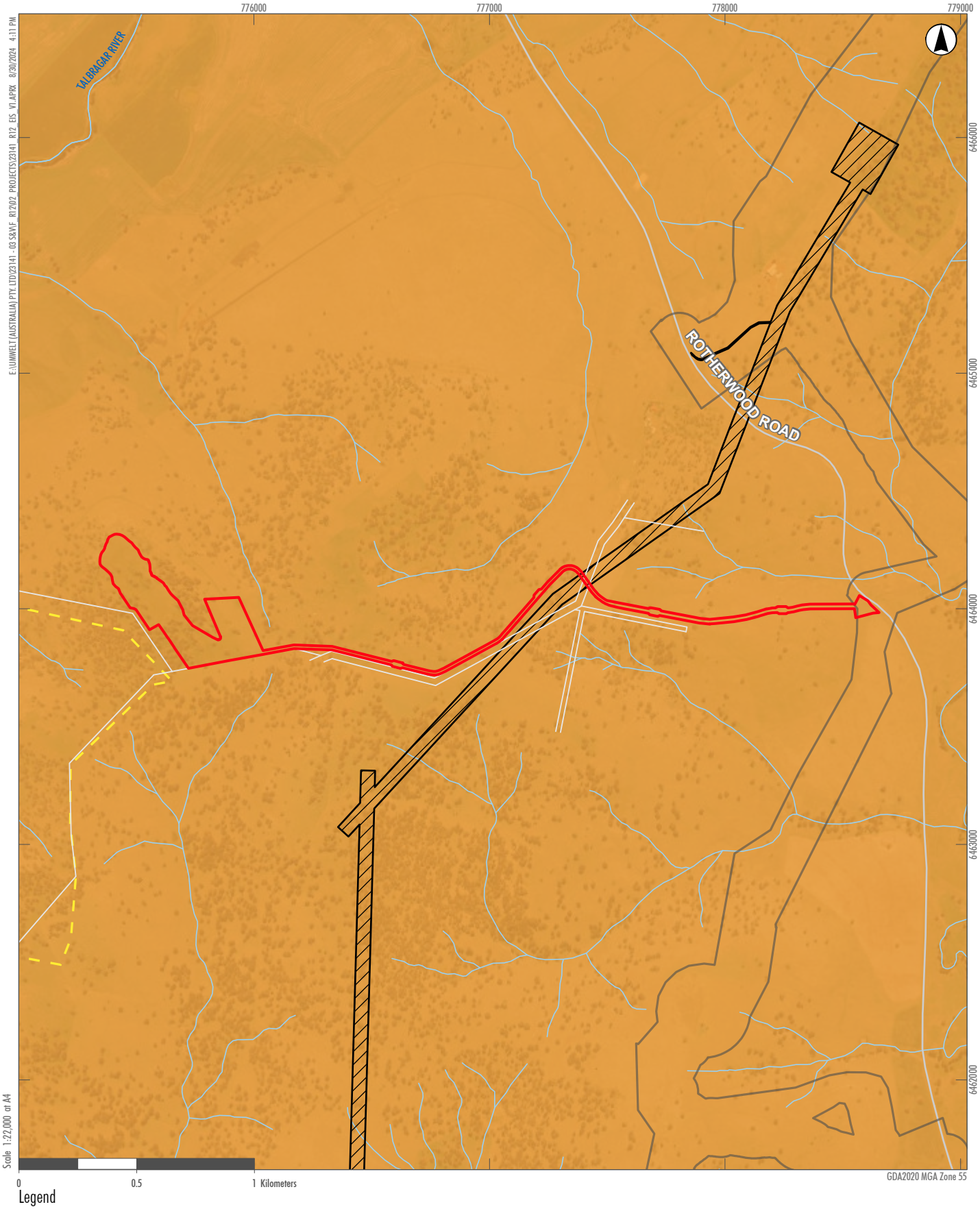
The SEARs require an assessment of the likely risks to public safety, paying particular attention to potential bushfire risks and the transport, handling and use of any hazardous or dangerous goods.

6.11.1 Bushfire

The Project Area is identified as bushfire prone land by the NSW Rural Fire Service (RFS) bushfire prone land mapping (RFS, 2021) (refer to **Figure 6.12**). Extensive areas surrounding the Project Area have been subject to clearing associated with historical agricultural activities which reduces the bushfire risk in these cleared areas. The Project Area and surrounding land is mapped as Category 3 Vegetation on the RFS mapping, which represents lower bushfire risk. This vegetation category is consistent with isolated stands of remnant vegetation and grassland. Areas of remnant vegetation remaining within and surrounding the Project Area are isolated and connectivity of vegetation across the landscape is limited. Areas associated with Category 3 Vegetation is generally also land subject to ongoing land management practices that actively reduce bushfire risk.

Weather conditions influence the size, intensity and speed that a bushfire can spread across the landscape. The bushfire season generally commences from October and concludes in March each year, however in some years the season has started as early as September and extended into April. Weather conditions primarily associated with the bushfire season consist of strong north-westerly fronts generated from the interior, which may be extremely dry and hot (RFS, 2018). The hot, dry and windy climate during the summer months within the Project locality increases bushfire risk across the region despite lower fuel loads being present.

An assessment of the Project has been undertaken in accordance with Planning for Bushfire Protection (PBP) (RFS, 2019). Section 8.3 of PBP 2019 provides assessment guidelines for 'Other non-residential development', which applies to the Project. Section 8.3.6 of PBP – Mining (underground and open cut) and petroleum production aligns the Project as an extractive industry. PBP states that assessment associated with Section 8.3.6 should be undertaken with *consideration to the same provisions detailed in section 8.3.5 for wind and solar farms*.



Legend

- Project Area
- Liverpool Range Wind Farm Project Site
- Liverpool Range Wind Farm Project Development Corridor – External Transmission Line CWO REZ
- Liverpool Range Wind Farm Project Development Corridor – Wind Farm
- Road
- Drainage Line
- Surveyed Cadastre

NSW Bush Fire Prone Lands

- Vegetation Buffer
- Vegetation Category 1
- Vegetation Category 2
- Vegetation Category 3

FIGURE 6.12

Bush Fire Prone Land Map

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)

All proposed infrastructure (plant and equipment), as well as any temporary demountable buildings (e.g. mobile crib room and toilet facilities) will be located within the proposed operations area. Given the nature of the operations area (bare ground, no vegetation), the site infrastructure will be located a minimum 10 m from treed vegetation, thereby creating a minimum Asset Protection Zone (APZ) of 10 m as required under Section 8.3.5 of PBP 2019. In addition, being constructed to accommodate the two-way all-weather movement of loaded haul trucks, the proposed access road proposes passing bays and will accommodate fire trucks entry and emergency egress route.

Appropriate bushfire emergency management and mitigation measures will be developed and implemented as part of the EMP, in accordance with the requirements of Section 8.3.5 of PBP 2019, including:

- Details of measures to prevent or mitigate fires igniting.
- Description of work that should not be carried out during total fire bans.
- Details of the availability of fire-suppression equipment, access and water and emergency access.
- Details of storage and maintenance of fuels and other flammable materials.
- Notification process to the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate.
- Appropriate bush fire emergency plan.

Through the implementation of appropriate bushfire protection measures, bushfire threat associated with the Project can be appropriately mitigated.

6.11.2 Preliminary Hazard Analysis

A preliminary risk screening was undertaken for the Project in accordance with Chapter 3 of the *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP). The preliminary risk screening involves identification and assessment of the storage of specific dangerous goods classes that have the potential for significant off-site effects. A development is considered 'potentially hazardous' and requires a Preliminary Hazard Analysis (PHA) if the storage or transport of hazardous substances exceeds specific screening thresholds.

Table 6.25 provides a list of the hazardous materials to be stored within the Project Area, dangerous goods classes of the materials, storage quantities and screening thresholds. Based on the estimated quantities listed in **Table 6.25**, none of the hazardous materials proposed to be stored are above screening thresholds and a PHA is not required. Vehicle movements for the transport of hazardous materials to the Project Area will also be well below transportation screening thresholds. Explosives and explosive precursors will not be stored on site and therefore do not trigger screening requirements.

Table 6.25 Hazardous Materials Inventory

Material	Storage Type and Location	ADG Code[1] Class	Quantity	Screening Threshold	PHA Required?
Diesel	Above ground self-bunded tank (Operations Area)	C1	1 x 20 kL[2]	No screening thresholds for combustible liquids	No
Unleaded Petrol	Packages (Operations Area)	3 (II)	200 kg	< 5 tonne – screening distance does not apply	No
Engine and Hydraulic Oils	Packages (Operations Area)	C2	3,000 kg	No screening thresholds for combustible liquids	No
LPG	Packages (Operations Area)	2.1	100 kg	10 tonne	No
Welding Gases (e.g. acetylene)	Packages (Operations Area)	2.1	30 kg	10 tonne	No
Aerosols	Packages (Operations Area)	2.1	50 kg	10 tonne	No
Paint and Solvents	Packages (Operations Area)	3 (III)	50 kg	< 5 tonne – screening distance does not apply	No

Notes:

1. Australian Dangerous Goods Code
2. 20 kL of diesel has a mass of approximately 17,200 kg.

6.11.3 Contamination

A search of the EPA's NSW Contaminated Lands Public Record Register did not identify any areas of contaminated land within the Project Area or surrounds. The Project Area has been used for grazing activities and there are no known areas of contamination within the Project Area, or any identified contamination risks based on past land uses.

As with all activities that involve earthworks and industrial operations, activities carried out as part of the Project have the potential to cause localised contamination if not appropriately managed. Controls will be implemented to manage this risk through the development of appropriate chemical handling and storage procedures in the EMP. This will include appropriate storage of fuels and chemicals, appropriate waste management systems, spill and emergency response procedures and equipment, and regular inspection and reporting processes. Consistent with the requirements of the POEO Act, a Pollution Incident Response Management Plan (PIRMP) will be developed which will include procedures for managing fuel and chemical spills. The management of waste is discussed further in **Section 6.10**.

6.12 Health Impact Assessment

The SEARs require a health impact assessment of local and regional impacts associated with the development, including those health risks associated with relevant key issues. The preliminary risk analysis undertaken to inform the approach to the assessment for the EIS includes the identification of all potential impacts associated with the Project, including relevant health impacts.

The detailed assessment of each potential environmental risk associated with the Project (including potential related health impacts) has been undertaken in accordance with relevant legislation and guidelines, and by appropriately qualified specialists. Where relevant, potential risks to human health have been assessed against accepted assessment criteria established by the NSW Government. Where relevant criteria are predicted to be met or where mitigation measures are to be implemented to achieve criteria, no further detailed health impact assessment was determined to be required.

The identified risks to health, and a summary of the key assessment findings relevant to the identified risk, are provided in **Table 6.26**.

