APPENDIX 5
EIS and Appendices

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REGIONAL GROUP

BERAKEE QUARRY EXTENSION

Environmental Impact Statement

FINAL

January 2021

BERAKEE QUARRY EXTENSION

Environmental Impact Statement

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Regional Hardrock Gilgandra Unit Trust

Project Director:	Alex Irwin
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Report No.	20112/R02
Date:	January 2021

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Alex Irwin	8 January 2021	Alex Irwin	20 January 2021

Executive Summary

This Environmental Impact Statement (EIS) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Regional Hardrock Gilgandra Unit Trust (the Proponent) to support an application to Gilgandra Shire Council for an expansion to operations at the Berakee Quarry (the Quarry). The Quarry is located on Lot 1 DP1265657 (2697 Oxley Highway), approximately 10 km south-east of Collie and 30 km south-west of Gilgandra within the Gilgandra Local Government Area (LGA). Access to the Quarry site is via a Private Haul Road which traverses Lot 2 DP1265657 (under contractual agreement with the landowner) and Lot 52 DP43558 (under a Right of Carriageway over that Property).

The Quarry currently operates under development consent DA 2017/218 issued by Gilgandra Shire Council for non-designated development and is limited to a disturbance footprint of 2 hectares (ha) and annual production of up to 30,000 m^3 (equivalent to 80,000 tonnes (t)).

The Proponent is making an application for designated development and is seeking to expand quarrying operations as follows.

- Extraction of tertiary-aged basalt (up to 4.7 million tonnes (Mt)) using drill and blast methods over two stages:
    - Stage 1 – 2.3 Mt over 5 years at a production rate of up to 490,000 tpa to supply hard rock materials to the Inland Rail Project
    - Stage 2 – 2.4 Mt over 20 years at a production rate of between 80,000 to 120,000 tpa to supply hard rock products to local markets

    The extraction area would be increased from 1.5 to 8.4 ha.
- Campaign crushing and screening to produce basalt aggregates and construction materials for road base, road sheeting, infrastructure construction, rail ballast and concrete manufacture.

    The processing and stockpiling area would increase from 0.5 to 7.8 ha.
- transportation of material from the Quarry to customer sites
- ancillary activities including stockpiling areas (sufficient to hold up to 250,000 t of product) and surface water controls.
    - The proposed Quarry Expansion Project (the Project) requires an increase in the total disturbance footprint from 2 to 17 ha.

The Project has been designed in such a manner that the increase in production and disturbance area can be undertaken with minimal additional impact on the local environment and setting. The following provides an overview of the environmental impacts of the proposed modification after the implementation of all reasonable and feasible mitigation and management measures.

Traffic and Transport

The proposed increase in production would result in an increase in the number of trucks travelling to and from the Quarry. Modelling of the Private Haul Road – Oxley Highway intersection confirmed there would be no change to the Level of Service of this intersection, remaining at the highest level. A review of turn warrants (of Austroads) confirmed the intersection, as constructed, as suitable for the proposed level of traffic. Mid-block assessment of the Oxley Highway confirmed this would retain the highest Level of Service also.

The intersection of the Private Haul Road – Oxley Highway is located with excellent sight distance in both directions and no traffic crashes have been reported on this section of highway since 2014.

Noise

Noise modelling was undertaken for both construction and operating scenarios considering, as well as a traffic noise scenario. Notably, these scenarios considered all nominated noise generating equipment to be operating concurrently at locations as close to surrounding receivers as could occur.

The closest residential receivers were considered with the predicted noise level being well below the Project Noise Trigger Levels (PNTLs) (for construction and operating scenarios) and the day and night road traffic noise criteria for arterial roads. A comparison of the existing and future traffic levels on the Oxley Highway also confirmed that the change in noise levels is not anticipated to increase by more than 2 dB at the assessed residential receivers.

Blasting

The air overpressure and ground vibration associated with blasting was modelled for blasts of up to 20,000 t in size. The modelling confirmed compliance with the relevant noise and vibration criteria would be achieved subject to the implementation of appropriate blast controls.

Air Quality

Emission rates were estimated and applied in a dispersion model to predict the potential for air quality impacts. This assessment predicted that:

- the EPA's impact assessment criteria for annually averaged TSP and deposited dust would be met,
- there would be a negligible (less than 1%) increases in annually averaged PM_{10} and $PM_{2.5}$ concentrations at surrounding sensitive receivers, with background concentrations noted to already exceed criteria, and
- there would be no additional days where $PM_{2.5}$ concentrations exceeded the EPA's impact assessment criterion at the closest receivers to the Project Site. An additional exceedance of the maximum 24-hour average PM_{10} criterion at a single receiver was identified as principally due to an elevated background concentration rather than the contribution of the Project.

Surface Water Resources

Updates to the Quarry Soil and Water Management Plan would be required following approval of the Project (to accommodate the increased disturbance area and production rate), however, the implementation of best practice measures should prevent any discharge of polluted water from the Quarry site.

The Quarry site water balance was reviewed in light of the modified production rate and site layout. The water balance confirmed that water harvested from rainfall runoff would have to be supplemented by groundwater. The water balance also confirmed that no controlled discharges of water from the Quarry site with spills from the Quarry sediment basin only occurring in accordance with the guiding principles of the 'Blue Book' (Managing Urban Stormwater: Soils and Construction).

Groundwater Resources

Through a review of groundwater bore databases maintained by WaterNSW and a review of drilling data completed in 2017 and 2020/2021 the local groundwater table has been determined to be below the maximum depth of extraction. Groundwater will be required to supplement surface water for the purpose of dust suppression with this to be extracted from a new bore currently being drilled on the Quarry site.

Extraction of water from this bore would only follow issue of approval for use of this water for industrial purpose and obtainment of a Water Access Licence and sufficient allocation.

No significant impact on the groundwater table, other groundwater users or groundwater dependent ecosystems is anticipated. This notwithstanding, the Applicant would monitor for the possible inflow of groundwater and if observed would modify operations such that interaction with the groundwater table is avoided until such time as appropriate supplementary assessment is completed and approval obtained.

Biodiversity

The vegetation within the Quarry Site is highly modified and contains very little native vegetation or habitat features for threatened fauna species. Assessments of Significance were conducted for four species considered as potentially using the Quarry Site under both the BC Act and the EPBC Act with significant impacts to these species assessed as unlikely.

The Project will not impact on any land mapped as having biodiversity values and will only remove 0.8 ha of native vegetation. The Biodiversity Offset Scheme (BOS) is therefore not triggered and no further consideration of the Biodiversity Assessment Method (BAM) is required.

Cultural Heritage

No impacts on Aboriginal or non-Aboriginal heritage are anticipated as a result of the proposed Quarry expansion.

Visual Amenity

Minimal change to the visibility of the Quarry is anticipated as a result, the impact of the proposed Quarry expansion on local visual amenity is assessed to be acceptable.

Land and Agricultural Resources

The Quarry currently co-exists with surrounding agricultural activities without adverse effect and no change is predicted as a result of the proposed Quarry expansion.

Socio-economic Impacts

With the implementation of controls to manage noise, air quality and traffic impacts, the Project would be unlikely to result in any additional adverse impacts on the local socio-economic setting. On balance, the Project would provide for ongoing benefits to the local economy.

The Project addresses the objects and relevant clauses of the *Environmental Planning & Assessment Act 1979* (EP&A Act) and principles of Ecologically Sustainable Development. As an existing quarry development, the site is considered suitable for the scale of modification proposed and on balance it is assessed that the proposed modification could be undertaken in a manner that would satisfy all relevant statutory goals and criteria, environmental objectives and reasonable community expectations.

Declaration

EIS prepared by:	
Name:	Alex Irwin Principal Environmental Consultant
Qualifications:	Bachelor of Science (Hons) University of New South Wales
Address:	Umwelt (Australia) Pty Limited Office 4, 3 Hampden Avenue ORANGE NSW 2800
In respect of:	Berakee Quarry Expansion as described in the accompanying Environmental Impact Statement.
Applicant Name:	Regional Hardrock Gilgandra Unit Trust
Applicant Address:	PO Box 404 Dubbo NSW 2830
Land to be developed:	2697 Oxley Highway, Collie
Proposed Development:	Berakee Quarry Expansion
Environmental Impact Statement:	An Environmental Impact Statement is attached.
Certification:	I declare that: • the statement has been prepared in accordance with the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, • the statement contains all available information that is relevant to the environmental assessment of the development to which the statement relates; and • the information contained in the statement is neither false nor misleading.
Signature:	
Name:	Alex Irwin
Date:	21 January 2021

Table of Contents

Executive Summary i

Declaration iv

1.0 Introduction 1

1.1 Project Overview 1
1.2 Project Objectives 4
1.3 Quarry History 4
1.4 Project Justification 4
1.5 EIS Structure 5
1.6 Proponent Details 6
1.7 Management of Investigations 7

2.0 Site Description 8

2.1 Property Description and Ownership 8
2.2 Climate 10
2.2.1 Climate Statistics 10
2.2.2 Temperature 10
2.2.3 Rainfall and Evaporation 11
2.2.4 Wind Data 11
2.3 Landscape, Soil, Land Capability and Agricultural Resources 11
2.3.1 Landscape 11
2.3.2 Topography/Landforms 13
2.3.3 Soils 13
2.3.4 Land Capability 15
2.4 Water Resources 16
2.4.1 Surface Water 16
2.4.2 Groundwater 18
2.5 Biodiversity 18

3.0 Project Description 21

3.1 Summary 21
3.2 Project Staging 23
3.3 Site Establishment 23
3.3.1 Survey and Mark Out 23
3.3.2 Clearing of Vegetation 25
3.3.3 Soil Stripping and Stockpiling 25
3.3.4 Quarry Entrance, Access Roads and Hardstand Establishment 25
3.4 Operations 27
3.4.1 Resource 27

3.4.2 Extraction Area Design 27
3.4.3 Overburden Management 27
3.4.4 Drill and Blast Operations 28
3.4.5 Extraction Campaigns 28
3.4.6 Extraction Limit Monitoring and Reporting 29
3.5 Processing Operations 29
3.6 Stockpile Management 30
3.7 Site Access and Transportation 30
3.8 Site Amenities and Services 31
3.8.1 Amenities 31
3.8.2 Services 31
3.9 Water Management 31
3.9.1 Water Requirements 31
3.9.2 Water Sources 32
3.9.3 Erosion and Sediment Control 32
3.9.4 Groundwater Management 33
3.10 Waste Management 33
3.10.1 Production Waste 33
3.10.2 Non-Production Waste 33
3.11 Hours of Operation 34
3.12 Employment and Economic Contribution 34
3.12.1 Employment 34
3.12.2 Economic Contribution 35
3.13 Site Decommissioning and Rehabilitation 35
3.13.1 Final Land Use and Conceptual Landform 36
3.13.2 Land Use and Rehabilitation Objectives 37
3.13.3 Rehabilitation Methods and Procedures 39
3.14 Alternatives Considered 41
4.0 Issue Identification and Prioritisation 43
4.1 Issue Identification 43
4.1.1 Approach 43
4.1.2 Stakeholder Engagement 43
4.1.3 Strategic and Statutory Context 53
4.1.4 Environmental Performance 59
4.2 Issue Prioritisation 60
5.0 Environmental Impact Assessment 63
5.1 Traffic 63
5.1.1 Introduction 63
5.1.2 Local Setting 63

5.1.3 Assessment Methodology 65
5.1.4 Predicted Changes to Traffic Environment 66
5.1.5 Operational Safeguards and Management Measures 66
5.1.6 Assessment of Impacts 67
5.1.7 Conclusion 69
5.2 Noise and Vibration 69
5.2.1 Introduction 69
5.2.2 Existing Environment 70
5.2.3 Assessment Criteria 71
5.2.4 Assessment Methodology 74
5.2.5 Controls, Safeguards and Management Measures 76
5.2.6 Assessment of Impacts 78
5.3 Air Quality 80
5.3.1 Introduction 80
5.3.2 Existing Environment 80
5.3.3 Air Quality Criteria 82
5.3.4 Assessment Methodology 82
5.3.5 Air Quality Management 84
5.3.6 Impact Assessment 85
5.4 Surface Water 89
5.4.1 Local Setting 89
5.4.2 Regulatory Framework 90
5.4.3 Potential Surface Water Impacts 92
5.4.4 Management Measures and Operational Controls 93
5.4.5 Site Water Balance 102
5.4.6 Impact Assessment 104
5.5 Groundwater 105
5.5.1 Introduction 105
5.5.2 Local Setting 105
5.5.3 Groundwater Management 108
5.5.4 Assessment of Impact 109
5.6 Biodiversity 111
5.6.1 Introduction 111
5.6.2 Assessment Methodology 111
5.6.3 Local Setting 112
5.6.4 Impact Avoidance, Minimisation and Mitigation Measures 112
5.6.5 Assessment of Impacts 114
5.7 Aboriginal Cultural Heritage 115
5.7.1 Introduction 115
5.7.2 Local Setting and Existing Environment 115

5.7.3 Assessment Methodology and Results 116
5.7.4 Assessed Significance of the Recorded Site 117
5.7.5 Management Measures 118
5.8 Historic Heritage 118
5.8.1 Introduction 118
5.8.2 Local Setting 118
5.8.3 Assessment of Impacts 118
5.9 Land Resources 119
5.9.1 Introduction 119
5.9.2 Local Setting 119
5.9.3 Management Issues and Constraints 119
5.9.4 Design Features, Management Measures and Operational Controls 120
5.9.5 Assessment of Impact 123
5.10 Land Use and Agricultural Resources 124
5.10.1 Introduction 124
5.10.2 Local Setting 124
5.10.3 Management Issues and Constraints 126
5.10.4 Management and Mitigation 126
5.10.5 Assessment of Impact 127
5.11 Visual Amenity 127
5.11.1 Scope 127
5.11.2 Existing Environment 127
5.11.3 Changes to Visibility 128
5.11.4 Visual Impact Management 128
5.11.5 Assessment of Impacts 129
5.12 Hazards 130
5.12.1 Scope 130
5.12.2 Transport, Storage and Handling of Hazardous/Dangerous Goods 130
5.12.3 Bush Fire Hazard 132
5.13 Socio-Economic Setting 134
5.13.1 Introduction 134
5.13.2 The Existing Socio-Economic Setting 134
5.13.3 Significance of the Resource 135
5.13.4 Potential Impacts of the Project on the Socio-Economic Setting 135
5.13.5 Commitments and Contributions 135
5.13.6 Assessments of Impacts 136
6.0 Summary of Commitments 138

7.0 Evaluation, Justification and Conclusion 141
7.1 Introduction 141
7.2 Evaluation 141
7.2.1 Residual Environmental Impacts 141
7.2.2 Ecologically Sustainable Development 141
7.2.3 Environmental Planning & Assessment Act 1979 Considerations 143
7.3 Justification 144
7.3.1 Economic Contributions 144
7.3.2 Suitability of the Site 145
7.3.3 Consideration of Alternatives 145
7.3.4 Benefits of the Project 145
7.3.5 Consequences of Not Proceeding 146
7.4 Conclusion 146
8.0 References 147