Table 6.26 Identified Risks to Health and Associated Assessment Findings

Issue	Description of Risk to Public Health	Relevant Assessment Section	Summary of Key Findings
Air Quality	Human exposure to particulates (PM_{10} and $PM_{2.5}$).	**Section 6.4**	The modelling showed that the Project would not cause exceedances of the EPA assessment criteria for 24-hour average or annual average PM_{10}, 24-hour average or annual average $PM_{2.5}$ at any sensitive receptor.
Noise	Human exposure to noise, low frequency noise causing annoyance and sleep disturbance from transient noises (with tonal characteristics).	**Section 6.2**	Appropriate operational management will be implemented to ensure compliance with noise criteria at all sensitive receptors. The quarry will not operate at night, activities proposed during the night-time period when sleep assessment criteria apply will be limited to maintenance activities which are unlikely to be audible at any sensitive receptor.
Water Contamination	Contamination of surface water and drinking water and health risks associated with human exposure	**Section 6.5.1** and **Section 6.11.3**	Appropriate ESCs will be implemented during construction and decommissioning to mitigate any potential impact on downstream receiving waters. The potential for adverse water quality impacts on downstream receiving waters during the operational phases are considered negligible.
Water Contamination	Contamination of Groundwater and health risks associated with human exposure	**Section 6.5.2** and **Section 6.11.3**	Impacts on groundwater quality or quantity are considered unlikely during construction and operation and no groundwater interactions or adverse impacts to aquifers are predicted as a result of the Project. In addition, there are no known groundwater issues (e.g. contamination) in the vicinity of the Project Area.
Land Contamination	Health related risks from human exposure to contaminated land.	**Section 6.11.3**	The Project Area does not contain any areas of known contamination that may cause a significant risk to human health or the environment. As with all activities that involve earthworks, activities carried out as part of the Project have the potential to cause contamination if not managed appropriately. Appropriate controls are

Issue	Description of Risk to Public Health	Relevant Assessment Section	Summary of Key Findings
			proposed to manage this risk as part of the Project including appropriate chemical handling and storage procedures, appropriate waste management systems, spill and emergency response procedures and equipment, and regular inspection and reporting processes. No potential impacts to off-site land users are expected to occur.
Bushfire	Direct and indirect health risks associated with bushfire including risk to life.	**Section 6.11.1**	The Project will not increase the risk of bushfire and appropriate bushfire management measures will be implemented to mitigate bushfire threat associated with the Project.
Dangerous Goods	Health risks associated with the storage, handling and disposal of dangerous goods.	**Section 6.11.2**	The types and quantities of goods used and stored on site do not exceed the relevant thresholds to require a preliminary risk screening. No potential impacts to off-site land users are expected to occur.
Waste	Health risks associated with the handling and disposal of waste including hazardous waste.	**Section 6.10**	All required waste management measures will be developed and implemented through the EMP. With these controls in place, it is expected that the impacts associated with waste generation and disposal resulting from the Project can be effectively managed with low risk to human health.

6.13 Visual Amenity

A comprehensive assessment of the existing landscape character and the potential visibility of the Project was undertaken by Moir Landscape Architecture Pty Ltd (MLA) and is provided in **Appendix 14**. In accordance with the Project SEARs, the Landscape and Visual Impact Assessment (LVIA) includes a detailed assessment of the likely visual impacts of the development on private landowners and key vantage points in the public domain, paying particular attention to any new landforms.

6.13.1 Existing Visual Landscape

The dominant landscape character of the area includes undulating hills utilised for grazing and dryland cropping. Scattered vegetation is located on the steeper hills surrounding the Project Area and land used for agricultural purposes is generally cleared.

Zone of Visual Influence (ZVI) mapping was prepared as part of the assessment to identify land from which the Project may theoretically be visible, to inform field work and the selection of viewpoint analysis locations. The ZVI is a preliminary assessment tool based on topography alone and does not consider the impacts of screening elements such as vegetation and structures.

The ZVI mapping indicated that the Project may be partially visible from Vinegaroy Road to the south-west, Rotherwood Road to the north-west and north, and Yarrawonga Road to the north-east. The Project is likely to have higher visibility from areas with a higher elevation at a greater distance to the north and north-east. Due to the undulating topography that characterises the landscape, there are large areas of land from which the Project will be screened.

6.13.2 Impact Assessment

The findings of the ZVI were assessed from both public and private view points with consideration of the influence of existing vegetation and other built structures and screen factors through fieldwork and the preparation of photomontages, the photomontages are provided in **Appendix 14**.

Based on the detailed assessment, due to a combination of distance, vegetation and topography the proposed quarry will be predominately screened from view from all public viewpoints. In relation to the 3 identified associated dwellings, due to the low horizontal extent of the Project and existing vegetation (particularly to the northeast) the visual impact rating for all 3 dwellings is considered negligible.

The proposed access roads are likely to be viewed as part of the existing agricultural character of the landscape with the impact considered to be negligible. The potential visual impacts of vehicle movements within the Project Area are also expected to be minimal due to the duration and visibility for short periods of time.

6.13.3 Mitigation and Management Measures

Although visual impact associated with the quarry are considered negligible the VIA includes the following measures to further assist with minimising any potential visual impact:

- Retention of existing trees within the Project Area in close proximity to the site boundary where practicable to assist in screening views to the Project.
- Revegetation of degraded and disturbed areas once quarry operations are complete.

6.14 Social

A detailed Social Impact Assessment (SIA) has been prepared by Umwelt in accordance with the NSW Government's Social Impact Assessment Guideline (DPE, 2023) (SIA Guideline) for SSD to address the requirements of the SEARs which requires an assessment of social impacts associated with the Project (refer to **Appendix 15**). SIA involves understanding impacts from the perspectives of those involved in a personal, community, social or cultural sense, to provide a complete picture of potential impacts, their context, and implications. The results of the SIA are summarised in the following sections with the results of the consultation outlined in **Section 5.3**.

6.14.1 Methodology

The SIA includes three key phases, as outlined in **Figure 6.13**. The phases run concurrently with and are informed by the specialist assessment and preparation of the EIS for the Project.

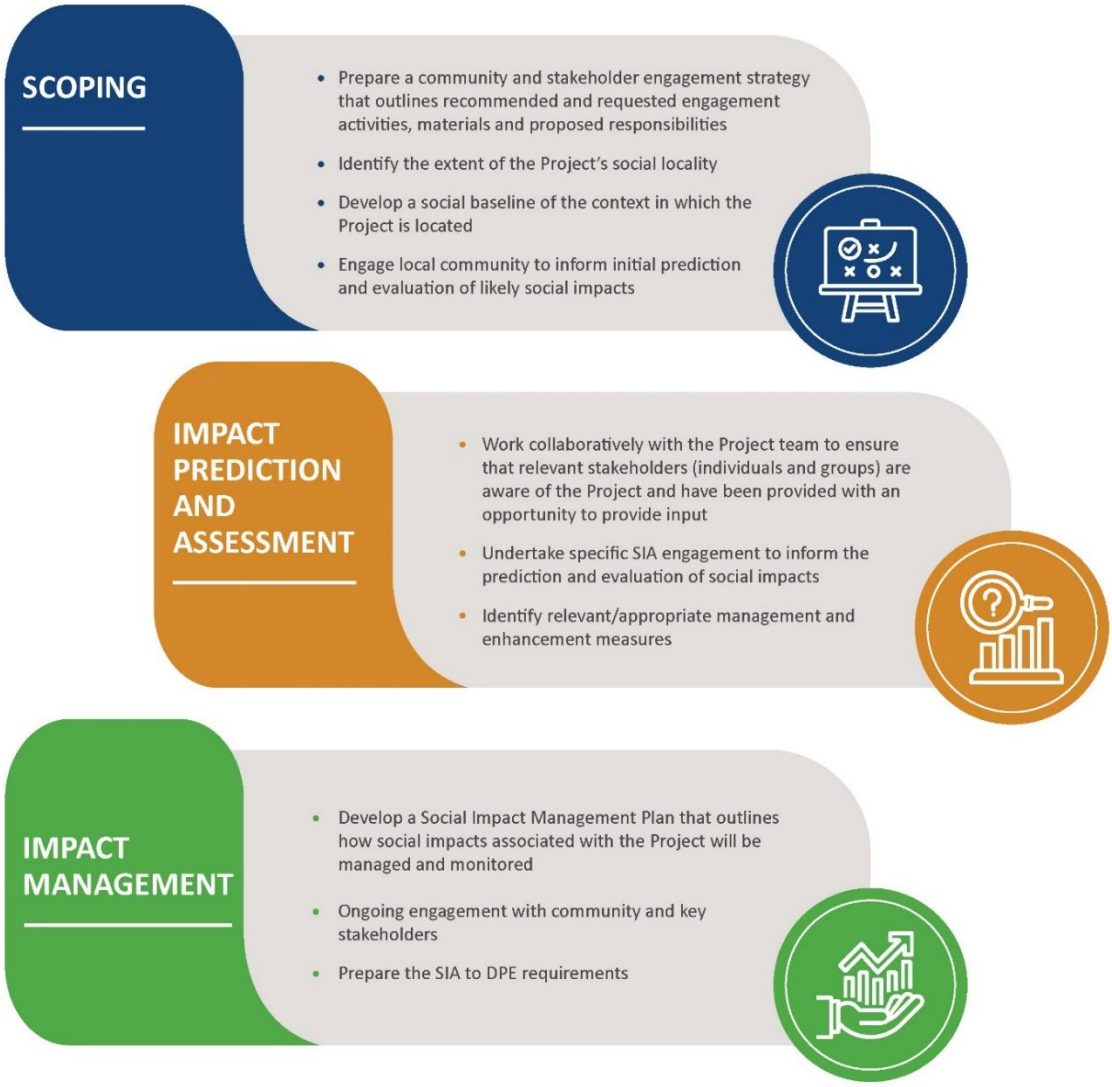


Figure 6.13 SIA Phases

Source: Umwelt 2023.

6.14.2 Social Baseline Profile

A social baseline profile gathers knowledge from both primary and secondary data sources to increase understanding of the existing social environment in which a project is proposed, and of potentially affected communities. The social baseline profile is a foundational component of SIA, as it provides the basis from which social impacts associated with the Project may be predicted.

The Project is located within the Central-West Orana Renewable Energy Zone (CWO REZ) and directly linked to the LRWF project. The LRWF project is one of the most advanced staged projects currently in the REZ. The Project is a direct response to an identified shortage of construction materials to facilitate the construction of the LRWF project. The proposed location for the Quarry within the LRWF project area aims to reduce the environmental, social and cultural impacts associated with the transport of quarry materials required for the approved LRWF project and, by doing so, also reduces cumulative traffic (and associated) impacts on the broader road network associated with the construction of other renewable energy projects by enabling the LRWF project to effectively avoid cumulative transport impacts. This interaction requires consideration of the local context and also the regional context, which are summarised below:

Local Context

- **Immediate surrounding demographics:** Within the area immediately surrounding the Project Area, people are more likely to be older in age, more likely to live in slightly larger households, more likely to be married and more likely to earn a lower income than the average population of NSW. The median age is 41 (compared to the NSW median of 39), with higher proportions of children under 10 and adults over 50 in this SA1. There are fewer younger adults in their twenties and early thirties, potentially reflecting younger people leaving the area for educational attainment. Similarly, 51% of residents are married (compared to 47.3% in NSW) and 3.3 people live in each household on average (compared to 2.6 in NSW).