Figures

Figure 1.1 Locality Plan 2
Figure 1.2 Local Setting 3
Figure 2.1 Land Ownership 9
Figure 2.2 Geology 12
Figure 2.3 Soils, Land Capability and BSAL 14
Figure 2.4 Catchment Context 17
Figure 2.5 Biodiversity Values and Regulated Land Mapping 19
Figure 3.1 Quarry Site Layout 24
Figure 3.2 Private Haul Road Formation 26
Figure 3.3 Conceptual Final Landform and Land Use 38
Figure 5.1 School Bus Services 65
Figure 5.2 Project Traffic and AustRoads Traffic Warrants 68
Figure 5.3 Existing Water Management System and Catchments 94
Figure 5.4 Operational Water Management System Plan 96
Figure 5.5 Operational Water Management System Schematic 97
Figure 5.6 Groundwater Bores 107
Figure 5.7 Plant Community Types and Habitat Features 113
Figure 5.8 Central West Orana Renewable Energy Zone 125

Plates

Plate 2.1 View of Calf Pen Creek upstream (east) of the Private Haul Road 16
Plate 2.2 View of Calf Pen Creek downstream (west) of the Private Haul Road 18
Plate 5.1 Scarred Tree 117
Plate 5.2 View (South) to Receiver R2 129

Tables

Table 1.1	Format of the EIS	5
Table 1.2	Proponent Details	6
Table 2.1	Land Ownership	8
Table 2.2	Climate Statistics	10
Table 2.3	Quarry Site Soil Properties	13
Table 3.1	Project Parameters	21
Table 3.2	Indicative Blast Design Parameters	28
Table 3.3	Stage 1 Vehicle Movements	31
Table 3.4	Non-Production Waste Management	33
Table 3.5	Proposed Hours of Operation	34
Table 3.6	Alternatives Considered	41
Table 4.1	Community Consultation	44
Table 4.2	Coverage of SEARs	45
Table 4.3	Agency Issues and Coverage	49
Table 4.4	Gilgandra Shire Council raised Issues and Coverage	52
Table 4.5	Section 4.15(1) Matters for Consideration	54
Table 4.6	Summary of Other State Legislation	56
Table 4.7	Extractive Industries in Rural Zones – DCP Matters for Consideration	59
Table 4.8	Summary of Potential Adverse Impacts Resulting from the Proposed Modification	60
Table 5.1	Intersection Performance	67
Table 5.2	Mid-block Assessment	69
Table 5.3	Project Amenity Noise Levels – Rural Noise Amenity Area	71
Table 5.4	Project Noise Trigger Levels $L_{Aeq(15\ minute)}$ dB(A)	72
Table 5.5	Road Traffic Noise Criteria	73
Table 5.6	Noise Management Levels (NML)	73
Table 5.7	Modelled Site Specific Meteorological Parameters	75
Table 5.8	Construction Equipment	75
Table 5.9	Predicted Operational Noise Levels	78
Table 5.10	Road Traffic Noise – Residential Receivers	79
Table 5.11	Annual Meteorological Statistics	80
Table 5.12	Nearby Air Quality Monitoring Stations	81
Table 5.13	Data Capture Rates for DPIE Monitoring Stations	81
Table 5.14	NSW EPA Impact Assessment Criteria for Key Emissions	82
Table 5.15	Estimated Emissions to Air	83
Table 5.16	Dust management measures	84
Table 5.17	Predicted Annual Average PM_{10} Concentration	85
Table 5.18	Review of change in number of days with PM_{10} concentrations exceeding 50 (µg/m^3)	86
Table 5.19	Predicted Annual Average $PM_{2.5}$ Concentration	86
Table 5.20	Review of change in number of days with PM2.5 concentrations exceeding 25 (µg/m^3)	87
Table 5.21	Predicted Annual Average TSP Concentration	88
Table 5.22	Predicted Annual Average Deposited Dust	88
Table 5.23	NSW Water Quality Objectives	89
Table 5.24	EPL 21093 Conditions relating to Water Management	91
Table 5.25	Limitations to Land Disturbance	98
Table 5.26	Water Quality Discharge Criteria and Monitoring Requirements – Point 1 (EPL 21093)	100
Table 5.27	Gross Water Balance Results – Stage 1	103
Table 5.28	Median Year Net Water Balance	103
Table 5.29	Water Import Demands	103

Table 5.30	Detention Basin Discharge Volumes for SD-1	104
Table 5.31	Detention Basin Discharge Frequency for SD-1	104
Table 5.32	Groundwater Bores	108
Table 5.33	Database Search Results	116
Table 5.34	Land Use Conflict Risk Assessment – Key Steps	127
Table 5.35	Bushfire Hazard – Activities and Controls	133
Table 6.1	Summary of Environmental Management Commitments	138
Table 7.1	Objects of the EP&A Act	143

Appendices

Appendix 1	Existing Approvals for Berakee Quarry
Appendix 2	Secretary's Environmental Assessment Requirements
Appendix 3	Community Information Sheet
Appendix 4	Standard Drawings
Appendix 5	Traffic Impact Assessment
Appendix 6	Noise and Vibration Impact Assessment
Appendix 7	Air Quality Impact Assessment
Appendix 8	Biodiversity Assessment
Appendix 9	Aboriginal Cultural Heritage Assessment
Appendix 10	Groundwater Bore Works Summaries

1.0 Introduction

1.1 Project Overview

Berakee Quarry (the Quarry) is located approximately 10 kilometres (km) south-east of Collie and 30 km south-west of Gilgandra near the Gilgandra-Warren Shire boundary (refer to **Figure 1.1**). The Quarry, owned and operated by Regional Hardrock Gilgandra Unit Trust (Regional Hardrock) currently operates under development consent DA 2017/218 issued by Gilgandra Shire Council for non-designated development (refer to **Appendix 1**). The Quarry is currently limited to a disturbance footprint of 2 hectares (ha) and annual production of up to 30,000 m^3 (equivalent to 80,000 tonnes (t) based on a specific gravity (density) of 2.8 for the basalt product). The size of the approved basalt resource was previously estimated at between 500,000 and 625,000 t (RWC, 2017).

This Environmental Impact Statement (EIS) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Regional Hardrock Gilgandra Unit Trust (Regional Hardrock) (the Proponent) to accompany a development application to Gilgandra Shire Council for an expansion to the Berakee Quarry (the Project).

The Proponent is seeking development consent to expand quarrying operations as follows.

- Extraction of tertiary-aged basalt (up to 4.7 million tonnes (Mt)) using drill and blast methods over two stages:
  - Stage 1 – 2.3 Mt over 5 years at a production rate of up to 490,000 tpa to supply hard rock materials to the Inland Rail Project (refer to **Figure 1.1** for the alignment of the Narromine to Narrabri section of the Inland Rail Project)
  - Stage 2 – 2.4 Mt over 20 years at a production rate of between 80,000 to 120,000 tpa to supply hard rock products to local markets

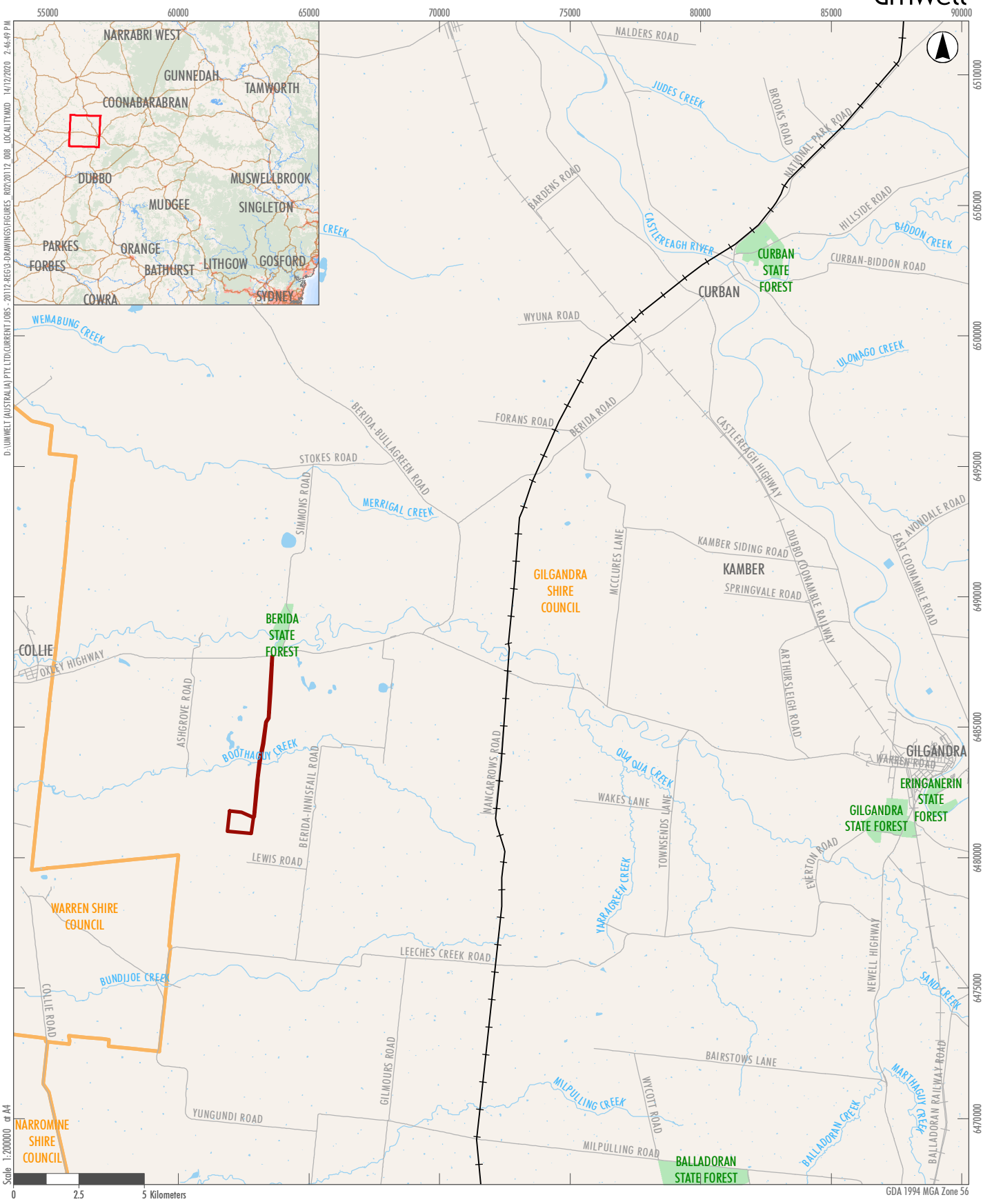
  The extraction area would be increased from 1.5 ha to 8.4 ha.
- Campaign crushing and screening to produce basalt aggregates and construction materials for road base, road sheeting, infrastructure construction, rail ballast and concrete manufacture.

  The processing and stockpiling area would increase from 0.5 ha to 7.8 ha.
- Transportation of material from the Quarry to customer sites via the existing Private Haul Road over the “Berakee” property (Lot 2 DP1265657) and “Wilgaroo” property (Lot 52 DP43558).
- Ancillary activities including stockpiling areas (sufficient to hold up to 250,000 t of product) and surface water controls.

For the purpose of the EIS, the Project Site composes two key components (refer also to **Figure 1.2**).

- The Quarry Site: being the site of the quarrying operations and defined by Lot 1 DP1265657.
- The Private Haul Road: being the existing haul road between the Quarry site and the Oxley Highway which traverses, under agreement with the owners, Lot 2 DP1265657 and Lot 52 DP43558.

The Project requires an increase in the total disturbance footprint on the Quarry site from 2 ha to a maximum of 17 ha. Notably, the land over which the majority of this additional disturbance is to be undertaken has been cleared previously and pasture improved for agricultural purposes and so does not retain significant area of native vegetation. The Project does not require any modifications to the Private Haul Road, noting that the production rate and therefore number of vehicles on this road would be increased.



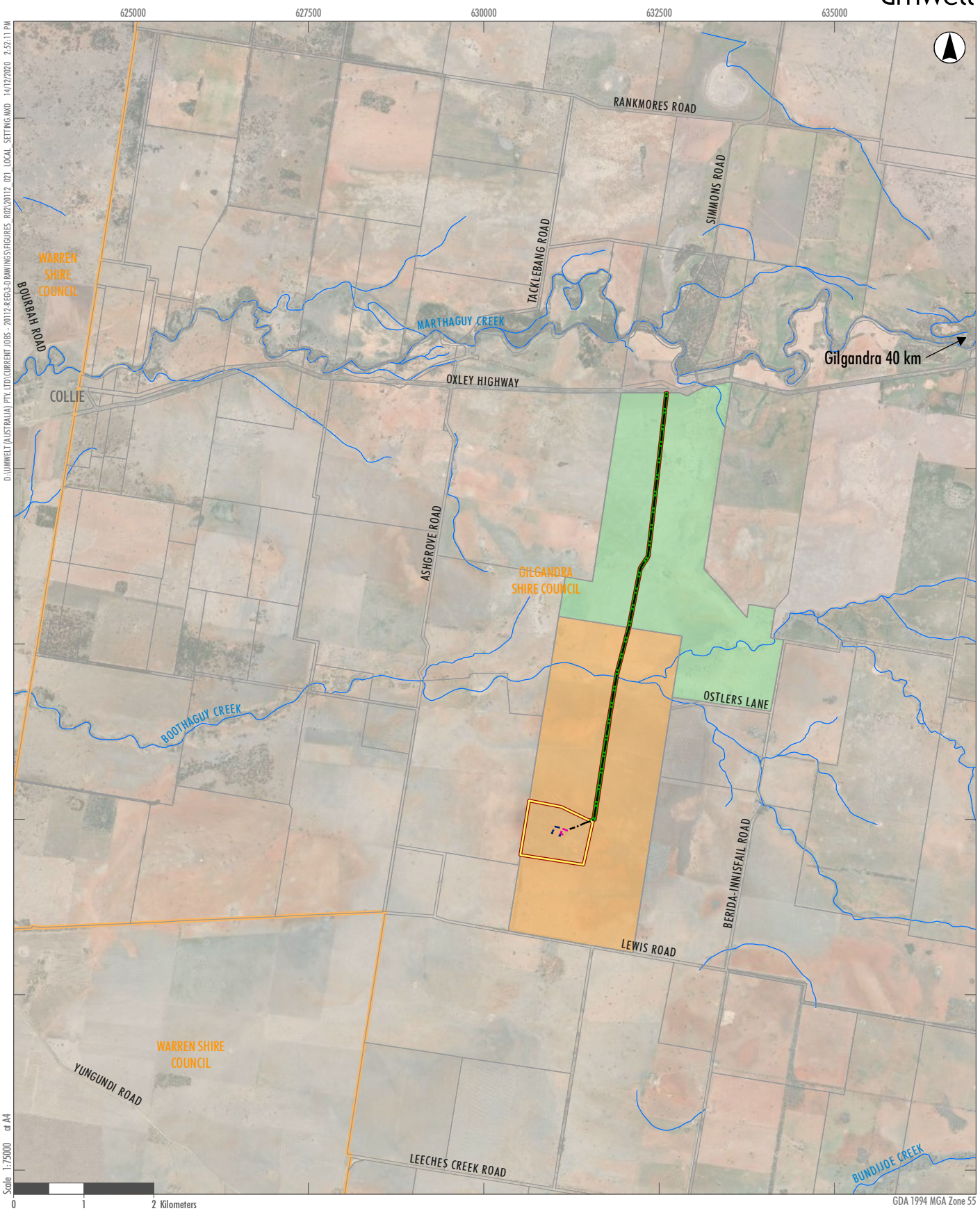
Legend

- Project Site
- Local Government Boundary
- National Parks (NPWS Estate)
- State Forest
- Road
- Drainage Line
- Railway Line
- Approximate ARTC Inland Rail Line

FIGURE 1.1

Locality Plan

Data source: Geoscience Australia; Forestry Corporation of NSW (2019); DSFI (2017); NPWS Estate (2019), ARTC (Nov 2020)



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Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Approved Extraction Area
- Approved Crushing and Stockpile Area
- Local Government Boundary
- Berakee Area
- Wilgaroo Area
- Haul Road
- Drainage Line

FIGURE 1.2

Local Setting

Image Source: ESRI (2020) Data source: NSW LPI (2020)

This EIS details the proposed extraction operations, describes the existing environment on and surrounding the Project Site and Private Haul Road, and assesses the environmental effects of the Project after a range of environmental safeguards are adopted.