- **Immediate surrounding land uses:** The Project Area is currently owned by a landholder associated with the LRWF project and is located within the LRWF project area. The land parcels which the Project will be situated on are zoned RU1 Primary Production under the Upper Hunter Local Environmental Plan, 2013. The Project Area is currently used for grazing. The land surrounding the Project Area is primarily used for agriculture (beef cattle grazing and cropping).

Regional Context

- **An elderly and ageing population**: Warrumbungle Shire (50), Upper Hunter (42) and Mid-Western (42) LGAs feature older median population and substantially higher proportions of the population older than 65 (28.5%, 21.2% and 20.7%) compared to NSW (39 and 17.7%). This has implications for health and social service requirements as older age is correlated with greater health complications and service needs. It also has implications for engagement and information sharing preferences, suggesting a lower reliance on online communications.

- **Experiences of socio-economic disadvantage**: There is an average level of disadvantage in the Upper Hunter Shire Council (5th decile) and Mid-Western Regional LGA (5th decile) with substantially higher levels of disadvantage in the Warrumbungle Shire Council (2nd decile). This has implications for resilience to economic change, especially in the Warrumbungle Shire.

- **Low or negative population growth**: The LGAs of Warrumbungle, Upper Hunter Shire and Mid-Western Regional are expected to grow at slower rates than NSW (+0.95% annually) over the next years, with population decline expected in Warrumbungle Shire (-0.89% annually) and the Upper Hunter Shire (-0.31% annually) and a low annual population increase predicted in the Mid-Western Regional Council area (0.77% annually). This has implications for future housing and service demand and local job and investment growth or stagnations.

- **Strong specialisation in agriculture and mining**: The Upper Hunter LGA (11.6%) and Mid-Western LGA's (15.9%) top industry of employment is mining. In comparison, the Warrumbungle LGA's (27.6%) top industry of employment is agriculture, forestry and fishing. Over a third (34.2%) of the economic output from Warrumbungle LGA comes from the Agriculture, Forestry & Fishing industry; with this sector also providing close to a quarter of economic output (24%) in the Upper Hunter LGA. In Mid-Western Regional LGA the economy is dominated by mining, with 55.9% of economic output from this sector. This has implications for the potential for employment and procurement opportunities, especially due to overlapping industrial activities and supply chain needs between mining and quarrying.

- **Opportunities for economic benefits** associated with renewable energy development are likely to be higher in Mid-Western LGA and lower in the Warrumbungle LGA. While not captured in the 2021 data, economic activity associated with the construction of renewable energy development in the Warrumbungle and Mid-Western LGAs is expected to increase significantly in the coming decade based on current proposed and approved wind farm development and there is likely to be significant economic output from these renewable energy projects into the foreseeable future.

- **Rich in natural resources**: The regional locality of the Project Area is rich in natural resources with the presence of multiple national parks and nature reserves.

- **Limited access to health facilities**: There is an identified shortfall of health services in the social locality with the NSW Primary Health District identifying access to mental health services, access to specialists, availability of after-hour GP services, unequal distribution of GPs, travel distances and transport availability across the region as key concerns for the region (NSW Health, 2022). This has implications for the impact of incoming workforces given the potential for the workforce to access health services.

- **Mixed unemployment rates**: Upper Hunter Shire and Mid-Western Regional LGAs have a lower unemployment rate compared to the State (3.2% and 4.0% compared to 4.9%). However, Warrumbungle Shire has a higher unemployment rate of 6.1%. This has implications for sourcing of local workforces and levels of regional vulnerability.

- **A relatively settled population**: Warrumbungle LGA (55.4%) and Upper Hunter LGA (54.1%) have a less transient community compared to the state (50.7%), measured by the proportion of the population who lived at a different address 5 years before the census date. The Mid-Western Regional LGA (48.6%) has a slightly more transient community in comparison to the State. A less transient community can be associated with strong place attachment and cohesion.

6.14.3 Social Impact Evaluation

The SIA concludes that almost all social impacts are of short duration as the Project will only operate at peak capacity for four years with limited activity associated with site rehabilitation following this initial peak construction period. The potential impacts associated with the project are predicted to be within relevant impact assessment criteria and the Project will mitigate and reduce traffic and haulage impacts associated with the approved LRWF project.

The social significance matrix used to evaluate social impacts (refer to **Table 6.27**), considers both the magnitude of the potential social impact (Minimal, Minor, Moderate, Major and Transformational) and the likelihood of the impact occurring (Very unlikely, Unlikely, Possible, Likely and Almost certain) to determine an overall evaluation of impact as 'Low', 'Medium', 'High' or 'Very High'. **Table 6.28** and **Table 6.29** contain further detail regarding magnitude and likelihood classifications. Proposed mitigation and enhancement strategies are also considered in determining the residual social impact.

Table 6.27 Social Impact Significance Matrix

Likelihood level	1 - Minimal	2 - Minor	3 - Moderate	4 - Major	5 - Transformational
A – Almost certain	Low	Medium	High	Very High	Very High
B – Likely	Low	Medium	High	High	Very High
C – Possible	Low	Medium	Medium	High	High

Likelihood level	1 - Minimal	2 - Minor	3 - Moderate	4 - Major	5 - Transformational
D – Unlikely	Low	Low	Medium	Medium	High
E – Very Unlikely	Low	Low	Low	Medium	Medium

Source: SIA Guideline (DPIE, 2023)

Table 6.28 Defining Magnitude for Social Impact

Magnitude level	Meaning
Transformational	Substantial change experienced in community wellbeing, livelihood, infrastructure, services, health, and/or heritage values; permanent displacement or addition of at least 20% of a community.
Major	Substantial deterioration/improvement to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area.
Moderate	Noticeable deterioration/improvement to something that people value highly, either lasting for an extensive time, or affecting a group of people.
Minor	Mild deterioration/improvement, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable.
Minimal	Little noticeable change experienced by people in the locality.

Source: SIA Guideline (DPIE, 2023)

Table 6.29 Definitions of Likelihood

Likelihood level	Meaning
Almost certain	Definite or almost definitely expected (e.g. has happened on similar projects)
Likely	High probability
Possible	Medium probability
Unlikely	Low probability
Very unlikely	Improbable or remote probability

Source: SIA Guideline (DPIE, 2023)

Table 6.30 provides an evaluation of the likely significance of the positive and negative social impacts associated with the Project, including those identified by the community as outlined in **Section 5.3**, with reference to perceived stakeholder importance and unmitigated significance. The table summarises the Project aspects that have the potential to generate social impacts, describes the social impact itself, its extent (likely affected stakeholders), the importance of the impact (sensitivity/vulnerability) to key stakeholders and groups (from the perspectives of the stakeholders consulted), the duration and/or timing of the impact, and the significance of the impact, with consideration of relevant management measures to ameliorate, mitigate and/or enhance social impacts.

Social impacts have been ranked in terms of their significance from low to very high, with green cells indicating positive impacts/opportunities. Orange cells indicate negative impacts. Darker shades indicate impacts or opportunities of higher significance, while lighter shades indicate lower significance.

The impact assessment has identified that any negative social impacts of the Project can be mitigated or managed to reduce their significance, with positive impacts enhanced with the implementation of appropriate management measures.

Table 6.30 Social Impact Evaluation

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
Surroundings **Accessibility** **Health and Wellbeing**	Increased road safety for road users due to the Project reducing the distances travelled on the local and regional road network to transport quarry material to the LRWF project area using heavy vehicles.	Transport of quarry material and vehicle movements.	C & O 4 years	Road users Broader community	H	A	3	H	• Traffic Management Plan to include strategies for improving road safety. • Limiting Project product haulage vehicles to approved haulage roads. • Road upgrades to Rotherwood Road and Project access road intersection to mitigate impacts on traffic flow associated with turning vehicles. • Clear communication regarding the LRWF project's responsibility for road maintenance associated with quarry haulage and other construction activities. • Complaints Register to ensure community can inform proponent where there are road issues and processes for referring any complaints to the operator of the LRWF project for action. • Limiting truck speeds on local roads.	H
Surroundings **Accessibility** **Health and Wellbeing**	Congestion, road deterioration, and safety issues associated with Quarry trucks on local roads.	Transport of quarry material and vehicle movements. Cumulative interaction with LRWF project impacts.	C & O 4 years	Near neighbours	M	B	2	M	• Traffic Management Plan to include strategies for improving road safety. • Limiting Project product haulage vehicles to approved haulage roads. • Road upgrades to Rotherwood Road and Project access road intersection to mitigate impacts on traffic flow associated with turning vehicles.	L

[2] P = Planning, C = Construction, O = Operations, D = Decomissioning
[3] Perceived significance based on the impact frequencies in Figure 4.1; 0-1 = Low; 2-3 = M; 4-5 = H.
[4] L = Likelihood (A: Almost Certain, B: Likely, C: Possible, D: Unlikely, E: Very Unlikely); M = Magnitude (1: Minimal, 2: Minor, 3: Moderate, 4: Major, 5: Transformational); S = Significance rating (L: Low, M: Medium, H: High, VH: Very High)

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
									• Clear communication regarding the LRWF project's responsibility for road maintenance associated with quarry haulage and other construction activities. • Complaints Register to ensure community can inform proponent where there are road issues and processes for referring any complaints to the operator of the LRWF project for action. • Limiting truck speeds on local roads.	
Surroundings **Accessibility** **Health and Wellbeing**	Congestion, road deterioration, and safety issues associated with Quarry trucks on local roads.	Transport of quarry material and vehicle movements. Cumulative interaction with LRWF project impacts.	C & O 4 years	Road users Broader community Local council	M	B	1	L	• Traffic Management Plan to include strategies for improving road safety. • Limiting Project product haulage vehicles to approved haulage roads. • Road upgrades to Rotherwood Road and Project access road intersection to mitigate impacts on traffic flow associated with turning vehicles. • Clear communication regarding the LRWF project's responsibility for road maintenance associated with quarry haulage and other construction activities. • Complaints Register to ensure community can inform proponent where there are road issues and processes for referring any complaints to the operator of the LRWF project for action. • Limiting truck speeds on local roads.	L
Surroundings	Real or perceived increase in noise from the Project, impacting residents' sense of place and enjoyment of	Quarry construction and operation activities.	C & O 4 years	Host landowner	H	B	3	H	• Host landholder informed of potential noise impacts as part of the commercial negotiations regarding the use of their land.	L

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
	their homes and neighbourhood.	Cumulative interaction with the LRWF project noise.							• Noise monitoring and management including location and orientation of stockpiles and equipment to minimise noise production and spread. • Installing white noise reversing alarms instead of tonal alarms on relevant quarry equipment. • Restrict operations to day-time hours, with only limited maintenance activities in the evening and night periods. • Develop and implement appropriate noise management and mitigation measures. • Complaints Handling Procedure, engagement with proximal landholders, alerts prior to key operational activities including blasting.	
Surroundings	Real or perceived increase in noise from the Project, impacting residents' sense of place and enjoyment of their homes and neighbourhood.	Quarry construction and operation activities. Cumulative interaction with the LRWF project noise.	C & O 4 years	Near neighbours	M	C	3	M	• Host landholder informed of potential noise impacts as part of the commercial negotiations regarding the use of their land. • Noise monitoring and management including location and orientation of stockpiles and equipment to minimise noise production and spread. • Installing white noise reversing alarms instead of tonal alarms on relevant quarry equipment. • Restrict operations to day-time hours, with only limited maintenance activities in the evening and night periods. • Develop and implement appropriate noise management and mitigation measures.	L

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
									• Complaints Handling Procedure, engagement with proximal landholders, alerts prior to key operational activities including blasting. •	
Surroundings	Real or perceived increase in noise from the Project, impacting residents' sense of place and enjoyment of their homes and neighbourhood.	Quarry construction and operation activities. Cumulative interaction with the LRWF project noise.	C & O 4 years	Broader community	L	D	2	L	• Host landholder informed of potential noise impacts as part of the commercial negotiations regarding the use of their land. • Noise monitoring and management including location and orientation of stockpiles and equipment to minimise noise production and spread. • Installing white noise reversing alarms instead of tonal alarms on relevant quarry equipment. • Restrict operations to day-time hours, with only limited maintenance activities in the evening and night periods. • Develop and implement appropriate noise management and mitigation measures. • Complaints Handling Procedure, engagement with proximal landholders, alerts prior to key operational activities including blasting.	L
Surroundings	Changes in the visual landscape, impacting resident's sense of place and experience of the local area.	Quarry pit and surrounding infrastructure. Cumulative interaction with LRWF project visual impacts.	C & O & D 4 years	Near neighbours Host landowner Broader community	M	D	2	L	• Maximising the use of natural topography and vegetation to minimise visual impacts. • Retention of existing trees where possible. • Use of quarry infrastructure elements that blend with surrounding landscape where possible (e.g. in colour). • Avoiding large signage.	L

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
									• Proponent to inform near neighbours and broader community of closure plans prior to closure and rehabilitation and revegetation of disturbed areas once operations have been completed. • Timely rehabilitation of site following end of quarry activities to facilitate ongoing rural activities. • Lighting designed to minimise visual impacts to neighbours and meet Dark Sky requirements associated with the Siding Springs Observatory. •	
Surroundings	Changes in the visual landscape, impacting resident's sense of place and experience of the local area.	Quarry pit and surrounding infrastructure. Cumulative interaction with LRWF project visual impacts.	C & O & D 4 years	Broader community	M	E	2	L	• Maximising the use of natural topography and vegetation to minimise visual impacts. • Retention of existing trees where possible. • Use of quarry infrastructure elements that blend with surrounding landscape where possible (e.g. in colour). • Avoiding large signage. • Proponent to inform near neighbours and broader community of closure plans prior to closure and rehabilitation and revegetation of disturbed areas once operations have been completed. • Timely rehabilitation of site following end of quarry activities to facilitate ongoing rural activities. • Lighting designed to minimise visual impacts to neighbours and meet Dark Sky requirements associated with the Siding Springs Observatory.	L

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
Surroundings	Vibrations from blasting activities may negatively impact surrounding dwellings and buildings.	Quarry construction and operation activities.	C & O 4 years	Host landowner Near neighbours	L	D	2	L	• Implementation of pre-blast protocol and appropriate blast management and mitigation measures. • Implementation of a blast notification system to give landholders notice and communication relating to blasting times, such as SMS alerts or phone calls. • Implement a Blast Monitoring System to capture ground vibration and air blast overpressure impacts from the Quarry at nearest residences to ensure they remain below the ANZECC guidelines and make these results publicly accessible. • Implementation of a Complaints Register to capture and manage complaints.	L
Surroundings Way of Life	Actual or perceived environmental impacts affecting community members' sense of place and connection to the landscape.	Quarry operations and impacts.	C, O & D	Near neighbours	H	C	3	M	• Implementation of recommended mitigation and management measures in the BDAR. • Provide quality, easy to understand information on the company website about environmental mitigation efforts and results. • Communication of BDAR findings, environmental mitigation measures and results to interested stakeholders in a proactive and planned nature. • Open face to face communication of how environmental concerns are being managed with key local residents who have concerns. • Capturing the above in a Community and Stakeholder Engagement Plan (CSEP), or inclusion of the Quarry in the LRWF project's CSEP.	L

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
									• Communicate Project developments through engagement with the Community Consultation Committee (CCC) for the wider LRWF Project. • Offsetting of Project's impacts to ecosystems and species via biodiversity credits.	
Surroundings Way of Life	Land clearing resulting in loss of natural environment and habitat for local species, thereby impacting quality of, and access to, those natural environments and ecosystems.	Quarry operations and impacts.	C & O 4 years	Near neighbours Broader community Local environmental groups	M	B	2	M	• Implementation of recommended mitigation and management measures in the BDAR. • Provide quality, easy to understand information on the company website about environmental mitigation efforts and results. • Communication of BDAR findings, environmental mitigation measures and results to interested stakeholders in a proactive and planned nature. • Open face to face communication of how environmental concerns are being managed with key local residents who have concerns. • Capturing the above in a Community and Stakeholder Engagement Plan (CSEP), or inclusion of the Quarry in the LRWF project's CSEP. • Communicate Project developments through engagement with the Community Consultation Committee (CCC) for the wider LRWF Project. • Offsetting of Project's impacts to ecosystems and species via biodiversity credits.	L L

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
Surroundings **Way of Life** **Livelihoods**	Perceived contamination of Talbragar river, impacting its usability as a recreational and livelihoods area.	Construction. Operations.	C, O & D	Host landowner Near neighbours Broader community Council Local environmental groups Downstream river users	M	D	1	L	• Limiting Quarry design and operations to remain above the groundwater table. • Implementing industry standard sediment and erosion control measures. • Reporting breaches or non-compliances to the relevant regulatory authority in line with regulatory requirements.	L
Surroundings **Way of Life** **Livelihoods**	Reduction in overall quality and usability of local ground and river water sources due to contamination of water table and nearby Talbragar River.	Quarry construction and operation activities.	C, O & D ongoing	Near neighbours Broader community Council Local environmental groups	M	D	1	L	• Limiting Quarry design and operations to remain above the groundwater table. • Implementing industry standard sediment and erosion control measures. • Reporting breaches or non-compliances to the relevant regulatory authority in line with regulatory requirements.	L
Surroundings	Potential for waste generation or use of the quarry as a waste dump negatively impacting the surrounding amenity.	Quarry operations and impacts.	C & O 4 years	Near neighbours Broader community Local environmental groups	L	D	1	L	• Develop and implement appropriate waste management measures to be communicated with Council and relevant stakeholders.	L
Livelihoods	Increased employment opportunities for local community members.	Construction and Operational workforce requirements.	C & O 4 years	Local workforce	M	C	3	M	• Openly communicating employment opportunities with the broader	M

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
	Low unemployment rates decreasing local employment opportunities for the Project.	Construction and Operational workforce requirements.	C & O 4 years	Local workforce	L	C	3	M	community in a way that maximises the chance for local employment first.	L
Livelihoods	Increased procurement opportunities for local businesses.	Construction and operational workforce requirements. Cumulative interaction with other regional Projects.	C & O 4 years	Local businesses	H	C	3	M	• Timely and proactive communication of what services would be required and when, to allow local businesses to plan ahead. • Host an industry day to share information on how to be involved and foster engagement with local businesses and include the Quarry in any industry days for the broader LRWF project. • Collaborating with a local supply solutions or procurement business, or local Chambers of Commerce to link in with other local businesses.	M
Livelihoods	Impacts and disruption to agricultural activities due to reduction in grazing area or risk of livestock harm.	Quarry construction and operation activities.	C, O & D On-going	Near neighbours Host landowner	H	C	3	M	• Ensure that adequate fencing or other barriers are installed to sufficiently separate livestock from quarry operations. • Reduced speed limits for trucks in farming areas. • Adjacent livestock owners able to contact the proponent's Site Manager directly for any related livestock safety issues emanating from the Quarry. • Rehabilitate the quarry site after decommissioning to facilitate ongoing agricultural activities.	L

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
Livelihoods	Impacts of property devaluation on financial stability of landowners.	Quarry construction and operation activities.	C, O & D On-going	Near neighbours	L	D	3	M	• Appropriate monitoring of noise, vibration, air, and water quality to ensure they remain at acceptable levels and any mitigation measures remain effective. • Implementation of a Complaints Register. • Open and proactive engagement with nearby residents to ensure understanding of Project impacts on a case-by-case basis.	L
Livelihoods	Royalty benefits from resource extraction leading to economic benefits for the host landowner.	Quarry construction and operation activities.	C & O 4 years	Host landowner	H	A	3	H	• Continued open engagement with the host landowner and ability to contact the proponent's Site Manager directly regarding any issues or concerns.	H
Health and Wellbeing **Surroundings**	Reduced air quality as a result of increased dust and particle matter causing potential impacts to respiratory health.	Quarry construction and operation activities.	C & O 4 years	Host landowner Near neighbours	M	D	2	L	• Communication of the conclusions of the AQGIA to mitigate concerns over potential air quality impacts. • Implementation of dust management measures under the Project's EMP. • Respectful communication of the results of monitoring to interested local stakeholders.	L
Health and Wellbeing **Livelihoods**	Risks to safety of persons and livestock due to quarry operations, particularly blasting.	Quarry construction and operation activities.	C & O 4 years	Host landowner Near neighbours	M	D	2	L	• Appropriate use of fencing to prevent people or livestock accessing the Quarry area. • Provide advance notice to local farmers of blasting activities to mitigate any possible impacts on livestock.	L
Health and Wellbeing **Livelihoods**	Risks to safety of persons and livestock due to storage and transport of hazardous materials associated with quarry operations.	Quarry construction and operation activities.	C & O 4 years	Host landowner Near neighbours	L	D	1	L	• Manage hazardous material present on site in accordance with relevant codes and standards. • Ensure vehicle movements for the transport of hazardous materials to the	L