1.2 Project Objectives

The objectives of the Project are as follows:

- To provide a source of basalt aggregates and gravel products for the Inland Rail Project over the next four to five years before transitioning to supply of local and regional road building, construction and concrete manufacture in the longer term.
- To minimise, to the greatest extent practicable, the impact on the local environment, community and other stakeholders.
- To provide for a final landform amenable to further extension of the quarry operation, future use for agriculture or other agreed purposes.
- To ensure that the Project can operate in a safe, reliable and cost-effective manner, contributing to the local economy of the Gilgandra LGA.

1.3 Quarry History

As noted in **Section 1.1**, the Quarry currently operates under development consent DA 2017/218, issued by Gilgandra Shire Council, which limits extraction to a disturbance footprint of 2 ha and annual production of up to 30,000 m^3. DA 2017/218, which refers to the former Lot 45 DP752563, was modified in June 2019 (DA 2017/218A - refer to **Appendix 1**) to allow for delivery of quarry products via a Private Haul Road to the Oxley Highway which traverses portions of the 'Berakee' and 'Wilgaroo' properties (under a right of carriageway agreement) (refer to **Figure 1.2**). The intersection between the Private Haul Road and the Oxley Highway required by DA 2017/218A has recently been completed and transport via this route is now permissible. It is noted that approval for the delivery of Quarry products via public roads to the Oxley Highway (Ostlers Lane and Berida-Innisfail Road) has expired.

In early 2020, the consent holder of DA 2017/218A (Sandy Creek Family Trust) was approached over the acquisition of the Quarry by Regional Quarries Australia (RQA), the quarrying division of Maas Group Pty Limited. As a result, Sandy Creek Family Trust, made application to sub-divide Lot 45 DP752563, on which the Quarry was located into two lots. This sub-division was approved in April 2020 by Gilgandra Shire Council (DA 2020/333) excising a 69 ha block (Lot 1 DP 1265657) on which the Quarry is located, from the larger agricultural block.

Lot 1 DP1265657 was subsequently acquired, along with the rights to DA 2017/218A, in August 2020 by RQA with application for Secretary's Environmental Assessment Requirements (SEARs) submitted to commence the process for this development application. RQA continues to operate the Quarry in accordance with DA 2017/218A, whilst this application is assessed and determined.

1.4 Project Justification

Hard rock quarry products are an essential raw material supplying the construction industry and are used for a variety of purposes such as road base, drainage, concrete and asphalt. Demand for hard rock quarry products is influenced by population growth, road and other infrastructure construction and residential and commercial building.

While the approved Quarry is capable of meeting local and regional demand for hard rock quarry products, there will be a significant increase in demand for quality hard rock construction materials to supply the Inland Rail Project which is currently under construction to link Melbourne and Brisbane by a dedicated freight rail route. The Australian Rail Track Corporation (ARTC) who are responsible for the construction of the inland rail in partnership with the private sector, are sourcing these hard rock materials from existing and new quarries to be established along the route. The alignment of the Inland Rail Project comes within 5 km of the Project Site (refer to **Figure 1.1**), making the Quarry an ideal source of construction materials for this project.

1.5 EIS Structure

This EIS has been prepared in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act), the *Environmental Planning and Assessment Regulation 2000* (EP&A Reg) and the SEARs (refer to **Appendix 2**). The EIS comprises a main text component and supporting studies, which are included as appendices. An overview of the layout and contents of the main text is presented in **Table 1.1** below.

Table 1.1 Format of the EIS

Section	Description
Declaration	Provides a statement of authorship and declaration as to the accuracy of the EIS in accordance with the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.
Executive Summary	Provides a concise overview of the proposed Quarry expansion, approach to the assessment and assessment of impacts following the implementation of the various management and mitigation measures nominated throughout the EIS.
Section 1.0	Introduces the Project, the Proponent and the Project Site, provides information on the structure of the document and describes the management of investigations.
Section 2.0	Provides a description of the site and its surrounding context, including areas outside of the site that may be impacted by the Project.
Section 3.0	Describes a detailed description of the Project including proposed staging of activities, operational parameters, waste and water management, hours of operation, infrastructure and services and rehabilitation activities. **Section 3.0** also identifies and describes other feasible alternatives considered and rejected by the Proponent through the design phase of the Project.
Section 4.0	Describes the approach to issue identification and prioritisation which includes: • A summary of the consultation undertaken with the local community and government agencies (including a summary of the SEARs and other government agency assessment requirements) • The strategic and statutory context provided by relevant policies, legislation and planning instruments at a Commonwealth, NSW, regional and local level and their applicability to the Project, and • The environmental performance of Quarry operations to date.
Section 5.0	Assesses the environmental impact of the Project by describing how the matters identified in the SEARs have been assessed, and how any potential impacts have been avoided, minimised or offset.
Section 6.0	Provides a summary of the mitigation measures to be implemented by the Proponent in the execution of the Project.
Section 7.0	Outlines the evaluation and draws conclusions, including discussion of how the Project balances impacts, strategic need and benefits.
Section 8.0	References

The information presented in this document covers all aspects of the planning, development, operation, rehabilitation and proposed environmental management of the Project at a level of detail reflecting the environmental risk posed by each issue.

The main text of the EIS is supported by a set of appendices as follows.

1. A copy of existing approvals held for the Berakee Quarry.
2. A copy of the Secretary's Environmental Assessment Requirements (SEARs) and matters identified for consideration in the correspondence submitted to NSW Department of Planning and Environment (DPE) by other State government agencies.
3. Community Information Sheet provided to landowners and residents surrounding the Project Site.
4. Standard Drawings, for erosion and sediment control, taken from Managing Urban Stormwater: Soils and Construction, Vol. 1 (Landcom, 2004) (the Blue Book).
5. A Traffic Impact Assessment prepared by Cardno Pty Ltd.
6. A Noise and Vibration Impact Assessment prepared by Muller Acoustic Consulting Pty Limited.
7. An Air Quality Impact Assessment prepared by Jacobs Pty Ltd.
8. A Biodiversity Assessment Report prepared by Umwelt Australia Pty Limited.
9. An Aboriginal Heritage Assessment prepared by OzArk Environmental & Heritage Management Pty Ltd.
10. Groundwater Bore Works Summaries for bores within 3 km of the Quarry site

1.6 Proponent Details

Regional Hardrock is a company within the RQA group of companies, the quarrying division of the Maas Group. Founded in 2002 and with a head office in Dubbo NSW, Maas Group encompasses expanding construction materials, property, civil infrastructure and underground mining and tunnelling divisions. RQA operates seven quarries in regional NSW, delivering product to civil and infrastructure construction projects across the state. Products include aggregates, crushed rock and road base, fill material, sand and specialty rock.

A summary of the company registration details is provided in **Table 1.2**.

Table 1.2 Proponent Details

Registered Name	Regional Hardrock Gilgandra Unit Trust
ABN	12 364 872 209
Address	PO Box 4921 Dubbo NSW 2830

1.7 Management of Investigations

This document has been prepared by Mr Alex Irwin (B.Sc (Hons)), Principal Environmental Consultant with Umwelt, with assistance from Mr Jon Novoselac (BBus, MEnvSus (Current)), Environmental Consultant with the same company. The following personnel of the Applicant provided information in relation to the existing and proposed activities and reviewed and approved this document for release.

- Mr Richard Tomkins – General Manager of Regional Group.
- Mr Scott Lancaster – Major Projects Manager of Regional Group.

A range of specialist environmental investigations have been completed to ensure the SEARs have been adequately addressed. These studies were undertaken by the following consultancies.

- Traffic and Transport – Cardno Pty Ltd.
- Noise and Vibration – Muller Acoustic Consulting Pty Ltd.
- Air Quality – Jacobs Pty Ltd.
- Aboriginal Cultural Heritage – OzArk Environment and Heritage Management Pty Limited.
- Surface Water – Umwelt Australia Pt Ltd.
- Biodiversity – Umwelt Australia Pty Ltd.

2.0 Site Description

2.1 Property Description and Ownership

The Quarry is located approximately 10 km south-east of Collie and 30 km south-west of Gilgandra near the Gilgandra-Warren Shire boundary (refer to **Figure 1.1**). The Project Site is located at Lot 1, DP 1265657 and is surrounded by privately-owned rural land on all boundaries (refer to **Figure 2.1**).

Lot boundaries and the locations of residences on the Project Site and within the surrounding area are shown on **Figure 2.1**. Land ownership[1] is also summarised in **Table 2.1**.

Table 2.1 Land Ownership

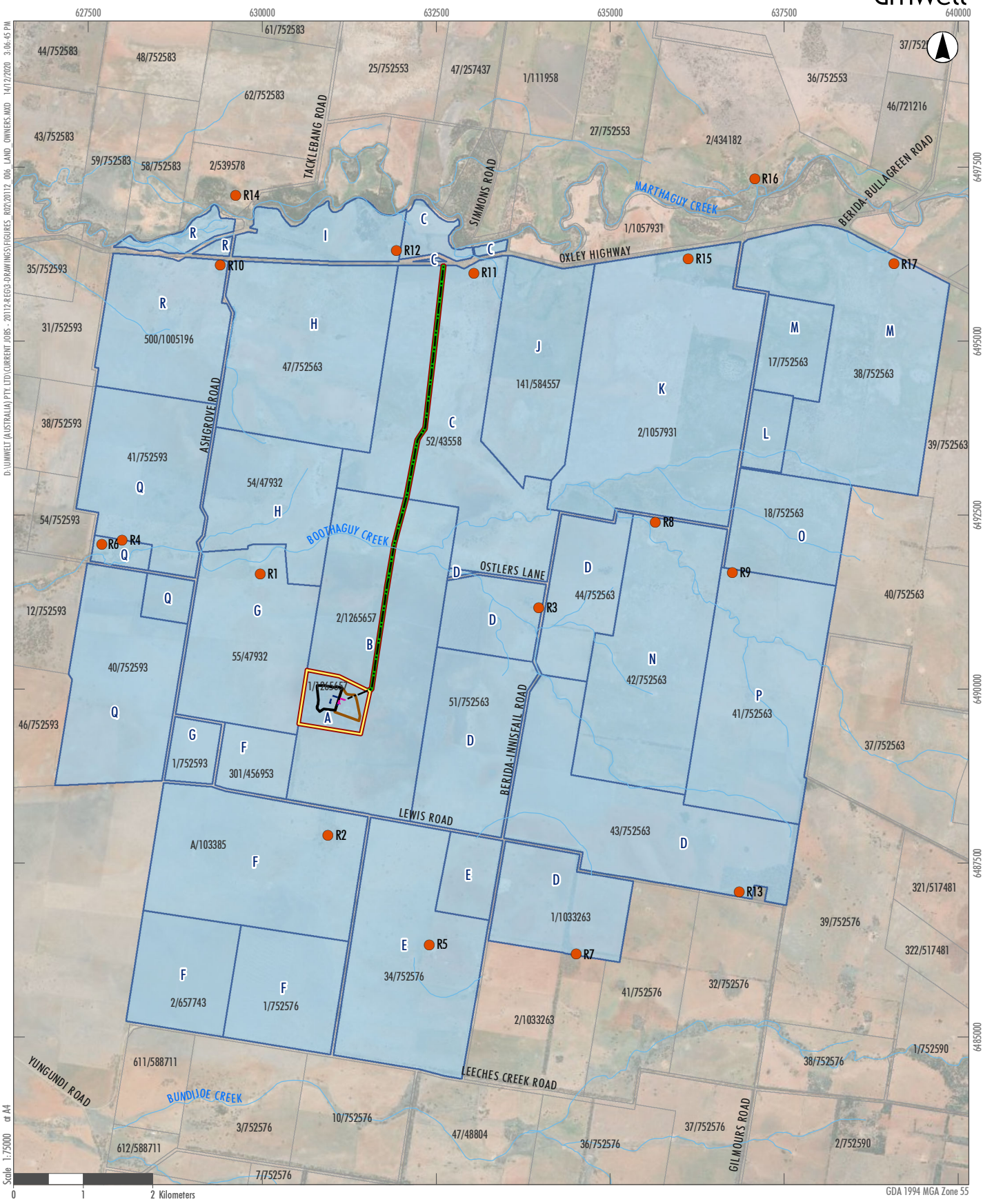
Ref[1]	Land Parcel (Lot/DP No.)	Title Holder	Receiver[1]
A	1/1265657	Regional Hardrock Gilgandra Unit Trust	-
B	2/1265657	Sandy Creek Family Trust	-
C	52/DP43558	BT Border	R11
D	1/1033263, 42-44/752563, 51/752563	MK Mudford	R3, R13
E	2/1033263, 34/752576	WD Lewis	R5
F	301/456953, A/103385, 1/752576, 2/657743	GA Herbig	R2
G	1/752593, 55/47932	GB Lewis	R1
H	54/47932, 47/752563	Lytoco Pty Ltd	-
I	47/7522563	G Foran	R12
J	141/584557	EOSE Pty Ltd	-
K	2/1057931	EIRAM Pty Ltd	-
L	Part 18/752563	LM Border	-
M	17/752563, 38/752563	JP Foran	R17
N	44/752563	CM Kilby	R8
O	Part 18/752563	Milroy Gil Pty Ltd	-
P	41/752563	J Prout	R9
Q	40-41/752593	MP Foran	R4, R6
R	500/1005196	ME Mudford	R10

Note 1: Refer to **Figure 2.1**

Source: NSW LPI (2020) / Regional Hardrock Gilgandra Unit Trust (2020) / Sandy Hill Family Trust (2018)

For the purpose of the assessment of impacts, several additional receivers have been identified, namely R14 on Lot 2 DP539578 and R16 on Lot 2 DP434182, and included on **Figure 2.1**. The land ownership details of these properties and receivers was not identified as these would not be directly impacted and predicted impacts with respect to air and noise emissions were well below relevant standards or guideline requirements.

[1] The land ownership presented in Table 2.1 is based on NSW LPI records available as of September 2020 and consultation undertaken by the Proponent (refer also to Section 4.1.2.1). It is noted that any inaccuracies, should they be identified, do not alter the validity of assessment contained within the EIS.



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Proposed Extraction Area
- Proposed Crushing and Stockpile Area
- Approved Extraction Area
- Approved Crushing and Stockpile Area
- Land Ownership
- Haul Road
- Drainage Line
- Receiver Locations

FIGURE 2.1

Land Ownership

Image Source: ESRI (2020) Data source: NSW LPI (2020)

The Private Haul Road is approximately 6.2 km in length (2.8 km being on Lot 2 DP1265657) and 3.4 km on Lot 52 DP43558). Based on a right of carriageway width of 22 m, the area covered by the Private haul Road is approximately 13.6 ha. Based on an average with of 10 m (8 m road formation and 2 m for roadside drainage), the disturbance area within the Private Haul Road is approximately 6.2 ha.