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
									Project are undertaken in accordance with relevant codes and standards. • Communication of the above results with the wider community and any concerned residents.	
Health and Wellbeing **Accessibility**	Impacts of Quarry development and operations on increasing fire risk and/or impacting ability of emergency fire services to suppress fires in the vicinity.	Quarry construction and operation activities.	C & O 4 years	Host landowner Near neighbours Local emergency services	L	C	3	M	• Implement appropriate bushfire management and mitigation measures • Regular engagement with local emergency services. • Presence and maintenance of on-site fire appliances and employees trained in their use.	L
Health and Wellbeing	Impacts of the Quarry and other proximal developments on community members' mental health due to cumulative change and uncertainty over future development.	Quarry construction and operation activities.	C & O 4 years	Near neighbours	L	C	3	M	• Providing consistent, transparent and proactive information and active consultation with stakeholders throughout Project development. • Develop and implement a Quarry CSEP. • Consider the employment of a local Community Liaison Officer. • Proactive collaboration with other proponents, NSW Government and Council through multi-stakeholder forums to develop coordinated strategies to address cumulative social impacts.	L
Decision-making Systems	Community member concerns around transparency of information sharing and communication, impacting ability to contribute to Project planning and decision making.	Cumulative impacts with the Project.	P, C, O & D 4 years	Near neighbours Broader community	L	C	3	M	• Implementing a Quarry CSEP. • Provide quality, easy to understand information on the company website about mitigation efforts and results, such as environmental or traffic. • Open face to face communication of how environmental and amenity concerns are being managed with key local residents who have concerns.	L

Social Impact Category	Social Impact Description	Project Aspect	Duration[2]	Affected Stakeholders	Perceived Significance[3]	Significance Rating [4]			Mitigation or Enhancement Measures	Residual Significance
						L	M	S		
									• Where possible, transparently sharing monitoring and regulatory compliance results on the website and in regular community briefings and updates. • Ensuring that there is a record of all annual community complaints from the Complaints Register and include the close out or mitigations to address the complaint.	
Decision-making Systems	Perceived or actual inequity in how the benefits and impacts of the Project are being shared between neighbouring landowners.	Quarry impacts and compensation. Cumulative interaction with Project impacts.	P, C & O 4 years	Near neighbours	M	D	2	L	• Open face to face communication of how environmental concerns are being managed with key local residents who have concerns. • Where possible, share monitoring and regulatory compliance results on the website and in regular community briefings and updates.	L
Accessibility **Community**	Opportunity for the Proponent to support or fund community services leading to improved amenity or service provision for the local community.	Shared Quarry benefits .	P, C & O 4 years	Local council Broader community	L	C	3	M	• Sponsoring community initiatives and discuss opportunities for other local community sponsorship with local community groups.	H
Culture	Potential for construction and operation of the Project to affect people's connection to Country and ongoing cultural practices and values.	Quarry activities and footprint. Cumulative interaction with Project impacts.	C, O & D On-going	Traditional Owners and other relevant Indigenous Groups	L	D	2	L	• Ensure that the LRWF project has ongoing and respectful engagement and involvement with the Traditional Owners. • Incorporate unexpected finds protocol as part of EMP.	L

Overall, the SIA has identified a number of positive impacts associated with the Project, including:

- increased road safety for road users by reducing the distances travelled on the local and regional road network to transport quarry material to the LRWF project area using heavy vehicles
- increased employment opportunities for local community members
- increased procurement opportunities for local businesses
- royalty benefits from the extraction of resources obtained by the host landholder
- opportunity for the proponent to support or fund community services leading to improved amenity or service provision for the local community in specific instances.

In relation to potential negative social impacts which predominately relate to amenity issues related to noise, air quality, traffic and visual, the SIA determines that all negative social impacts receive a post-mitigation ranking of 'Low'. Independent assessments for visual impacts, noise, vibration, and air quality have found that the Project will have minimal negative impacts from these factors, and that any impacts can be mitigated through the appropriate management measures such that the levels of predicted impacts are within accepted impact assessment criteria. Overall, the benefits of the Project in relation to reduced impacts associated with quarry product haulage for the LRWF project on the broader road network have been rated as 'High'.

6.14.4 Social Management, Mitigation and Enhancement

The Proponent has committed to the development of a Quarry Community and Stakeholder Engagement Plan (CSEP), or inclusion of the Project in the LRWF project's CSEP (to be determined during the detailed design phase). The CSEP will capture communication strategies and create a plan for the communication to be implemented to inform the community and also track any complaints and key messages as the Project progresses. Specific operational controls which address environmental impacts of concern or potential concern to community members will be detailed in the EMP.

The Proponent will also continue to liaise with local businesses and Councillors in relation to local community sponsorship opportunities.

6.15 Economic

The SEARs for the Project require a detailed assessment of the likely economic impacts of the development, paying particular attention to:

- the significance of the resource
- the costs and benefits of the project; identifying whether the development as a whole would result in a net benefit to NSW, including consideration of fluctuation in commodity markets and exchange rates
- the demand on local infrastructure and services.

An Economic Impact Assessment (EIA) has been prepared by Gillespie Economics to address the other SEARs. The key findings of the EIA are discussed in the following sections with the full report is provided in **Appendix 16**.

While there are no specific economic assessment guidelines for extractive industries, the Guidelines for Economic Assessment of Mining and Coal Seam Gas Proposals (NSW Government, 2015) and the Technical Notes Supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals (NSW Government, 2018), provide guidance on the economic assessment techniques that are appropriate for addressing the requirements under the EP&A Act.

The Guideline identifies that:

- Cost Benefit Analysis (CBA) is used to assess the public interest by estimating the net present value of the project to the NSW community.
- Local Effects Analysis (LEA) is used to assess the likely economic impacts of the development in the locality. The Guideline identifies a specific method for assessing the direct local effects of a mining project. However, it also states that "a range of techniques are available for estimating second round or flow-on effects. These include CGE (computable general equilibrium) modelling, Input-Output (IO) or multiplier analysis."

6.15.1 Significance of the Resource

As discussed in **Section 2.3**, detailed geological and geotechnical investigations has been undertaken onsite by the Proponent which indicate resources within the 'Main Pit' are dominated by a volcanic flow sequence of basalt and dolerite, whereas resources within the 'Borrow Pit' are predominantly clay and weathered volcanic rock. Resources from both pits are ideally suited to producing the typical range of blended, in-specification quarry products required to support the construction of the LRWF project.

The geological and geotechnical investigations confirmed a quarry resource of approximately 2 Mt within the Project Area from both a 'Main Pit' and 'Borrow Pit'. Additional resources in excess of this approximately 2 Mt proven resource are likely though would require additional drilling to confirm.

The quantity and price for quarry products in the region reflect the interaction of supply from existing quarries and demand from general construction activities in the region. Based on first principles, the LRWF project will create a demand shock. In the short-term supply of hard rock products is generally fixed (mainly due to limits on extraction, time frame of planning approval processes etc.), unless there is spare capacity in existing approved operations i.e. quarries are not operating at peak approved production rates and have available resource. Where spare capacity is limited and supply adjustment is sticky, a demand shock results in an increase in the price of quarry products and can "crowd out" those who currently purchase quarry products i.e. the demand shock results in price increases and shortages for other construction uses with consequent delay effects.

The ability (spare capacity and available resource) of existing quarries in the region to supply the LRWF project without impacts on other users would appear to be limited, but in any case, would involve extensive transportation costs and associated externalities.

The Project can be characterised as a supply shift that, compared to the base case, would ensure that the LRWF project has access to quarry products at a lower delivered cost and lower transportation externalities. The Project would also negate price increases and shortages for other quarry product users that would apply under the base case scenario associated otherwise associated with the increased demand created by the LRWF project.

6.15.2 Cost Benefit Analysis

The Cost Benefit Analysis (CBA) considers the incremental costs and benefits of a project relative to the base case of the project not proceeding. The starting point for CBA is to establish the "without" Project scenario for the land impacted by the Project. This becomes the base case against which to assess the potential economic, social, and environmental impacts of changes due to the Project.

Without the Project, the Project Area (land impacted by the Project) would continue to be used for grazing (sheep and cattle). Under the base case, it is assumed that the demand for quarry projects generated by the LRWF project would be met from existing quarries in the region, with associated crowding out, quarry product price increases, and transport costs. "With" the Project, is the implementation of the Project and the extraction of up to 0.7 Mtpa, continuing for approximately four years.

Relative to the base case, or "without" Project scenario, the Project may have the potential incremental economic benefit and cost categories shown in **Table 6.31**. The scope of the CBA is to the quarry gate as the quarry is within the LRWF project area and LRWF project will be responsible for transport of quarry material from this point to where it is required. All material haulage can be managed along existing approved LRWF project haulage routes and the conditions of consent for the LRWF project include a requirement to 'make good' any damage to public roads caused by construction activities which includes potential damage associated with quarry material haulage.

It should be noted that the potential environmental, social, and cultural costs of the proposed quarry that are listed in **Table 6.31** are only economic costs to the extent that they affect individual and community well-being through direct use of resources by individuals or non-use. If the potential impacts do not occur or are mitigated, compensated, or offset to the extent where community wellbeing is insignificantly affected (i.e. costs are borne by the proponent), then no environmental, social or cultural economic costs should be included in the Project CBA apart from the mitigation, compensation or offsetting costs.

Table 6.31 Potential Incremental Economic Benefits and Costs of the Project

Category	Costs	Benefits
Net production benefits from extraction and processing	• Opportunity cost of land • Opportunity cost of capital • Capital costs • Operating costs at quarry gate • Decommissioning and rehabilitation costs at cessation of the Project	• Sale value of quarry product at quarry gate • Residual value of capital and land at the end of the Project

Category	Costs	Benefits
Potential environmental, social and cultural impacts of extraction and processing after mitigation, offsetting and compensation	• Air quality impacts • Greenhouse gas generation • Noise and blasting impacts • Groundwater impacts • Surface water impacts • Biodiversity impacts • Aboriginal heritage impacts • Historic heritage impacts • Visual impacts • Net public infrastructure costs • Loss of surplus to other industries	• Reduced transport costs and externalities • Economic benefits to existing landholders • Economic benefits to suppliers • Wage benefits to employment • Nonmarket employment benefits

The CBA was undertaken in 2024 real values, with discounting at 7 percent (%) and sensitivity testing at 4% and 10%. The analysis period is 6 years, coinciding with the Project duration plus one year pre-commencement and one year post closure of the Project. Any impacts that occur after this period are included in the final year of the analysis as a terminal value.

Environmental, cultural, and social impacts were then estimated using market data and benefit transfer and incorporated into an estimate of the net social benefit of the Project. This estimated net social benefit of the Project provides another threshold value that any residual or non-quantified economic costs would need to exceed to make the Project questionable from an economic efficiency perspective.

6.15.2.1 Net Production Benefits

The present value of production costs and benefits, using a 7% discount rate, is provided in **Table 6.32**, this is based on three scales (Global, National and State).

Table 6.32 Net Production Benefits of the Project ($M Present Values at 7% Discount Rate) - Costs

Aspect	Quarrying
Cost - Opportunity cost of land and capital	$0
Cost - Capital costs	$4
Cost - Operating costs	$46
Cost - Rehabilitation and decommissioning costs	$0
Sub-total	**$50**
Benefits - Revenue	$56
Benefits - Residual value of land and capital equipment	$0
Sub-total	**$56**
Global Net Production Benefits	**$6**
Royalties	$0
Company Tax	$2

Aspect	Quarrying
Residual Net Production Benefits	$4
Global Net Production Benefits	**$6**
Royalties	$0[1]
Company Tax	$2
Residual Net Project Benefits	$4
Australian Net Production Benefits	**$6**
Royalties	$0[2]
Company Tax	$0
Residual Net Production Benefits	$4
NSW Net Production Benefits	**$4**

1 – differences in totals are due to rounding

2 – included in producer surplus calculations

The Project is estimated to have net production benefits of $6M (present value at 7% discount rate).

The net production benefits can be further apportioned to Australia and NSW based on the Proponent being 100% NSW owned, and company tax benefits (at a rate of 27.5%) accruing to NSW based on its population share i.e. 32%. On this basis, the net production benefits of the Project that accrue to Australia and NSW are estimated at $6 M and $4 M (present value at 7% discount rate), respectively.

The estimated net production benefits that accrue to Australia and NSW can be used as a minimum threshold value or reference value against which the relative value of the residual (net) environmental impacts of the Project, after mitigation, may be assessed. This threshold value is the opportunity cost to society of not proceeding with the Project. It is a minimum threshold value as it does not include any potential wage benefits, any potential benefits to suppliers, any allowance for real price rises for quarry product as future demand outstrips limited supply.

Provided the value of the residual environmental impacts of the Project, to Australian and NSW households, after mitigation, do not exceed the respective net production threshold values, then the Project will have net benefits to the Australian and NSW communities.

6.15.2.2 Environmental and Social Cost and Benefits

The EIA has qualitatively considered (where possible) the main environmental, cultural, and social impacts of the Project, as outlined in **Table 6.33**.

Table 6.33 Environmental and Social (externality) Impacts ($M present values at 7% discount rate)

	Australia	NSW
Benefits		
Wage benefits to quarry employment	Unquantified	
Economic benefits to existing landholders	Existing landowner to share quarry producer surplus via a royalty payment	
Economic benefits to suppliers	Unquantified	
Road Transport		
Reduced haulage cost	$34	$8
Reduced accident cost	$1	$1
Reduced GHG emissions	$0.006	$0.002
Reduced other externality cost	$1	$1
Sub-total	**$36**	**$10**
Quarry Externality Costs		
Greenhouse gas emissions (Scope 1)	$0.003	$0.001
Air Quality	Meets relevant criteria – no material residual impact	
Noise and Blasting	Meets relevant criteria – no material residual impact	
Surface Water	Opportunity cost of water use – $0.008 No adverse water quality impacts	
Groundwater	No Impact	
Biodiversity	Impacts to biodiversity are offset – cost of offsets are internalised as capital costs	
Aboriginal Heritage	No Impact	
Historic Heritage	No Impact	
Visual	No material residual impact	
Net Public Infrastructure Cost	No Impact (costs associated with increased road maintenance are covered by LRWF project development consent obligations)	
Loss of surplus to other industries	Loss of surplus to other quarries offset by reduced price to purchasers	
Sub-total	**$0.011**	**$0.009**
Net Benefits	**$36**	**$10**

As shown in **Table 6.33**, the environmental impacts of the Project are not material from an economic efficiency perspective, and the main potential impacts of the quarry are internalised into the production costs of the Project through mitigation measures, biodiversity offsets and payments for water. The positive impacts from reduced quarry haulage result in net externality benefits of $36M, present value to Australia and $10M present value to NSW.

The EIA indicates that overall, the Project is estimated to have a net social benefit to both Australia ($41M) and NSW ($14M) and is justified from an economic efficiency perspective. The EIA also notes that other residual environmental, cultural or social impacts that remain unquantified would need to be valued at

greater than approximately $41M and $14M for the Project to be questionable from an Australian and NSW economic efficiency perspective, respectively.

6.15.2.3 Sensitivity Analysis

The EIA notes that the Project is proposed solely to meet the identified demand for construction materials for the LRWF project, and this underpins the financial viability of the Project. There is some risk associated with the estimation of environmental, social, and cultural impacts of the Project and the level of mitigation measures proposed. However, it should be noted that impacts have generally been assessed based on the maximum annual levels of production and hence are likely to be overstated. Ongoing monitoring will ensure that appropriate mitigation measures are implemented as required.

A sensitivity analysis was undertaken to test the following variables at 4%, 7% and 10% discount rates:

- opportunity costs of land
- quarry capital costs
- quarry operating costs
- quarry revenue
- transport costs
- transport externality costs
- greenhouse gas emission costs
- surface water costs.

The sensitivity analysis indicates that the CBA results at the NSW level are most sensitive to reductions in the value of hard rock products and increases in operating costs but still returns positive financial benefits even under these scenarios. The LRWF project provides specific demand for hard rock products from the Project with the value of hard rock products from the Project determined contractually with the Tilt Renewables. Consequently, sustained reductions in the value of hard rock products from the Project will not occur. Operating cost estimates are based on a detailed financial model of the business operations prepared by the Proponent. The financial model draws on the Proponents experience in quarry operations at eight (8) different sites across NSW since 2018, as well as extensive experience in the resources sector over the last two decades. Consequently, sustained increases in modelled operating costs are unlikely.

The sensitivity analysis also indicated that the CBA results are not sensitive to changes in opportunity costs of land, capital costs, which includes mitigation, compensation, and offset costs. Since mitigation, offset and compensation costs are small components of the capital and operating costs of the Project, it is unlikely that large changes in these cost levels would have any significant impact on the CBA results. The CBA results are also not sensitive to the inclusion of global social damage costs of GHG emissions from the Project instead of the costs to NSW households only.

6.15.3 Local Effect Analysis

The local area is defined as the LGAs of Dubbo Regional, Mid-Western Regional, Warrumbungle Shire and Upper Hunter, within which the Project is located and is the region considered likely to be main source of labour and non-labour inputs for the Project.

The Project will provide six full time equivalent (FTE) direct quarry jobs, for approximately four years. Assuming that those that already reside in the local area would have otherwise been already employed and that job vacancies created by these people filling the Project jobs remain unfilled (i.e. no job chain effects), the incremental disposable wages accruing to the region from Project is $0.2M per annum. This is equivalent to two direct FTE jobs. This is a minimum estimate as it assumes full employment in the region and hence the jobs from which people come to fill the Project jobs remain vacant.

Standard regional economic impact assessment using Input-Output (IO) analysis, is not restricted to a focus on the existing labour force in the local area and does not assume an absence of job chain effects. In this framework, the Project is estimated to provide the following annual direct and indirect annual effects to the local economy:

- $31M in output
- $10M in value-added
- $4M in gross wages
- 51 jobs.

The subject land is used for sheep and cattle grazing. Some land will be temporarily unavailable for grazing during the Project while a small area will remain unavailable for grazing in perpetuity. The regional economic impact of this foregone grazing is immaterial.

Given the minimal workforce required to operate the Project there will be no observable impact on regional wages or demand for housing, local infrastructure and services.

6.15.4 Economic Management Measures

The construction and operation of the Project will have net positive impacts on the level of economic activity in the regional economy and reduce road transport impacts associated with supplying quarry materials to the LRWF project.

The Proponent proposes to work in partnership with the local Councils and the local community to help maximise the projected economic regional benefits whist minimising any impacts. In this respect, a range of general economic management measures will be implemented by the Proponent including:

- Employment of regional residents preferentially where they have the required skills and experience and can demonstrate a cultural fit with the organisation.
- Participating, as appropriate, in business group meetings, events or programs in the regional community.

- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive.
- Provision of community grants through various initiatives and programs within the local community, including the education, arts, sporting, and culture sectors.

6.16 Rehabilitation and Final Landform

The overarching objective for the rehabilitation of the Project Area is that the final landform is safe, stable and non-polluting having regard to the proposed end land use for the site and surrounding areas. The SEARs require the EIS to include:

- A detailed description of the proposed rehabilitation measures that would be undertaken throughout the development and during quarry closure.
- A detailed rehabilitation strategy, including justification for the proposed final landform and consideration of the objectives of any relevant strategic land use plans or policies.
- Potential impacts on landforms (topography), paying particular attention to the long-term geotechnical stability of any new landforms (such as overburden dumps, bunds etc).

6.16.1 Rehabilitation Strategy

The proposed rehabilitation strategy for the Project has been developed with regard to a number of key principles and includes:

- rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria
- nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies
- the potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region.

Rehabilitation of the Project will address the long-term stabilisation of both quarried and disturbed areas, including stabilisation of the quarry benches in the Main Pit and excavated slopes of the Borrow Pit and areas surrounding the quarry pits, with two final voids (Main Pit and Borrow Pit) to remain after closure.

Options for the post closure use of the land have been discussed with the landowner and this included full disclosure of potential constraints presented by the two remaining void areas. The agreed post closure management of these areas is detailed in **Section 3.2.5** and includes**:**

- A final void will remain in the Main Pit. Safety berms will be constructed around the perimeter of steep slopes of the void and may be fenced (to prevent inadvertent access by stock and humans), in consultation with the landowner. An access ramp will be retained to the pit benches and floor.
- The Borrow Pit will be reshaped to form a small farm dam with surrounding disturbed areas top-dressed with stockpiled topsoil and revegetated with pasture species.

- The landform outside of the Main Pit and Borrow Pit will be shaped to be free draining to the two voids and sediment basin.
- All infrastructure not required by the landowner for post-closure land use will be removed.

Options for use of the Main pit as a water storage are limited as, while it is expected to periodically hold water, formation of a permanent pit lake is considered unlikely due to the high pan evaporation rates and limited catchment area of the final void.

The proposed conceptual final landform is shown in **Figure 6.14**.

All final landform slopes (including retained highwalls) will be assessed for long term geotechnical stability having regard to the risk profile presented by the final landform and potential access to the site.

Due to the nature of the Project design (which is dictated by the geology of the resource), the location of processing and handling infrastructure, and relatively short-term nature of the operation (approximately 4 years), there are limited opportunities for progressive rehabilitation of the Project.

The ability to return the entire Project Area to a viable grazing paddock is limited due to the Main Pit void being entirely located withing the extent of the hard rock basalt deposit and the desire of the landowner for the Borrow Pit to be retained as an additional water storage dam for the rural property. Areas outside the extraction areas will be returned to grazing lands except where infrastructure is retained at the request of the land owner.

A conceptual final landform and life of operations rehabilitation management strategy relevant to achieving these land use outcomes will be detailed in the EMP, which will also contain a Quarry Closure Plan. Both the conceptual final landform in the EMP and the Quarry Closure Plan will be based on a final land use focused on promoting the re-establishment of grazing activities on the site consistent with landowners current rural/grazing land use.

The exact timing of individual rehabilitation works will be dependent upon on the completion of Project which will be dictated by the construction timetable of the LRWF project.

6.16.1.1 Relevant land use plans or policies

The conceptual end land use opportunities identified for the Project have been developed in consideration of the objectives of the Upper Hunter LEP 2013. As noted in **Section 4.0**, the Project Area is located on land zoned RU1 Primary Production. The objectives of the RU1 zone are:

To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.

- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To protect the agricultural value of rural land.
- To maintain the rural landscape character of the land in the long term.

- To ensure that development does not unreasonably increase demand for public services or public facilities.