2.2 Climate

2.2.1 Climate Statistics

Climate statistics relevant to the Project are presented in **Table 2.2** and have been sourced from the following Bureau of Meteorology (BoM) weather stations:

- Temperature and Rainfall – Gilgandra (Chelmsford Ave) (Station Number 051018) located approximately 26 km to the east of the Quarry.
- Evaporation – Trangie Research Station AWS (Station Number 051049) located approximately 50.8 km to the southwest of the Project Site.

Table 2.2 Climate Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature (°C) (1915 to 1975)													
Mean Max	33.1	32.2	29.8	24.8	20	16.4	15.6	17.2	21	25.2	29	31.9	24.7
Mean Min	17.3	17.4	14.6	10.3	6.1	3.9	2.5	3.4	5.9	9.4	12.6	15.9	9.9
Monthly Rainfall (mm) (1889 to 2020)													
Mean	63.7	53	47.8	39.6	42.2	45.7	42.7	38.9	39.4	46.6	47.8	53.9	557.8
Lowest	0	0	0	0	0	0	0	0	0	0	0	0	195.6
10th %ile	7.5	7.5	2.9	0	3.9	6.9	7.2	6.5	4.7	8.2	5.3	6.8	327.8
Median	54.6	33.5	33.6	29.8	34.4	37.2	37.9	33.3	29.7	39.8	36.1	40.1	558.6
90th %ile	127.7	111.4	114.8	97.8	93.3	98.6	86	79.7	82.1	91.3	97	113.8	803.3
Highest	334.7	379.3	208.3	191.8	196.6	208.3	155.9	152	195.6	238.8	244.1	249	1272.6
Evaporation (Pan) (mm) (1971 to 2007)													
Mean Daily	9.8	8.8	6.9	4.6	2.6	1.8	1.8	2.7	4.0	6.0	8.1	9.7	5.6
Mean Monthly	303.8	248.6	213.9	138	80.6	54	55.8	83.7	120	186	243	300.7	2045.4

Source: BoM, Climate Data Online

2.2.2 Temperature

January is typically the warmest month of the year with a mean daily maximum temperature of 33.1°C and February typically has the highest minimum temperatures with a mean daily minimum temperature of 17.4°C. The coolest month of the year is typically July with the lowest mean daily maximum temperature of 15.6°C and coldest mean minimum temperature of 2.5°C.

2.2.3 Rainfall and Evaporation

On average, 557.8 mm of rain is recorded each year, with that rainfall spread relatively evenly throughout the year. Rainfall is typically highest between December and February (53 to 63.7 mm) and drier throughout the remainder of the year. Rainfall can, however, be highly variable from year to year with annual rainfall varying from 195.6 to 1272.6 mm and monthly rainfall varying from nil to 379.3 mm.

Mean evaporation at the Trangie Research Station AWS throughout the year is 5.6 mm per day or 2045.4 mm per year. Monthly evaporation varies between 54.0 mm in June and 303.8 mm in January. Mean monthly pan evaporation is greater than mean monthly rainfall in all months.

2.2.4 Wind Data

Wind speed and direction data have been collated from the Dubbo Airport weather station (Station No. 065070) approximately 55 km to the south and Trangie Research Station (Station No. 051049) approximately 51 km to the south-west. With reference to these weather stations, the prevailing winds are predominantly as follows.

- Annual: Winds blowing from the north and east most common
- Summer: Similar trends to those observed annually, with winds blowing from the south and southwest also common
- Autumn: Similar prevailing trends to those observed in summer
- Winter: Winds blowing from the north most common with winds from the east and southwest also occurring frequently, and
- Spring: Similar trends to those observed in winter with a higher frequency of calm conditions.

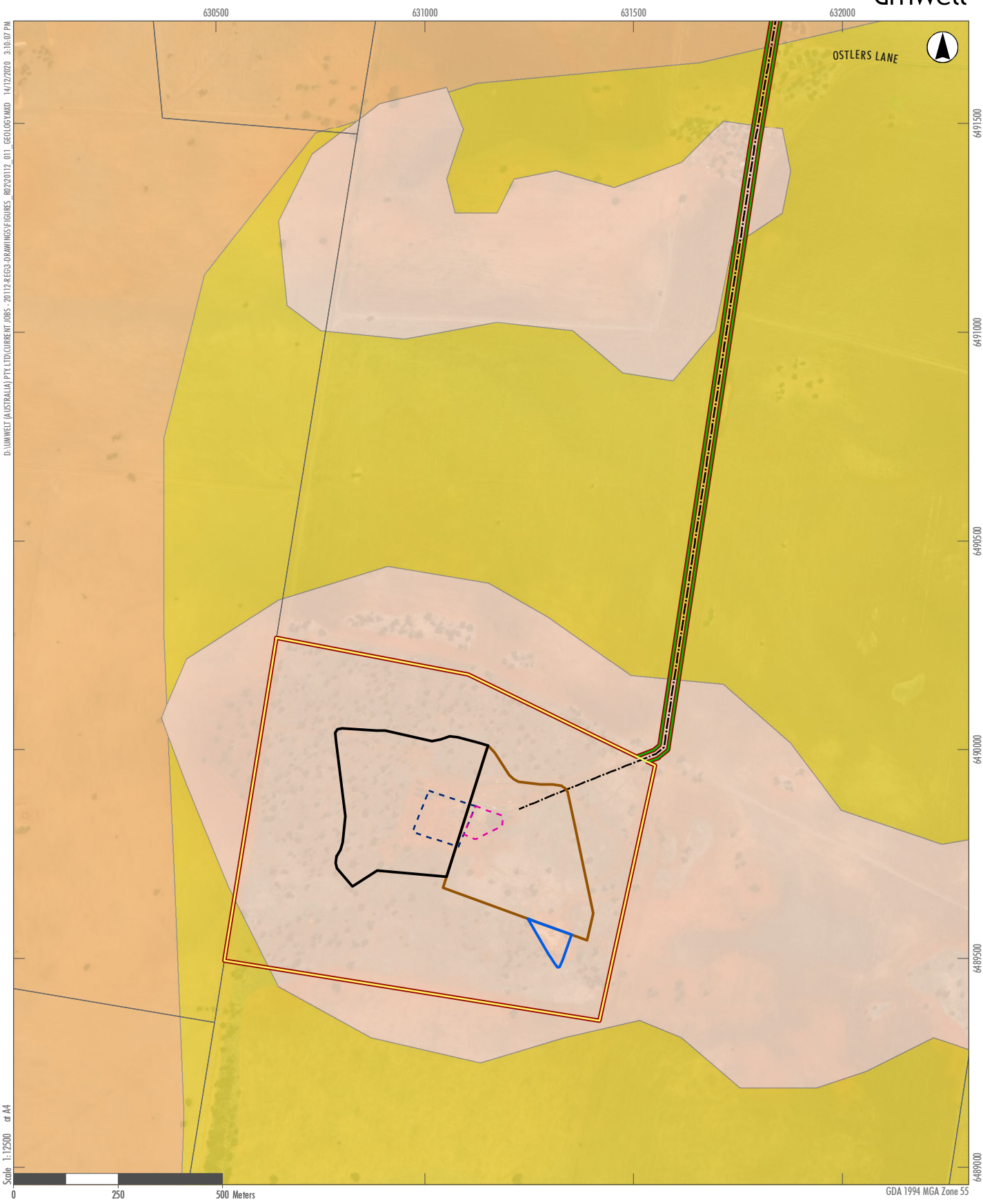
The average wind speed ranges from 3.3 m/s to 3.7 m/s and the annual percentage of calms (wind speeds below 0.5 m/s) ranges from 5.1% to 7.0%. For further detail on local wind data, refer to *Section 4.2.1* of the Noise and Vibration Impact Assessment (MAC, 2021) and *Section 4.3* of the Air Quality Impact Assessment (Jacobs, 2021) which are provided as **Appendix 6** and **Appendix 7** respectively.

2.3 Landscape, Soil, Land Capability and Agricultural Resources

2.3.1 Landscape

The Project Site occurs within a largely cleared landscape set over undulating to stepped low hills with long slopes and local relief generally restricted to 30 m. A review of the Nyngan 1:250 000 geological map (Watkins, 1996) identifies the Project Site as occurring within a largely alluvial depositional landscape, over outcropping and near-surface basalt geology which is tertiary in age and deposited by lava flows from the nearby Warrumbungles Range (refer to **Figure 2.2**).

The NSW Mitchell Landscapes mapping v3.1 (DPIE 2018), developed to define landscapes and ecosystems of NSW based on geologic, geomorphic and pedologic characteristics, identifies the Project Site as occurring on Myall Glen Basalts. This landscape is relatively isolated within the surrounding alluvial landscapes, and has been identified as over cleared, with an estimated 75% clearing across its occurrence. This is not unexpected given the value of the basalt resource within this landscape.



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Approved Extraction Area
- Approved Crushing and Stockpile Area
- Proposed Extraction Area
- Proposed Crushing and Stockpile Area
- Proposed Sediment Basin
- Haul Road

Geology

- Pilliga Sandstone
- Carrabear Formation Alluvium
- Tertiary Basalt

FIGURE 2.2

Geology

Image Source: ESRI (2020) Data source: NSW DFSI (2020), Nyngan 1:250000 Gelogical Sheet SH/55-15 1st Edition (Watkins, 1996)

2.3.2 Topography/Landforms

The Quarry site occurs as a low hill rising to an elevation of approximately 270 mAHD, sloped more gently from the east and south (approximately 1.5 %) and slightly more steeply from the west and north (approximately 4 %). Surrounding the Quarry site the land is flat with slopes of < 1 % drainage primarily by sheet flow to Boothaguy Creek to the north and Bundijoe Creek to the south. Similar low hills occur in the local landscape, generally associated with outcropping basalt or other harder rock geological features.

2.3.3 Soils

The Quarry site is mapped as occurring over the Berakee Basalt Hydrogeological Landscape (HGL) on the Office of Environment and Heritage (OEH) online mapping tool eSpade. The Berakee Basalt HGL consists of occurs within small areas of basalt in the Berakee area. Geology includes residual materials derived from Tertiary basalts and tuffs. Landforms within the Berakee Basalt HGL consists of gently undulating rises with low (9 to 30 m relief). The landscape is characterised by distinctive basalt caps with highly fertile black soils. Surface soils are light clay and clay loams. Water logging is common across the landscape. Surface soils can have high water erodibility and sub soils can have slow drainage.

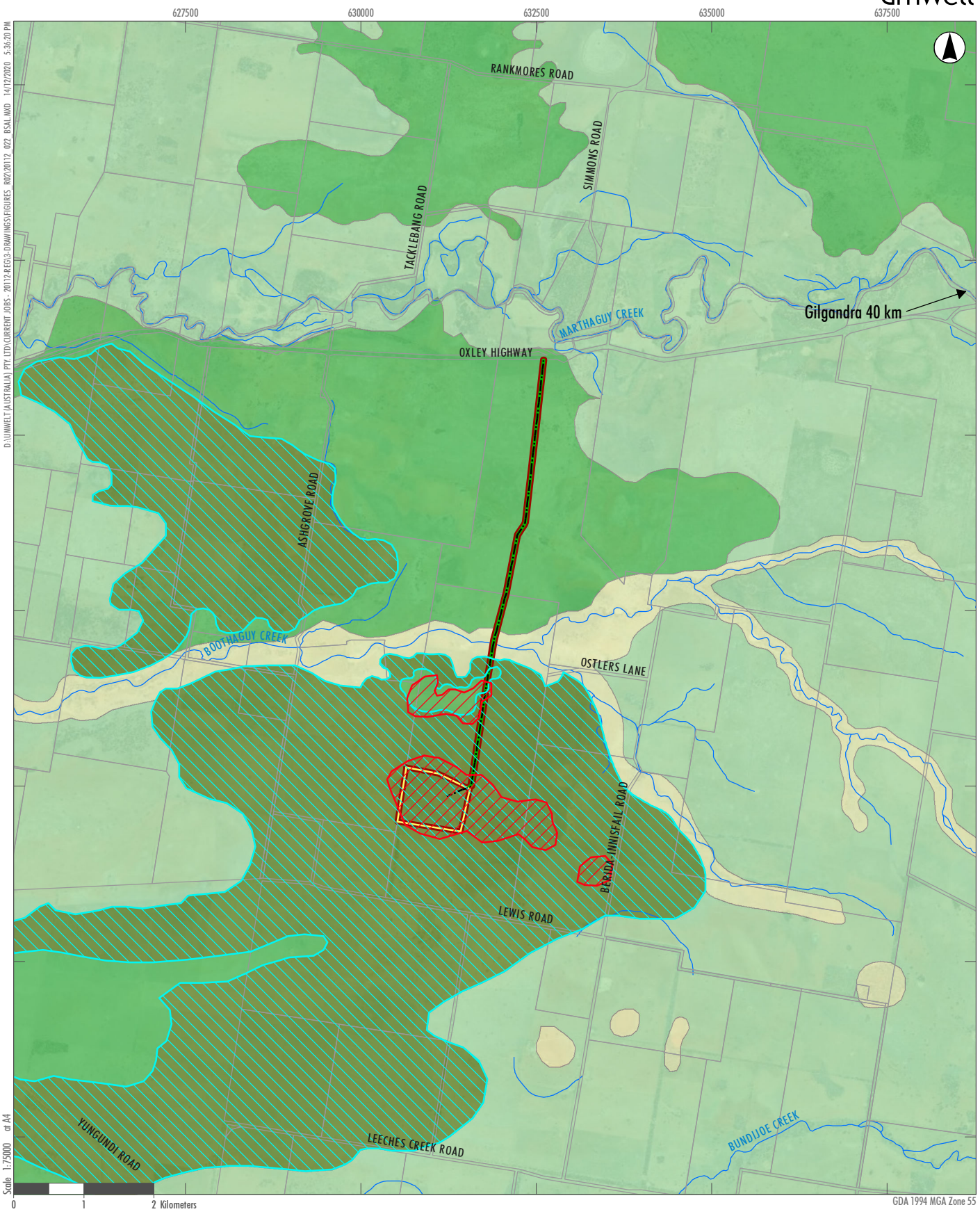
The soil of the Project site occurs as red and red-brown sandy loam and light clay loam soils with significant gravels present. Surface stone in form of basalt cobbles and scatters of small shale-like fragments are present across the Project site, particularly in the immediate vicinity of the proposed extraction area. Observations of excavations on the Project Site indicate a soil layer of between 200 and 400mm transferring to weathered basalt.

Observations on the Quarry site are comparable to those recorded (in eSpade) approximately 1.7 km to the north-east (refer to **Figure 2.3**) which identified soils that are dark brown moist sandy clay loam topsoils with massive structure and reddish brown moist clay loam sandy subsoils with no cracking. **Table 2.3** presents relevant modelled soil properties sourced from eSpade (OEH, 2020).