- To ensure that development for the purposes of extractive industries, underground mines (other than surface works associated with underground mines) or open cut mines (other than open cut mines from the surface of the flood plain) will not;

(a) destroy or impair the agricultural production potential of the land or, in the case of underground mining, unreasonably restrict or otherwise affect any other development on the surface, or

(b) detrimentally affect the quantity, flow and quality of water in either subterranean or surface water systems, or

(c) visually intrude into its surroundings, except by way of suitable screening.

The proposed conceptual end land use is the revegetation of the processing and operations area to pasture, with endemic pasture species suited to growing in shallow soil environments and the retention of access to the void for emergency purposes, including accesses to the Borrow Pit water storage for water access purposes.

Rehabilitation of the Project will focus on re-establishing vegetation that is consistent with primary industry production within the constraints presented by the remaining voids. Opportunities to enhance vegetation within the retained voids are limited by the hard rock environment and lack of topsoils on the site, as well as the proposed use of the Borrow pit for water storage. The proposed water storage to be developed in the Borrow pit area will support the agricultural uses of the land.

6.16.1.2 Rehabilitation Objectives

The Quarry Closure Plan will describe the key requirements of final landform design, revegetation, water drainage and the future sustainability of the Quarry site. There are a number of key considerations to be taken into account in designing the rehabilitation objectives, including safety, legal requirements, key physical constraints (such as climate, location, topography, soils) and community and stakeholder input.

Based on the consideration of these factors, and in particular the location within land subject to existing intensive grazing, the rehabilitation objectives for the Project are:

- creation of a safe, stable and non-polluting landform

- decommissioning and removal of all surface infrastructure (unless retention is approved by the detailed closure planning process as agreed with the landowner)

- retention of two final voids which may develop pit lakes available for biodiversity and water use purposes

- retain vehicle access to the final voids for future use and emergency access purposes.

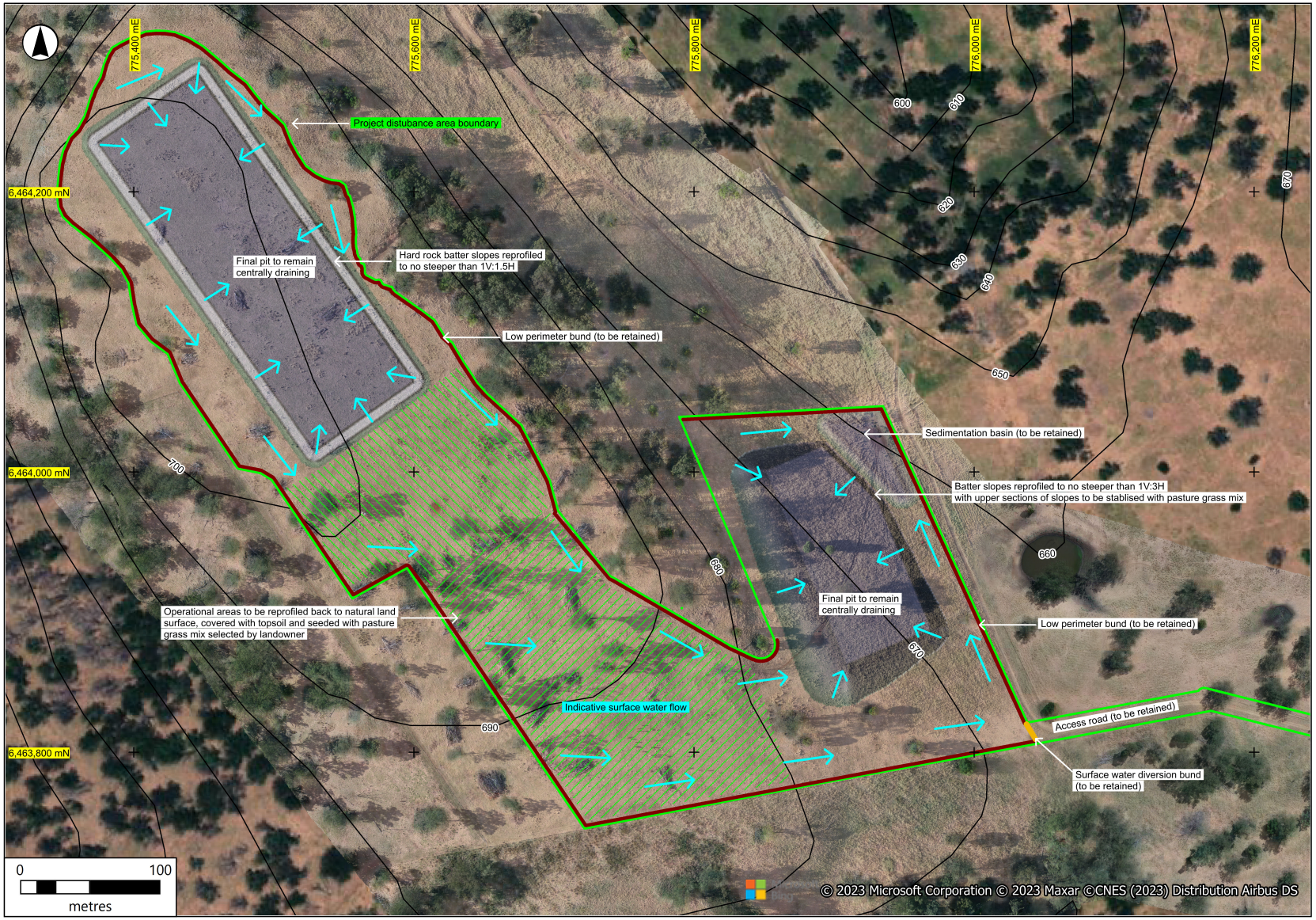


FIGURE 6.14

Conceptual Final Landform

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Image Source: Tilt (2023)

6.16.1.3 Proposed Rehabilitation Methodology

The total surface area available for rehabilitation at any one point in time will be limited due to the nature of extractive operations proposed, the progressive vertical expansion of the active quarry pits, stepped development of benches in the Main Pit and progressive extraction in 'cells' in the Borrow Pit. The Main Pit and ancillary areas will generally not become available for rehabilitation until active operations have fully exhausted resources in that area and ancillary areas for processing, stockpiling and laydown activities are not required. All disturbance associated with the Project will be contained with the proposed disturbance area.

At the end of the operational life, onsite infrastructure and associated facilities not required for the post-closure land use will be decommissioned and removed. Closure monitoring and maintenance works will continue until it can be demonstrated that all completion criteria have been achieved. Rehabilitation practices will be detailed in the EMP and will include the following key management measures to be implemented throughout the quarry establishment and operational stages:

- Quarry bench management – bench slopes in the Main Pit and extraction slopes in the Borrow Pit will be reprofiled to no steeper than 1V:1.5H and 1V:3H respectively to produce a safe and stable surface, exceeding the requirements for slope stability detailed in **Appendix 12** and **Appendix 13**.

- Topsoil management – topsoil material for rehabilitation will be sourced from soil stored on-site which has been stockpiled as part of the initial site preparation processes, although it is noted that the soil resource across the disturbance area is limited, and importation of additional material from other areas of the Project Site may be required at the time of rehabilitation. Where practicable, any mulched vegetation will also be included to promote on-site growth medium availability. Prior to use for rehabilitation purposes, topsoil material will be analysed at a National Associated of Testing Authority (NATA) registered laboratory to determine the application requirements for any soil ameliorants, if necessary.

- Habitat enhancement – while proposed tree clearing is very limited, the salvage of any hollow bearing trees, hollow logs, and fallen timber will be undertaken, where practical, during the vegetation clearing process. These resources will be stockpiled within the operations area along with topsoil stockpiles, with both being spread across flatter areas of the shaped landform once complete. The relocation of these habitat resources into post-quarrying rehabilitation areas is aimed at increasing habitat complexity, in order to make these areas more habitable for native species.

- Weed and pest management – Weed and pest species may be inadvertently introduced to the quarry through vehicle movements or could invade naturally into disturbed areas following the removal of cover crop and other vegetation. Weed and pest management strategies will be detailed in the EMP to ensure populations are appropriately controlled throughout the life of the quarry.

- Revegetation – A major issue to be considered in the revegetation of the surrounding processing / operational areas is the shallow rock underlying the entire site. Topsoil and substrate depth and/or the ability of plant root systems to penetrate the subsoil is crucial to ensure plant survival, to allow access to water and support for root systems. If the roots of planted vegetation cannot reach sufficient depth, they may be susceptible to toppling as they age. Revegetation of the site processing / operational areas with shallow soil material (e.g. outcrop areas or shallow rock) will require scarifying of any compacted surfaces, spread of stockpiled topsoil and importation of soil if required, prior to the spread of an appropriate pasture grass species mix in consultation with the landowner.

6.16.1.4 Monitoring and Completion Criteria

The scope of the rehabilitation monitoring program will be detailed within the Quarry Closure Plan and in the EMP. The rehabilitation monitoring program will define responsibilities, record keeping requirements, inspection requirements and timing and include an annual rehabilitation monitoring program, which will be linked to Trigger Action Response Plans (TARPs) contained within the quarry EMP.

The key objectives of rehabilitation monitoring will be to:

- include regular inspections of rehabilitated areas
- assess progression towards the rehabilitation objectives of the Project
- inform the timely implementation of TARPS which cover unexpected deviations from the expected successional pathways in rehabilitation areas.

Preliminary completion criteria will be used to demonstrate achievement of rehabilitation objectives and performance standards as outlined in **Table 6.35**.

Table 6.34 Preliminary Closure and Rehabilitation Completion Criteria

Aspect	Preliminary Completion Criteria
Decommissioning	Removal of all infrastructure that does not have a potential post-quarrying use
Decommissioning	All demolition work has been undertaken in accordance with AS2601-2001: The Demolition of Structures, or its latest version
Decommissioning	Implementation of appropriate security measures to minimise the potential for unauthorised access during the transition period to the intended final land use
Landform	No significant erosion is present that would constitute a safety or water quality issue
Landform	Contour banks are stable and there is no evidence of overtopping or significant scouring as a result of runoff
Landform	Surface is free of any hazardous materials and any contaminated soil material has been removed and/or remediated
Landform	Landform survey confirms constructed landform is generally in accordance with the approved landform design, including heights detailed in the relevant approval documentation
Landform	Rehabilitated areas are designed to be free draining (excluding the catchment areas of final voids)
Water	Runoff and discharge water quality complies with any documented EPL requirements
Vegetation	Revegetation areas contain flora species assemblages suitable for grazing uses
Vegetation	There is no significant weed infestation, such that weed presence on site is not materially different to surrounding grazing land
Vegetation	More than 75% of revegetation is healthy and growing as indicated by rehabilitation monitoring

Dependent upon the outcomes of the rehabilitation monitoring, the scope of post-closure rehabilitation care and maintenance activities will include the following:

- weed control
- erosion and sediment control
- revegetation (direct planting and/or reseeding) of rehabilitation areas that may have failed or not achieve desired species density
- maintenance fertilising as required
- watering/irrigation as required
- repair of fence lines, safety measures, access tracks and other general related land management activities.