Table 2.3 Quarry Site Soil Properties

Parameter	Value
Soil Erodibility (K factor as used in the Revised Universal Soil Loss Equation (RUSLE))	0.03 – 0.05
Exchangeable Sodium Percentage (ESP)	<2% (0 – 30 cm depth) 2 – 4% (30 – 100 cm depth)
Clay Percentage	30 – 40% (0 – 5 cm depth) 40 – 50% (0 – 30 cm depth) >50% (30 – 100 cm depth)
Silt Percentage	5 – 15% (0 – 100 cm depth)
Sand Percentage	30 – 45% (0 – 5 cm depth) 25 – 45% (0 – 30 cm depth)
pH	6 – 6.5 (0 – 30 cm depth) 7 – 7.5 (30 – 100 cm depth)
Electrical Conductivity (dS/cm)	>0.1 – 0.2 dS/cm (0 – 30 cm depth) >0.1 – 0.3 dS/cm (30 – 100 cm depth)
Soil Hydrologic Group	D
Volumetric Runoff Coefficient (C_v) for a 5 day, 95th Percentile Rainfall event[1]	0.74

Note 1: 5 day, 95th percentile rainfall event for Dubbo is 50.7 mm



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Haul Road
- Drainage Line
- Myall Glen Basalts (Mitchell Landscape)
- Biophysical Strategic Agricultural Land

Soil and Land Capability

- 2
- 3
- 4
- 6

FIGURE 2.3

Soil and Land Capability and Biophysical Strategic Agricultural Land

Image Source: ESRI (2020) Data source: NSW SFSI (2020), Environmental Planning Industry (2020)

Based on the data in **Table 2.3** the Quarry site soils are considered to be non-dispersive (as the ESP is less than 6%) but fine, i.e. Type F (as the percentage of clay and silt is >30%) with low to moderate erodibility, slightly acidic to neutral pH and low salinity.

2.3.4 Land Capability

The NSW Soil and Land Information database eSPADE, managed by DPIE, identifies the Project Site as Land and Soil Capability (LSC) Class 2 (refer to **Figure 2.3**), which suggests the land is capable of sustaining high impact land uses. However, the eSPADE mapping is based on relatively broad-scale mapping and does not appear to account for the Myall Glen Basalts landscape over the Quarry site. Notably, an area to the north where the Quarry access road joins Ostlers Lane, which also occurs over the Myall Glen Basalts, is assigned a lower LSC Class 3. Based on the occurrence of surface stone and the relatively shallow soil layer, an LSC Class 3/4, is possibly a more accurate reflection of the limitations imposed.

It is also noted that the Quarry site occurs on land which has been classified by broad scale mapping as Biophysical Strategic Agricultural Land (BSAL) (refer to **Figure 2.3**). BSAL has been mapped across NSW by key industry representatives and industry experts as a combination of soil fertility, LSC class and access to reliable water which make it highly suitable for agriculture.

In the case of the land mapped as BSAL on and surrounding the Project Site (refer to **Figure 2.3**), these natural resource features (as taken from the Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land, OEH/OASFS, 2013) are as follows.

- Rainfall of 350 mm or more per annum (9 out of 10 years) (10^{th} percentile rainfall for Gilgandra (BOM Station No. 051018) is 327.8 mm).
- Land that falls under soil fertility classes “high” or “moderately high” under the Draft Inherent General Fertility of NSW (OEH), where it is also present with LSC Class 1, 2 or 3 (**Figure 2.3** identifies the Project Site as occurring over land variously mapped as LSC 2 and 3).

Due to the regional scale of the maps, site verification would be necessary to determine that particular sites are in fact BSAL. As designated development, verification of the land as BSAL is not required to allow for assessment determination, however, it is noted that the occurrence of rock outcrop and unattached surface rock (> 60 mm in diameter) over more than 20% of the area would likely remove this area from classification as BSAL.

2.4 Water Resources

2.4.1 Surface Water

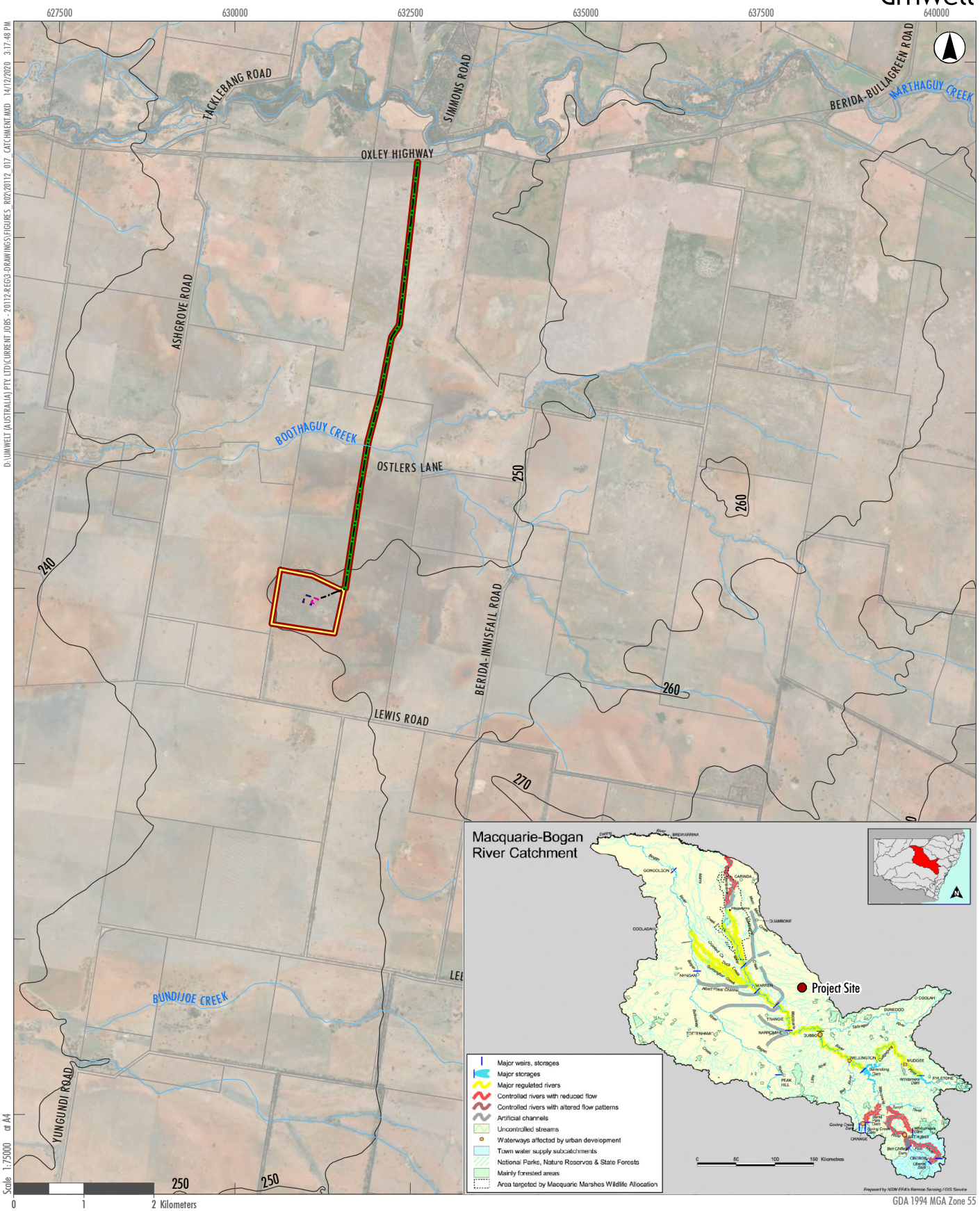
The Quarry site is located towards the southern boundary of the Marthaguy Creek Catchment within the Macquarie-Bogan Catchment (refer to **Figure 2.4**). Within the Marthaguy Creek catchment, the Quarry site falls near the catchment divide of the Boothaguy Creek to the north and Bundijoe Creek to the south. Surface runoff typically drains eastward towards first order tributaries of Boothaguy Creek. There are no defined drainage lines on the Project Site. Boothaguy Creek and Bundijoe Creek drain from east to west towards Marthaguy Creek.

The Quarry site falls on a local high point and it is not expected that the site would receive run on from any surrounding catchments. There are no defined drainage lines or dams on the Project Site. Based on inspection and classification of its soil as sandy to clay loam with significant surface rock, the Project Site is expected to be moderately to poorly permeable. The Project Site catchment is covered by the Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources, which applies to thirty individual water sources (NSW Department of Primary Industries, Office of Water 2012). Specifically, the quarry is within the Marthaguy Creek water source.

The Private Haul Road between the Oxley Highway and Project site crosses a 3rd order ephemeral watercourse known locally as Calf Pen Creek (although identified on local topographic maps as Boothaguy Creek) as a bed level crossing (see **Figure 2.4**). **Plates 2.1** and **2.2** provide a view of the watercourse which only flows during periods of extreme high rainfall.

Gilgandra Shire Council flood mapping indicates that the Quarry site is not located within the flood planning area and, as such, no assessment of flooding impact has been undertaken.

Plate 2.1 View of Calf Pen Creek upstream (east) of the Private Haul Road



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Approved Extraction Area
- Approved Crushing and Stockpile Area
- 10m Contours
- Haul Road
- Drainage Line

FIGURE 2.4

Catchment Context

Image Source: ESRI (2020) Data source: NSW DFSI (2020)

Plate 2.2 View of Calf Pen Creek downstream (west) of the Private Haul Road

2.4.2 Groundwater

The Project Site is covered by the Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources (NSW Department of Water and Energy 2009) which comprises all water contained in the sandstone aquifers of the Great Artesian Basin. These are described as the geological formations of the Cretaceous and Jurassic age, 65 to 210 million years old, belonging to the Great Artesian Basin and its intake beds. The Project Site lies within the Southern Recharge Groundwater Source, one of two non-artesian sources covered by the Plan.

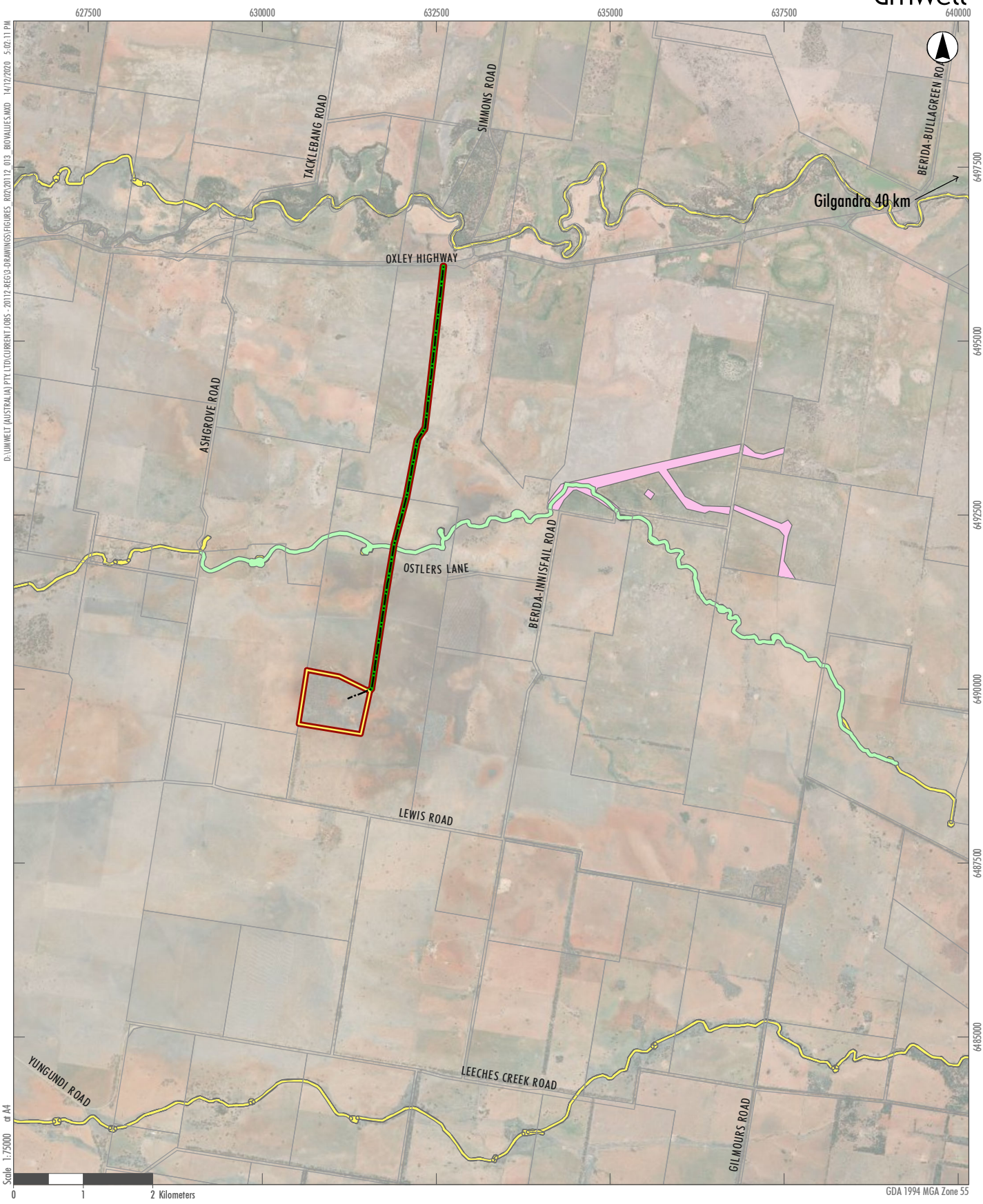
Further detail on the local groundwater setting and establishment of the groundwater table below the Quarry site is provided in **Section 5.5.2**.

2.5 Biodiversity

The land on and surrounding the Project Site has been subject to significant vegetation clearing associated with local agricultural activities. NSW government maintained databases have been searched which identify regionally significant vegetation as restricted to local drainage lines. **Figure 2.5** identifies land mapped as follows:

- Land mapped as displaying Biodiversity Values in accordance with Part 7 of the *Biodiversity Conservation Act 2016* (BC Act). This land follows the alignment of Boothaguy Creek (which is also known locally as Calf Pen Creek). The BV Map identifies such land as being particularly sensitive to impacts from development and clearing and is required to be considered for the purpose of biodiversity assessment and potential entry into the NSW Biodiversity Offsets Scheme.

- Land mapped as 'vulnerable regulated land' and 'sensitive regulated land' under the *Local Land Services Act 2013* (LLS Act). Vulnerable regulated land is land where clearing of native vegetation may not be permitted under the *Land Management (Native Vegetation) Code 2018*, and a limited range of allowable activities are permitted. Sensitive regulated land is land where clearing is not permitted under the *Land Management Code (Native Vegetation) Code 2018*, and a limited range of allowable activities is permitted. While the LLS does not strictly apply as the Project is the subject of a development application under the EP&A Act, it illustrates local drainage lines as presenting some of the more important local vegetation.



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Private Haul Road
- Sensitive Regulated Land (LLS Act)
- Vulnerable Regulated Land (LLS Act)
- Biodiversity Values (BC Act)

FIGURE 2.5

Biodiversity Values and Regulated Land Mapping

Image Source: ESRI (2020) Data source: NSW LPI (2020)

The Project Site has been previously mapped as containing Plant Community Type (PCT) 98 Poplar Box – White Cypress Pine – Wilga – Ironwood shrubby woodland on red sandy-loam soils in the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (OzArk, 2017) along with non-native pasture. Native groundcover diversity has been reduced by historic livestock grazing and clearing and the site continues to be grazed by kangaroos. **Section 5.6** provides additional information on local biodiversity undertaken as part of an Ecological Assessment of the Project Site.

3.0 Project Description

3.1 Summary

Regional Hardrock proposes to extend the extraction area, production rate, quarry life and disturbance footprint of the Berakee Quarry, located on Lot 1 DP 1265657, near Collie NSW. The quarry extension is to provide for additional basalt resource (up to 4.95 million tonnes (Mt)) and stockpiling areas (sufficient to hold up to 250,000 t of product). In order to achieve these increases, a number of associated changes to activities and infrastructure on the Project Site would be required including additional extraction equipment and changes to processing equipment, truck movements, water usage, blasting frequency and employment.

The layout of the Quarry site is shown in **Figure 3.1** which identifies the proposed extent of extraction, processing and stockpiling along with the locations of key infrastructure. No modifications to the Private Haul Road are proposed for the purpose of the Project. **Table 3.1** provides a comparative analysis of the Project against the existing development approved under DA 2017/218A.

Table 3.1 Project Parameters

Parameter	Approved Development (DA 2017/218A)	Berakee Quarry Expansion Project
Site description	Lot 1 DP 1265657, Lot 2 DP1265657 (formerly Lot 45 DP752563 at time of approval) Right of carriageway over Lot 52, DP43558	Lot 1 DP 1265657 Right of carriageway over Lot 2 DP1265657 (which will be secured upon Project approval) and Lot 52, DP45338
Products	Basalt aggregates and construction materials	No change
Resource Size	750,000 t	4,700,000 t
Production Rate	Up to 30,000 m3 (80,000 t) per annum	Stage 1 – 2.3 Mt over the initial 5 years (ie: 490,000 tpa) Stage 2 – 2.4 Mt over a further 20 to 25 years (ie: 80,000 to 120,000 tpa)
Quarry Life	8 to 12 years	30 years
Disturbance Footprint	Up to 2 ha	Up to 17 ha
Extraction area	Up to 1.5 ha	Up to 8.4 ha. No change to current development consent maximum extraction depth of 240 m AHD.
Extraction design	Final floor elevation 240-242 m AHD Final face angle 75-85° Two faces 8-10 m high separated by a single bench 3-5 m wide	No change
Extraction methods	Drill and blast	No change

Parameter	Approved Development (DA 2017/218A)	Berakee Quarry Expansion Project	
Extraction equipment	Bulldozer x 1 Drill rig x 1 Excavator x 1 Dump truck x 1 Backhoe x 1 Water cart x 1	Stage 1 Bulldozer x 1 Drill rig x 1 Excavator x 1 Front-end loader x 1 Dump truck x 2 Backhoe x 1 Water cart x 1	Stage 2 Bulldozer x 1 Drill rig x 1 Excavator x 1 Dump truck x 1 Backhoe x 1 Water cart x 1
Processing and Stockpiling area	Up to 0.5 ha (including material storage, crushing and roads) Small stockpiles maintained within the Processing Area and extraction area subject to available space	Primary crushing activities will be relocated into the extraction area as it expands. A significant increase in stockpiling area is planned to allow for up to 250,000 t of product to be stored at any one time (to provide sufficient capacity to supply the demands of the Inland Rail Project). The footprint of the Processing and Stockpiling Area will be increased to 7.8 ha.	
Processing operations	Mobile crushing unit, screening and stockpiling of in-situ materials only	On-site crushing, screening and stockpiling of in-situ materials only.	
Transport routes	Road transport up to B-double arrangement via Private Haul Road to the Oxley Highway Use of Ostlers Lane and Berida-Innisfail Road up to 30 June 2020	Exclusive use of the Private Haul Road to the Oxley Highway Predominantly 38 t capacity Truck & Dog arrangements, however, approval for access by vehicles up to B-double arrangement to be retained.	
Truck movements	Average truck movements (based on 30 t payload per truck): Daily 14 Weekly 100 Annual 5,000	Average truck movements (for Stage 1) (based on 38 t payload per truck): Daily 70 Weekly 496 Annual 25,000	
Water usage	Dust suppression only	Dust suppression and processing	
Water source	Surface harvesting supplemented by groundwater extracted from bore GW011693 on Lot 2 DP1265657 (as identified in the Quarry Water Management Plan	Surface harvesting supplemented by groundwater extracted from bore GW011693 on Lot 2 DP1265657 A new production bore is currently being established on Lot 1 DP1265657 to replace the supplementary source from GW011693	

Parameter	Approved Development (DA 2017/218A)	Berakee Quarry Expansion Project
Infrastructure and services	No power, water or sewage services to site.	No power, water or sewage services to site. The following additional infrastructure will be required: • demountable office compound and amenities • rainwater tank for additional potable water supply • parking • diesel generator power • pump-out septic system
Hours of operation	Monday to Friday 7.00 am to 6.00 pm Saturday 7.00 am to 4.00 pm No work on Sundays or Public Holidays	Monday to Friday 6.00 am to 6.00 pm Saturday 6.00 am to 6.00 pm No work on Sundays or Public Holidays Extension of transport into morning (from 5.00 am) and evening (to 10.00 pm) shoulder
Blasting	Monday to Friday 9.00 am to 3.00 pm 3 blasts per annum	Monday to Friday 9.00 am to 5.00 pm During Stage 1, up to 12 blasts per annum.
Employment	2-3 staff plus an additional 2-3 contractors during extraction and processing campaigns 2-3 contract truck drivers during extraction campaigns	Up to 24 staff plus contract truck drivers during extraction campaigns.
Rehabilitation	Final landform to provide livestock shelter and water storage for ongoing grazing	No change. Final void to be retained

3.2 Project Staging

Extraction operations for the Project would be undertaken over two stages:

Stage 1 extraction of approximately 2.3 Mt over 5 years i.e. 495,000 tpa to supply hard rock materials to the Inland Rail Project

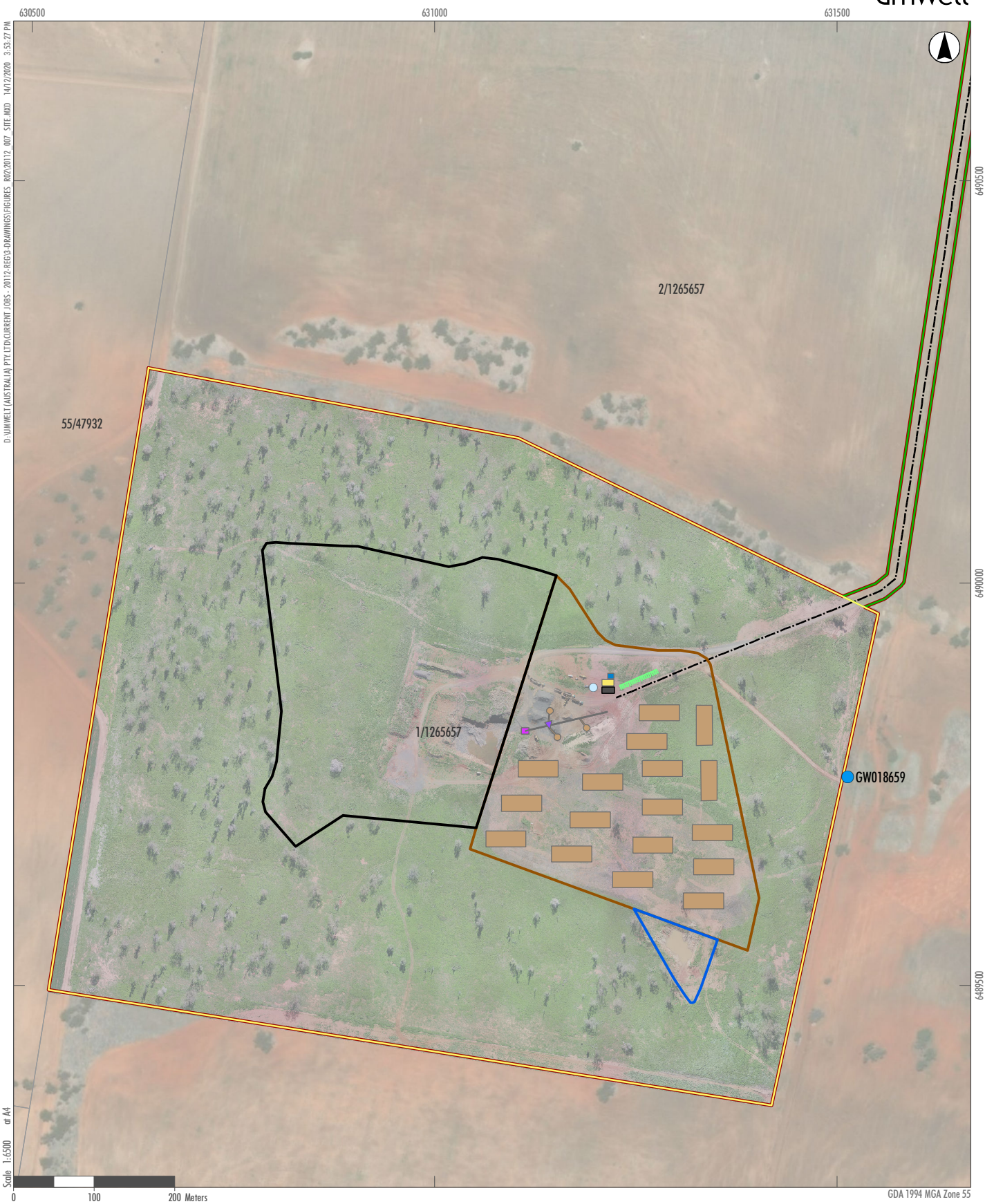
Stage 2 extraction of 2.4 Mt over 20 years i.e. 80,000 to 120,000 tpa following completion of the construction of the Inland Rail Project, to supply hard rock products to local markets.

3.3 Site Establishment

3.3.1 Survey and Mark Out

Prior to the commencement of any ground-disturbing activities, the Applicant would survey all areas of proposed disturbance and physically mark out approved areas of disturbance using appropriately labelled survey markers.

All site personnel would be made aware of the approved areas of disturbance and the significance of not disturbing areas outside the approved areas.



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Extraction Area
- Stockpile Area
- Sediment Basin
- Crib Room
- Amenities
- Site Office
- Stockpile
- Secondary Cone Crusher
- Primary Jaw Crusher
- Conveyor
- Car Parking
- Haul Road
- Groundwater Bores
- Water Tank

FIGURE 3.1

Quarry Site Layout

Image Source: ESRI (2020) Data source: NSW LPI (2020)

3.3.2 Clearing of Vegetation

The proposed extraction area and associated disturbance has been designed to avoid disturbance to large trees which could provide roosting or nesting habitat for birds and arboreal mammals. In the event that any fallen timber or shrubs be encountered within the area to be cleared ahead of extraction and this vegetation, these would either be manually dragged or pushed using a bulldozer with its blade positioned just above the surface and stockpiled adjacent to the area of disturbance for later use during rehabilitation. No cleared vegetation material would be burnt.

Groundcover vegetation would be removed with the topsoil to maximise the retention of the seed bank and nutrients within the soil, as well as to minimise opportunities for erosion and dust lift-off between removal of the larger vegetation and soil stripping.

3.3.3 Soil Stripping and Stockpiling

The following soil stripping, stockpiling and management measures would be implemented.

- Soil would be stripped to a depth of at least 300mm (where available) from all areas of disturbance, ensuring that sufficient soil is available to respread over the final landform of the Project Site.
- Soil would not be stripped when excessively dry or wet to preserve soil structure.
- During the initial site establishment phase, stripped soil would be spread onto the amenity bund. Where this is not possible, the soil would be placed in wind row stockpiles within the extraction area impact footprint.
- The soil stockpiles would be constructed to a height no greater than 3 m, with side slopes no more than 1:3 (V:H). The stockpiles would be stabilised through the establishment of grass achieving a coverage equivalent to 60% within 60 days of establishment.
- The operation of machinery on soil stockpiles once formed, other than to excavate these for use in rehabilitation, would be prevented to avoid compaction.
- All soil stockpiles would be sign-posted to avoid inadvertent disturbance.
- A soil inventory would be maintained to ensure that sufficient resources are available at the commencement of rehabilitation operations.

Over the life of the Project, an estimated between 45,000 and 60,000 m^3 of soil would be stripped, stockpiled and later used in the rehabilitation of the Quarry site. The stripped soil would be stockpiled in wind rows within the impact footprint of the extended extraction and Processing and Stockpiling Areas.

3.3.4 Quarry Entrance, Access Roads and Hardstand Establishment

3.3.4.1 Quarry Entrance

The Project requires no change to the entrance to the Quarry site, located approximately 400 m northeast of the crushing and extraction area at the north-eastern corner of the Quarry site (Lot 1, DP1265657) (refer to **Figure 3.1**). The entrance will remain secured with a lockable gate with signage to warn of the quarry operations and presence of deep voids. When not in operation, the gate would be locked.

3.3.4.2 Access Roads

Internal Access Road

The Quarry Access Road on the Quarry site will remain unchanged from the current alignment. No modifications to this road are proposed.

Private Haul Road

No change to the alignment and construction of a Private Haul Road between the Quarry Entrance and Oxley Highway is proposed (utilising right of carriageway on Lot 2 DP1265657 and Lot 52 DP45338). The width of the Private haul Road easement being 22 m, the width of road formation being 7 m with a 0.75 m shoulder on both side, and roadside drainage (tables and spoon drains) of approximately 1.5 m on both sides of the road. Figure 3.2 provides an illustration of the road formation of the Private Haul Road.

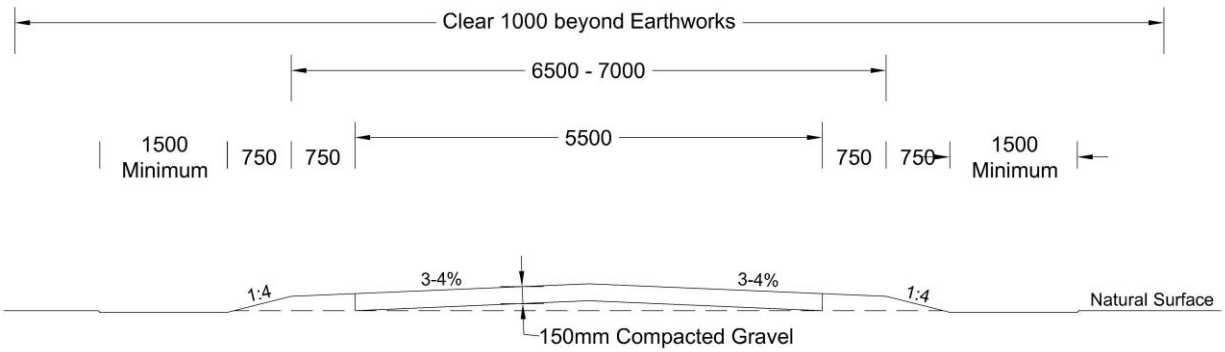


Figure 3.2 Private Haul Road Formation

3.3.4.3 Hardstand Surfaces

On clearing of vegetation and stripping of soil, material excavated from the upper layer of the extraction area, including subsoil, overburden (weathered basalt), would be placed over the area identified as the Crushing and Stockpiling Area (refer to **Figure 3.1**) to create a flat surface extending to the north, south and east of the existing hardstand stockpiling area. This area would then be sheeted with the basalt excavated from the extraction area and compacted to form a hardstand surface.