7.0 Project Justification

This section provides a conclusion to the EIS. It includes discussion of the justification for the Project, taking into consideration the associated environmental and social impacts and the suitability of the site, to assist the consent authority to determine if the Project is in the public interest.

7.1 Environmental, Social and Economic Impacts

The Project supports the current strategic direction of the NSW and Australian governments in the transition to renewable energy. The environmental, cultural, social, and economic impacts of the Project have been identified and were subject to a detailed environmental assessment based on:

- assessment of the site characteristics (existing environment)
- focused consultation with relevant stakeholders
- environmental and social assessment
- application of the principles of Ecologically Sustainable Development (ESD), including the precautionary principle, intergenerational equity, conservation of biological diversity and valuation and pricing of resources
- expert technical assessment.

The key issues associated with the Project were subject to comprehensive specialist assessment to identify the potential impacts of the Project on the existing environment and community. These assessments are detailed in **Section 6.0** and the appendices to this EIS.

As outlined in **Section 6.0**, the potential environmental, cultural and social impacts associated with the Project can be appropriately managed through the implementation of appropriate management, mitigation and monitoring measures. A consolidated list of the proposed management and mitigation measures is provided in **Appendix 4**.

The impacts of the Project have been kept to a minimum through:

- identification of the key issues and impacts through scientific evaluation and stakeholder engagement
- detailed Project planning considering the environmental and social constraints of the locality and investigation of various Project alternatives
- active engagement with key stakeholders, including proximal landholders and interested stakeholders within the locality, to identify key concerns and issues and to allow these to be considered in the Project design process
- a commitment to proactive and appropriate strategies to avoid, minimise, mitigate, offset or manage a range of potential environmental and social impacts (refer to **Section 6.0** and **Appendix 4**).

The detailed impact assessment undertaken concludes that with the implementation of appropriate management and mitigation measures, the Project can proceed.

7.2 Justification for the Project

NSW is currently experiencing significant public infrastructure development (government spending on roads, rail, ports, schools, housing and hospitals), and private investment (commercial and industrial development and residential construction) due to population growth and associated planned infrastructure development. This short- to medium-term construction demand is driving significant supply-side pressure for high quality quarry products across the State. These supply issues are currently resulting in cost and delivery time pressures on projects, with a flow on of negative productivity and inflationary pressures to the broader local and regional economies. Specifically in relation the Region associated with the Project, the significant infrastructure development required for the establishment of the Central West Orana Renewable Energy Zone (CWO REZ) and associated renewable energy projects will create further supply-side pressures unless alternate quarry resources can be located and developed.

The objective of the Project is to provide quarry material for the approved LRWF project. The Proponent has undertaken detailed site geological investigations which have identified a hard rock resource within the LRWF project area capable of supplying a range of in-specification quarry products required for the construction of the public road upgrades/repairs, internal road network, hardstand areas, turbine footings and other associated works.

There are significant benefits to the LRWF project and the surrounding community associated with sourcing quarry materials in proximity to the LRWF project, primarily associated with the reduction in haul distances. These benefits also extend to other developments in the broader region, in that the Project will reduce demand for quarry products sourced from other existing quarries.

7.3 Suitability of the Site

A detailed opportunities and constraints assessment was undertaken by the Proponent determined that the vast majority of the LRWF project area and the surrounding area is not suited to the production of quarry materials for the LRWF project. This is due to the very deeply weathered basalt soils and limited exposure of competent rock close to surface in other locations suitable for construction of the LRWF project.

From a geological and topographic perspective, the Project Area is an ideal location for sourcing the optimum mix of raw materials required to produce high quality quarry products, that can be viably extracted while minimising the extent of surface disturbance. In addition, the close proximity of the Project to the areas where quarry product is required for the LRWF project, its relative isolation from any sensitive receivers and the opportunity to utilise a suitable resource within an existing highly disturbed environment with good road access, means that potential impacts the Project can be minimised, as would the haul distance for supply of materials to the LRWF project.

As outlined in **Section 6.0**, the potential environmental, cultural and social impacts associated with the Project can be appropriately managed through the implementation of appropriate management, mitigation and monitoring measures.

7.4 Ecologically Sustainable Development

An objective of the EP&A Act is to encourage ecologically sustainable development (ESD) within NSW. This section provides an assessment of the Project in relation to the principles of ESD.

To justify the Project with regard to the principles of ESD, the benefits of the Project in an environmental and socio-economic context should outweigh any negative impacts. The principles of ESD encompass the following:

- the precautionary principle
- inter-generational equity
- conservation of biological diversity, and
- valuation and pricing of resources.

Essentially, ESD requires that current and future generations should live in an environment that is of the same or improved quality than the one that is inherited.

7.4.1 The Precautionary Principle

The EP&A Regulation defines the precautionary principle as:

'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options.'

In order to achieve a level of scientific certainty in relation to the potential impacts associated with the Project, this EIS has undertaken an extensive evaluation of all the key components of the Project. Detailed assessment of all key issues and necessary management procedures has been conducted and is comprehensively documented in this EIS.

The Proponent has undertaken careful evaluation as part of siting the Project to avoid, where possible, irreversible damage to the environment. The preparation of this EIS has involved a detailed analysis of the existing environment (refer to **Section 2.0** and **Section 6.0**), and the use of engineering and scientific modelling (where appropriate) to assess and determine potential impacts as a result of the Project. Specialist studies were undertaken to provide accurate information to assist with the evaluation and development of the Project.

The BDAR prepared for the Project (**Appendix 9**) includes specific consideration of serious and irreversible impacts on biodiversity values and concludes that the Project is unlikely to have serious or irreversible impact on any threatened species or communities, particularly when mitigation and offset measures are taken into consideration. The Project design, together with the implementation of the proposed mitigation and management measures (refer to **Appendix 4**) incorporates precautionary elements and will ensure that the Project does not result in serious or irreversible impacts to the environment.

The decision making process for the design, impact assessment and development of management processes has been transparent in the following respects:

- Government authorities, landholders potentially affected by the Project and the local community, were extensively consulted during EIS preparation (refer to **Section 5.0** and **Appendix 15**). This enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures.

- The community has been comprehensively engaged throughout the development and assessment of the Project (through integration with the LRWF project and separately as standalone project) through a range of mechanisms to inform the assessment process and the development of proposed management measures, which provided stakeholders with both information and the opportunity to influence Project outcomes.

The Proponent will develop and implement an EMP, which will implement best practice management and will incorporate all identified mitigation and management measures identified in this EIS. Additionally, the Project will be subject to an independent auditing and verification process consistent with relevant requirements for SSD projects. The EMP will incorporate the additional controls committed to in this EIS (refer to **Appendix 4**).

7.4.2 Intergenerational Equity

The EP&A Regulation defines the principal of intergenerational equity as:

'that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.'

Intergenerational equity refers to equality between generations. It requires that the needs and requirements of today's generations do not compromise the needs and requirements of future generations in terms of health, biodiversity and productivity.

The Project is consistent with the principle of intergenerational equity in that the benefits provided by the Project to either the current generation or future generations are not at the expense of either.

The benefits provided by the Project relate to both the reduction in impact (particularly traffic impacts) associated with the approved LRWF project (which has a benefit to the present generation in the local and broader area relative to existing approved operations) and to facilitate the construction of the LRWF project which will serve future generations. There are also economic benefits to the local community, which assist the present generation but also support the continued economic development of the local region and State which will benefit future generations.

In particular, the Project will:

- provide a local, secure supply of high-quality quarry products to support the construction of the LRWF project and assist with the strategic direction of the NSW and Australian governments approach transition to renewable energy

- conduct quarrying activities using industry best-practices to protect the environmental, social and cultural values of the area

- reduce traffic movements associated with the approved LRWF project from the broader local and regional road network, with associated benefits in terms of improvements to road safety and community amenity
- improve the financial viability of the LRWF project, by placing downward pressure on construction costs, with flow on effects benefitting end consumers of electricity.
- a range of environmental management and mitigation measures (summarised in **Appendix 4**) have been developed and evaluated to minimise the impact on the environment as far as practicable. The design of the Project and commitment to the management of environmental issues as outlined in this EIS will maintain the health, diversity and productivity of the environment for future generations.

7.4.3 Conservation of Biological Diversity and Ecological Integrity

The EP&A Regulation identifies that the principle of conservation of biological diversity and ecological integrity should be a fundamental consideration in the decision-making process. The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them. All environmental components, ecosystems and habitat values potentially affected by the Project are described in this EIS (refer to **Section 6.6**) and measures to ameliorate any negative impacts are outlined in **Appendix 4** and **Appendix 9**). The NSW biodiversity offsetting scheme established under the *Biodiversity Conservation Act 2016* is specifically designed to ensure the conservation of biological diversity and ecological integrity.

The conceptual layout has been developed to maximise the use of existing disturbed areas and avoid and minimise impact to identified biodiversity. Following the application of avoidance and mitigation measures, the BAM assessment has identified the biodiversity credit requirement to offset the impacts of the residual impacts of the Project and the required management and mitigation measures to be implemented. The principle of Conservation of Biological Diversity is therefore considered to be satisfied.

7.4.4 Improved Valuation and Pricing of Environmental Resources

The goal of improved valuation of natural capital has been included in Agenda 21 of Australia's Intergovernmental Agreement on the Environment. The principle has been defined in the EP&A Regulation as:

'that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems'.

The environmental consequences of the Project have been assessed in this EIS (refer to **Section 6.0**) and mitigation measures (including offsetting requirements) identified for factors with potential for adverse impact (**Appendix 4**). Implementing the mitigation measures would impose an economic cost on the proponent, increasing both the capital and operating costs of the Project. This signifies those environmental resources have been given appropriate valuation.

- The Project has been designed with the objective of minimising potential impacts on the receiving environment. This indicates that the design for the Project has been developed with an environmental objective in mind.

- The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in **Appendix 4** provide an auditable environmental management commitment to these parameters. The Project would be considered ecologically sustainable, due to the social, economic and environmental benefits identified in **Section 6.14** and **Section 6.15** and the mitigation measures put in place to protect from adverse impacts on the environment.

7.5 Conclusion

As outlined in **Section 7.4**, the Project has been assessed against the principles of ecologically sustainable development as required by the EP&A Act and EP&A Regulation. This assessment has indicated that while the Project would have impacts, these impacts can be effectively managed, mitigated and offset. In particular the Project will provide significant social and environmental benefits in terms of reduced road haulage impacts on the broader road network relative to the Project not proceeding. As noted above, these benefits are achieved with relatively minor adverse social and environmental impacts.

The Project is estimated to provide the following annual direct and indirect annual effects to the local economy:

- $31M in output
- $10M in value-added
- $4M in gross wages
- 51 jobs.

The Economic Impact Assessment indicates that overall, the Project is estimated to have a net benefit to both Australia and NSW and is justified from an economic efficiency perspective.

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