Low bunds and drains would be installed to direct runoff to an existing sediment basin (SD-1) located to the southeast of the Stockpiling Area. Further detail in this water management infrastructure is provided in **Section 5.4**.

3.3.4.4 Buildings and Other Infrastructure

Should additional buildings or other infrastructure in addition to the demountable Site Office be installed on the Quarry site, the relevant areas will be graded to create a flat surface with concrete foundations poured (as required) prior to placement of demountable structures.

3.4 Operations

3.4.1 Resource

A review of the Nyngan 1:250 000 geological map (Watkins 1996) identifies the Project Site as occurring over outcropping tertiary basalt which was formed from lava flows through paleochannels derived from volcanic centres of the Warrumbungle Range (refer to **Figure 2.2**). This dark grey to black olivine basalt is noted for producing quality aggregates for concrete manufacture and road construction.

In 2017, samples of the basalt were examined by Macquarie Geotech for petrographic analysis. The analysis confirmed the material as plagioclase rich basalt with rock texture described as porphyritic and highly competent with no cracks, pores or evidence of weathering (Macquarie Geotech 2017). The rock fabric consisted of euhedral phenocrysts of augite and olivine embedded in a plagioclase rich matrix. On the basis of the analysis, Macquarie Geotech concluded the material to be:

- highly competent, hard basalt showing no weakness or significant signs of weathering
- highly suitable for use as a concrete or structural aggregate.

The resource size of 4.7 Mt has been calculated by multiplying the extraction area volume of (1,680,000 m^3) (calculated based on an extraction area of 8.4 ha and depth to an elevation of 240 m AHD) by the density of the basalt (2.8 t/m^3).

3.4.2 Extraction Area Design

The layout of the proposed extraction area is presented on **Figure 3.1**. Design criteria are as follows:

- Maximum Extraction Area Footprint – 8.4 ha (based on restriction of depth to 240 m AHD as per the current development consent)
- Elevation of final floor – between 240 and 242 m AHD.
- Volume – approximately 1,680,000 m^3.
- Indicative angle of final faces – between 75° and 85°.
- Two final faces of 8 to 10 m in height separated by single bench of between 3 and 5 m in width.

The Proponent notes that the proposed angle of the final faces is based on experience of stable faces within competent basalt rock. The face angle may be modified over the life of the Project to reflect the geotechnical stability of this particular basalt resource.

3.4.3 Overburden Management

As the extractable resource at the Quarry lies immediately beneath the topsoil (which is shallow and generally < 600 mm) there would be very little overburden produced by the proposed extraction activities. The majority of the extraction area will require minimal stripping of overburden to expose the target basalt.

Following removal of topsoils, a bulldozer will be used to rip the very shallow layer (<1 m) of weathered material and push this into stockpiles. This material would be used for on-site road and hardstand sheeting, bund construction and other miscellaneous activities on the Project Site. Material in excess of these requirements would be maintained in stockpiles and either be blended with ROM material to produce specialty products or retained for replacement in the final void on completion of extraction activities.

3.4.4 Drill and Blast Operations

The in-situ rock would be fragmented using drill and blast techniques, as is currently the practice at the Quarry. All blasting operations would be supervised by a suitably qualified and experienced blasting engineer or shot-firer.

Blast holes would be drilled using a hydraulic drill rig equipped with dust and noise suppression equipment. These holes would then be filled with explosives and the blast initiated, fragmenting the in-situ basalt. Bulk explosives, detonators and boosters would not be stored on the Project Site; rather they would be brought to the site on the day of the blast.

Table 3.2 outlines the indicative blast design parameters to be applied.

Table 3.2 Indicative Blast Design Parameters

Parameter	Value
Blast hole diameter	89 mm
Blast hole depth	5.5 to 11 m
Blast hole spacing	Approximately 3 m x 3 m
Depth of stemming	1 to 2 m
Size of blast	15,000 to 20,000 bcm
Area of blast	500 to 1,500m^2
Bulk explosive type/Initiation system	ANFO/None
Maximum Instantaneous Charge (MIC)	Less than 50 kg

The Proponent anticipates the requirement for up to 12 blasts per annum during Stage 1, with requirements reverting to levels similar to current quarrying operations for Stage 2 i.e. three blasts per annum.

Consistent with existing practice, the Proponent will notify all surrounding landowners of intended blasting operations and offer to include any landowner on a blast notification register. On the day prior to blasting operations all residents who registered will be notified by text message, email or telephone call.

The Proponent will monitor all blasts for air overpressure and ground vibration, with monitoring locations to be chosen based on proximity and access.

3.4.5 Extraction Campaigns

Once fragmented, the basalt will be removed from the blast zone by front-end loader and either transferred directly to an on-site crushing unit or placed in a Run-of-Mine (ROM) stockpile. As the extraction area develops, the crushing unit will be relocated into the extraction zone such that the tramming distance between the blast zone and crusher is minimised.

Based on experience of the current Quarry operation, extraction and crushing campaigns are expected to take approximately three weeks to complete. That is, extraction operations would be undertaken for approximately 30 to 36 weeks per year during Stage 1 and 9 to 10 weeks each year during Stage 2.

3.4.6 Extraction Limit Monitoring and Reporting

The proponent will maintain a cumulative record of extracted basalt to ensure the total extracted resource by the development does not exceed approved 4.95 Mt.

While subject to modification or refinement in consultation with Gilgandra Shire Council and other relevant agencies, the method for calculation of extraction will be as follows.

- On an annual basis, the Proponent will sample and confirm the specific gravity (density) of the basalt (through assessment by an NATA accredited laboratory) within the extraction area.
- Prior to each survey the in situ volume of material to be blasted will be surveyed. This is required to ensure the correct powder factor is applied to the blast.
- For each blast, the volume will be converted to tonnes based on the density of the basalt established through laboratory analysis and this value added to a site maintained data base.

The Proponent will report to Gilgandra Shire on an annual balance along with forward plans for extraction in following years to confirm this remain below the 4.95 Mt during the life of the Quarry.

3.5 Processing Operations

Processing operations will be undertaken on a campaign basis using a mobile crushing unit which will initially be placed within the existing crushing and stockpiling area before being relocated following each blast to adjoin the blasted rock pile.

While the exact arrangement of the mobile crushing unit may vary (depending on customer size and quality requirements), it is expected to include the following key components:

- primary jaw crusher
- multi-deck screens
- secondary cone crusher
- assorted conveyors, screens and stackers.

Fragmented basalt is loaded onto a screen using a Front-end Loader prior to transfer to a mobile primary jaw crusher. The crushed rock is conveyed to a screen where -25 mm material is conveyed to surface for screening and additional crushing. A significant proportion of this initial crush is stockpiled for sale as road base. The remainder is conveyed to a cone crusher where further crushing, with the addition of water, is undertaken to produce washed aggregate products.

The mobile crushing unit will be diesel powered. An excavator or loader will be used to load the crusher and manage stockpiles. To be initially located at surface to the east of the extraction area (refer to **Figure 3.1**), the crushing and processing plant will be relocated to the floor of the extraction area once sufficient area has been opened up to allow for this to be undertaken in a safe manner. At a production rate of 495,000 tpa, this is expected to occur within the first two years of operation following issue of the designated development consent.

Acknowledging the variability in both the quality of the basalt to be extracted, and quality requirements of customers, the Proponent may blend materials with different fragment size or clay content to meet customer specifications. This will be undertaken either on the crushing and stockpile area or within the extraction area of the Project Site, with a front-end loader or excavator used to mix different quality gravels together as required.

3.6 Stockpile Management

As referenced in **Section 3.5**, blasted rock will either be transferred directly to an on-site crushing unit or to the ROM stockpile by front-end loader. After crushing, the variously sized products will be loaded to a haul trucks and distributed to stockpiles on the Stockpile Area.

In order to provide for the stockpiling of up to 250,000 t of product at any one time, an area of up to 7.8 ha has been identified (refer to **Figure 2.1**). Product stockpiles would include:

- densely graded base material
- densely graded sub-base material
- gabion
- ballast
- fines
- various sized (5 mm, 7 mm, 10 mm, 14 mm, 20 mm) aggregates.

Specific stockpile volumes will be dependent on market demands.

3.7 Site Access and Transportation

As discussed in **Section 1.3**, DA 2017/218 was recently modified (June 2019) to allow for the use of a Private Haul Road to the Oxley Highway which traverses portions of the 'Berakee' and 'Wilgaroo' properties under a right of carriageway agreement. The alignment follows existing fence lines as far as practicable with the crossing of Calf Pen Creek (identified on local topographic maps as Boothaguy Creek – refer to **Plate 2.1** and **Plate 2.2**) constructed and maintained as a bed level crossing.

As required by DA 2017/218A, the intersection of the Private Haul Road with the Oxley Highway has been completed to provide a Left (BAL)/Basic Right (BAR) intersection in accordance with Figures 7.6 and 8.2 of Part 4A of the Austroads Guide to Road Design series (3rd edition) (Austroads 2017). The design satisfies the swept path of a B-triple sized truck travelling at 15 to 20 km/hr with the exact configuration confirmed in consultation with RMS. The upgrade required a slight realignment of the primary lanes of travel to the south (converting the current east bound lane to the pass-by lane of the BAR treatment).

The Oxley Highway is a major east west transport route linking the mid north coastal regions to the central western regions of NSW. The two-way single carriageway highway is a State Road managed by the NSW Government. Between Gilgandra and Warren the Oxley Highway is utilised by various commuter, agricultural and heavy vehicle traffic. In the vicinity of its intersection with the Private Haul Road the Oxley Highway has a sign posted speed limit of 110 km/h with lane widths of 3.5 m and sealed shoulders of at least 0.5 m.

The Project would include an increase of (on average) approximately 56 truck movements per day. Stage 1 vehicle movements are summarised in **Table 3.3**.

Table 3.3 Stage 1 Vehicle Movements

Element	Tonnes/Number of movements
Average truck payload	38 t
Annual production	495,000 t
Required truckloads per annum (required truck movements)	13,000 (26,000)
Average truckloads per day (average truck movements)	35 (70)

Note: Number of hourly and weekly truck movements, and makes and models of vehicles would fluctuate depending on customer demand.

As the Inland Rail Project will be the primary customer for product from the Quarry, approximately 95% of heavy vehicle movements onto the Oxley Highway would be in an easterly direction, requiring a right-hand turn. Following completion of the Inland Rail Project, heavy vehicle movements east and west onto the Oxley Highway are expected to be equal.

A Traffic Impact Assessment (TIA) has been completed by Cardno and is presented in full as **Appendix 5** and summarised in **Section 5.1**.

3.8 Site Amenities and Services

3.8.1 Amenities

In addition to the existing demountable site office, the Project will require another demountable site office to serve as a crib room, portable toilet facilities and a carpark. Should additional structures be required in the future, separate application will be made to Gilgandra Shire Council as required. Additional staff amenities will consist of a contained pump out facility that will be serviced by a licenced waste contractor. A small diesel tank may be stored on site in a self-bunded container in accordance with AS 1940-2017 *The Storage and Handling of Flammable and Combustible Liquids*.

3.8.2 Services

Potable water will be sourced from additional rainwater tanks or a licenced water supplier. There would be no power, water or sewage services to the Project Site. All communications would be by mobile phone or in-vehicle two-way radio.

3.9 Water Management

3.9.1 Water Requirements

Water would be required at the Quarry primarily to manage dust emissions from active areas of the Quarry site, the Private aul Road, as well as to maintain a moisture content of between 3 and 5 % in the quarry product stockpiles. No water is required for processing, other than to prevent dust emissions from crushing and at transfer points between conveyors and stacks.

While the amount of water would vary from year to year dependent on climatic factors, production levels and the area of active operations, it is estimated that between 10 and 15 ML of water would be required annually. Based on a pan evaporation factor of 0.8 and the surface area of SD-1, a further 8.1 ML of water is likely to lost to evaporation annually.

Section 3.9.2 provides a review of the planned source of this water while **Section 5.4.5** provides a Site Water Balance to assess likely water deficits and discharges from the Quarry site.

3.9.2 Water Sources

3.9.2.1 Potable Water

Potable water for consumption and amenities would be sourced principally from water captured in a water tank to be constructed on the Quarry site. This would be supplemented by water purchased from commercial suppliers.

3.9.2.2 Operational Water Demands

This water for dust suppression is, and would continue to be drawn from two sources as follows:

Surface Water Harvest

Rainfall and runoff within the extraction area would be collected in sumps and would be available for extraction and either transfer to surface water storages (SD-1) or direct application to surfaces by water cart. Diversion banks and bunds are maintained on the Project Site to direct all other rainfall and runoff to the main sediment basin (SD-1) from which water would be available for extraction and application to surfaces.

SD-1 has an approximate capacity of 3 ML but will be increased to 5 ML to allow for acceptance of runoff from the design rainfall event (5-day 95th percentile – 50.7 mm) and additional freeboard to allow for on-site storage.

Groundwater Bore

A groundwater bore is currently being drilled on the Quarry site for which an industrial water use approval will be sought and obtained. Based on the records of a nearby groundwater bore on Lot 2 DP 1265657, a flow rate of 1 L/s of greater is sought and expected.

This would replace supply from an existing groundwater bore (GW011693) on Lot 2 DP 1265657 adjacent to the intersection of Ostlers lane and the Private Haul Road. This bore contains a submersible electronic pump which is capable of pumping 3.5kL/hr to an above ground tank. Until a bore is established, this water would be available to the Quarry and transferred by HDPE Pipeline to the Quarry site.

Off-site Supply

As a final solution, and in the event supply from surface water harvest or groundwater is not available, water would be purchased from commercial supplier and imported to the Quarry site.

3.9.3 Erosion and Sediment Control

A Soil and Water Management Plan (SWMP), has been prepared for the existing Quarry as part of a broader Water Management Plan (RWC, 2018). This provides the erosion and sediment control measures currently in place for the Quarry operations which comply with the following documents.

- Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004).
- Managing Urban Stormwater: Soils and Construction – Volume 2E – mines and quarries (DECC, 2008b).

The SWMP will be reviewed and updated following approval of the Project. **Section 5.4.4** provides a description of the various erosion and sediment control measures to be implement and which would be formalised within the updated SWMP.

3.9.4 Groundwater Management

The existing Quarry was designed to remain above the local groundwater table at 237 m AHD, determined through review of local groundwater bore records and observations during resource definition drilling. The Project does not propose to increase the depth of the Quarry and will remain above the local groundwater table.

A groundwater bore is currently under construction on the Quarry site and approval for industrial use will be sought and obtained prior to extraction of water from this bore for use on the Quarry site (to supplement surface water harvested and used for dust suppression). A Water Access Licence will also be obtained for Lachlan Fold Belt MDB Groundwater Source of the *Water Sharing Plan for the Murray Darling Basin Fractured Rock Groundwater Sources 2011* to account for any groundwater extracted.

3.10 Waste Management

3.10.1 Production Waste

The extractable resource at the Quarry lies immediately beneath the topsoil, therefore very little overburden is anticipated from the proposed extraction activities. Should any rock material be extracted that is not suitable for sale and despatch, it would be temporarily stockpiled before being placed over the final floor of the extraction area as part of final profiling and rehabilitation activities.

Similarly, scalped crusher material (crusher dust) and oversize material will be stockpiled temporarily on the Stockpiling and Processing Area prior to placement over the final floor of the extraction area as part of final profiling and rehabilitation activities. The crusher dust may be retained in stockpiles for longer periods and blended with stripped and stockpiled soil to improve the nutrient concentration and water retention of the soil material used in rehabilitation.

3.10.2 Non-Production Waste

Table 3.4 identifies the non-production wastes that would be generated during the life of the Project and briefly describes how each class of waste would be stored and subsequently removed from the Quarry site.

Table 3.4 Non-Production Waste Management

Waste Type	Storage/Management	Removal
General waste General Recyclables	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 oils and greases	Placed within bunded tank(s) within the workshop area. Where required, smaller, temporary storage containers may be positioned close 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	Used batteries would be placed within a covered and marked used battery storage area until removed from site.	Used batteries would be collected on a regular basis by an appropriate contractor and recycled.

Waste Type	Storage/Management	Removal
Tyres	Tyres would be placed within a marked used tyre storage area until removed from site or used for another purpose.	Collected on a regular basis by a licensed waste contractor and transported to a licensed waste disposal facility.
Scrap Steel/Metal	Stored in a specified areas within the workshop area or elsewhere as required.	Collected on a regular basis by a scrap metal recycler.
Waste water	Waste water would be treated using a Gilgandra Shire Council approved waste water treatment facility, with treated water used to irrigate pasture within the Project Site.	

3.11 Hours of Operation

Hours of operation for the extraction, processing, loading and blasting components of the Project remain unchanged from the existing approved Quarry, as detailed in **Table 3.5**.

Table 3.5 Proposed Hours of Operation

Activity	Monday to Friday	Saturday	Sunday/Public Holidays
Extraction, processing and loading[1]	6.00 am to 6.00 pm	6.00 am to 6.00 pm	-
Blasting	9.00 am to 3.00 pm	-	-
Product transportation	5.00 am to 10.00 pm[2]	5.00 am to 10.00 pm[2]	-

Notes:
[1] Toolbox meetings, pre-start inspections or other activities not involving mobile equipment operations may be undertaken prior to 6.00 am
[2] Between 5.00 am to 6.00 am pre-loaded trucks exiting the Quarry only and 6.00 pm to 10.00 pm unladen trucks returning to the Quarry only

The Proponent proposes an extension to transportation hours to meet anticipated demand by allowing for pre-loaded trucks to exit the Quarry between 5.00 am to 6.00 am in the morning and for unladen trucks to arrive back to the Quarry between 6.00 pm to 10.00 pm in the evening.

3.12 Employment and Economic Contribution

3.12.1 Employment

The Applicant anticipates that between 12 and 24 people would be employed at the Quarry during Stage 1 (variability reflects production rate).

- General Manager
- Operations Manager
- Business Manager
- HSE Manager
- Diesel Mechanics
- Loader Operators
- Plant Operators
- Haul Truck/Dozer Operator

It is anticipated that the majority of operational personnel would be sourced from and reside in the vicinity of the Quarry.

In addition, the Proponent notes that delivery of products from the Project Site would require a number of truck drivers. Some of these drivers may be employed by the Proponent, while others may be contract or third-party drivers who may access the Project Site on a regular or semi-regular basis. Based on the Proponent's experience, the Project would be likely to generate six to eight full time equivalent positions for drivers.

During Stage 2 employment would revert back to a level similar to that of the approved development (i.e. 2-3 staff plus additional contractors during extraction and processing campaigns).

3.12.2 Economic Contribution

Following an initial investment of $2.25 to $2.75 million for equipment purchase, haul road upgrade and other materials, the Applicant anticipates an ongoing contribution of between that the Project would contribute approximately $3.3 to $4.6 million per year to the local and regional economy as follows.

- Wages (direct employees only): $1.2 to $2.0 million pa.
- Consumables, goods and services: $1.5 to 2.0 million pa.
- Contractors and suppliers: up to $200,000 pa.
- Rates and taxes: up to $400,000 pa.

In addition, the Project would contribute to local, regional and State economies by providing:

- competitively priced hard rock road building and aggregate products to primary producers, increasing the productivity of those operations
- road construction and maintenance products, reducing the cost of operating the road network for local councils and the State, and
- high quality source of hard rock aggregates for the construction of the Inland Rail Project.

3.13 Site Decommissioning and Rehabilitation

This section describes the site decommissioning and rehabilitation activities that will be undertaken following completion of quarry operations as proposed in this EIS. While the Proponent anticipates that a further application for approval to extract basalt resources may be made during or towards the end of the life of the Quarry (as proposed), this subsection describes the site decommissioning and rehabilitation activities that would be undertaken following completion of the identified extraction operations, assuming no such application is made or that approval is not forthcoming.

While the Project is not strictly a 'mining' development, these subsections have been prepared with reference to the ESG3: Mining Operations Plan Guidelines September 2013 ('the Guidelines') as these provide for definition of performance targets and measurement over the life of the Quarry. ESG3 is based on the principles for mine closure and rehabilitation provided by the Strategic Framework for Mine Closure produced by the Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia (ANZMEC, 2000).

3.13.1 Final Land Use and Conceptual Landform

3.13.1.1 Land Use

The existing land uses in the vicinity of the Project Site are rural based industries and rural residential dwellings. Stands of remnant native vegetation also remain on the Project Site and on surrounding properties.

With consideration to the existing land uses of the local setting, the Proponent proposes two integrated land uses on the Project Site:

- Low intensity grazing, primarily on the hardstand surfaces used for processing, stockpiling, Quarry infrastructure and ancillary activities.
- Passive biodiversity conservation within the final void and select areas of the surface which adjoin remnant native vegetation.

These land uses are consistent with surrounding land uses and the Gilgandra LEP which has zoned the Project Site as RU1 – Primary Production Zone.

3.13.1.2 Final Landform

Quarry Site

Due to the lack of overburden, i.e. backfill material, to be removed from the extraction area, the final landform would remain a void of approximately 15m to 18m below surface with a single face of 75º to 85º slope. Within the retained void, drainage would be to a retained sump which would provide storage for stock watering. The hardstand surface of the Stockpile Area would be returned to a landform which recreates the pre-disturbance topography.

The proposed final landform for the Quarry site will include the following:

- Decommissioning and removal of site infrastructure.
- Retention of a final void to be surrounded by a safety bund, vegetated with native tree, shrub and grass species.
- Ripping and remediation of hardstand surfaces surrounding the final void which will be profiled and top-dressed with soil and seeded with pasture species to achieve a low intensity grazing land use.
- Select areas of the Project Site would be reseeded with native woodland species to extend and link the areas of remnant native vegetation on the Project site with the road corridor.
- The sediment basins and drainage infrastructure would be retained to support future agricultural activities within and in proximity to the Project site.

The proposed conceptual final landform for the Quarry site is shown in **Figure 3.3**.

Private Haul Road

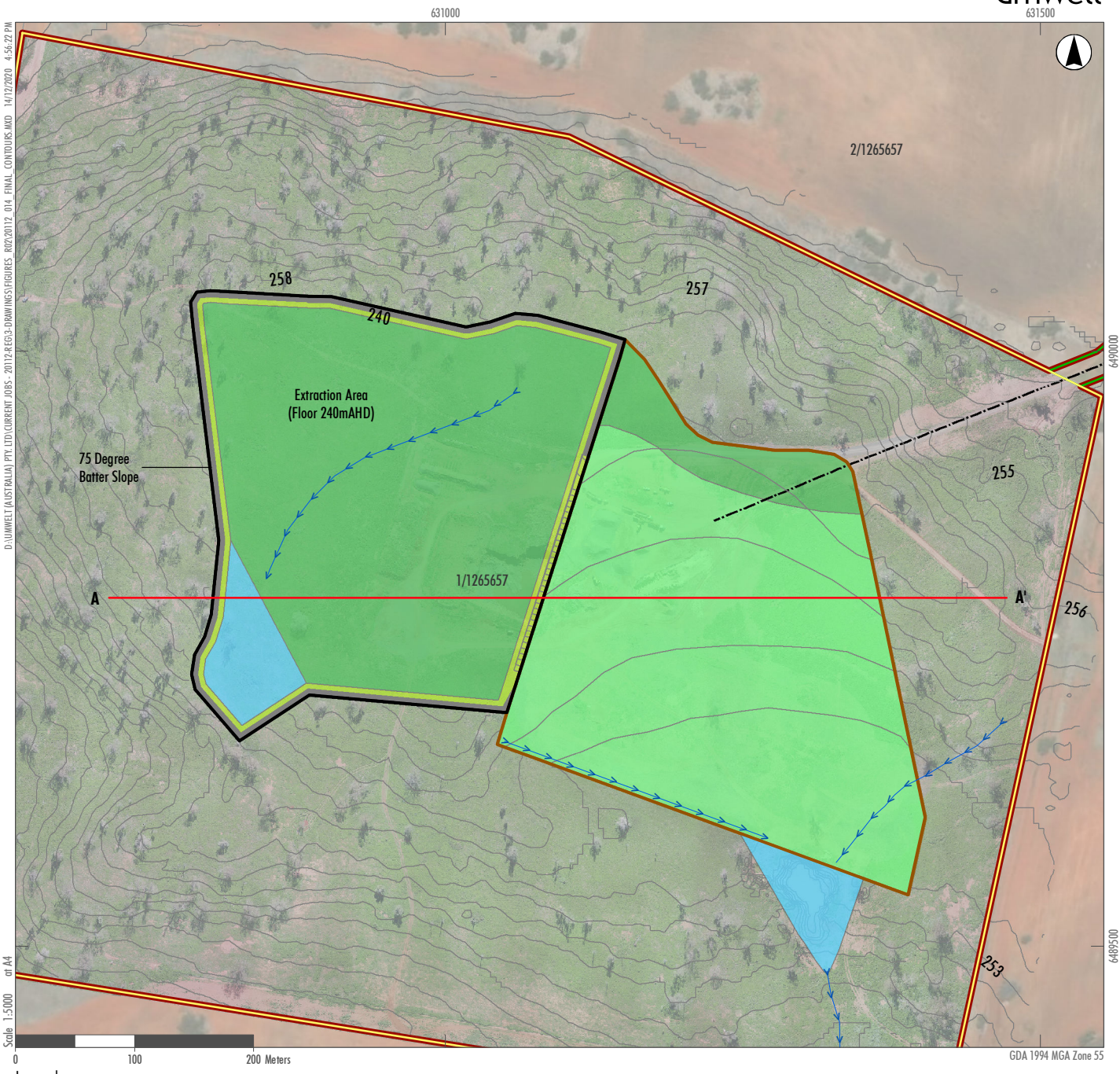
It is currently proposed to retain the Private Haul Road for ongoing use in the management of agricultural operations on the “Berakee” and “Wilgaroo” properties. However, should either of the two landowners request the decommissioning and removal of this road, the gravel materials used to constructed the road would be excavated and either sold or returned to the Quarry site for replacement in the final void. Previously stripped soil would be replaced over the road surface and this returned to agricultural land.

3.13.2 Land Use and Rehabilitation Objectives

The Applicant is committed to an integrated approach to the rehabilitation of all the areas of proposed disturbance resulting from the operations within the Quarry. The following land use objectives have been adopted when developing the rehabilitation procedures for the Project.

- To produce a safe and stable final landform that provides a livestock shelter and water storage for ongoing agricultural/grazing activities.
- To minimise disruption to existing drainage patterns, achieve a stable and functional drainage system on the Project Site and prevent any detrimental impacts on water quantity and quality.
- To minimise the environmental impact of all site earthworks associated with environmental controls and rehabilitation activities.

The rehabilitation objectives for the Project Site have been divided into three phases based on the rehabilitation phases hierarchy provided in the Guidelines. The specific rehabilitation objectives for each phase are outlined below.



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Extraction Area
- Stockpile Area
- Low Intensity Grazing
- Passive Biodiversity Conservation
- Retained Steep Face with Shrub_Grasses on Benches
- Water Storage
- Cross Section Location
- Flow Lines
- Retained Road (Farm Access)

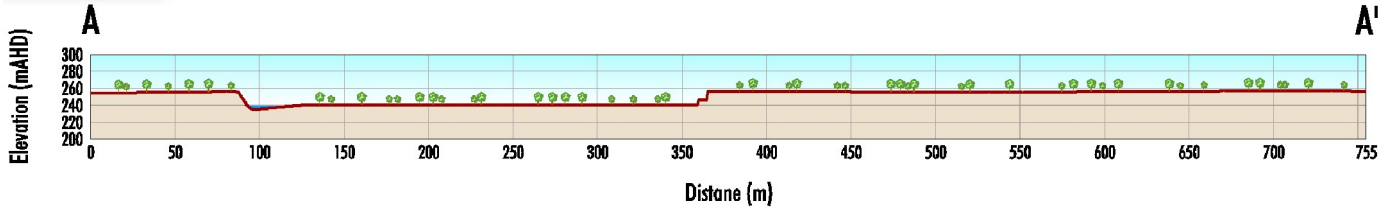


FIGURE 3.3

Conceptual Final Landform and Land Use

Image Source: ESRI (2020) Data source: NSW DFSI (2020)

Phase 1: Decommissioning and Landform Establishment

- Remove all processing-related infrastructure on the Project Site.
- Stabilise all disturbed areas and minimise erosion and dust generation.
- Provide a geotechnically stable, safe and non-polluting landform which provides land suitable for the final land use of grazing and passive biodiversity conservation.

Phase 2: Growth Media Development and Ecosystem Establishment

- Provide for soil management over the life of the Quarry which addresses the constraints related to stripping, storage and replacement on the final landform.
- Achieve a soil profile capable of sustaining the specified final land use.
- Where the intended final land us is low intensity grazing, establish pasture species consistent with that of surrounding agricultural properties.
- Where the intended final land use is passive biodiversity conservation, establish native tree, shrub and grass species comparable with the existing vegetation communities in the area. Where feasible and material is available, provide for surface micro-habitats such as fallen timber, surface rocks or other features which would encourage colonisation by native flora and fauna.

Phase 3: Ecosystem Development (Final Land Use)

- Return all disturbed areas to a final land use of low intensity grazing and passive biodiversity conservation areas through establishment and conservation of areas of native vegetation comprising woodland and grassland species.

3.13.3 Rehabilitation Methods and Procedures

3.13.3.1 Infrastructure Decommissioning and Removal

Site infrastructure will be decommissioned and removed by a licenced contractor and taken off-site for disposal or re-sale. The existing water storage dam and sediment basin for the Project Site will be retained post-closure to support future agricultural land uses. The Proponent is committed to engaging with stakeholders as part of the closure process for the Project site and will consider the merits of retaining infrastructure if agreed upon in consultation with landholders and the local council area.

Concrete foundations for infrastructure areas and any sealed roads within the Project site will be broken up and removed.

Hydrocarbon storage areas, explosives storage and other hazardous materials storage areas will be inspected for contamination as part of the decommissioning process. If contamination is identified, the area would be excavated by a licenced contractor and transferred to a licenced facility for disposal.

3.13.3.2 Landform Establishment

At the completion of extraction activities, a bulldozer would be used to rip the surface of the final quarry floor, with minor profiling works then completed to ensure that all water drains to a single location within the void. The dozer would also be used to rip the Processing and Stockpiling Area with the rock transferred to the extraction area for placement against selected walls. The underlying soil would be ripped and profiled to recreate the pre-disturbance topography of the Quarry site.

Void

A geotechnical review of the Quarry will be undertaken to confirm if the final void and proposed landform is safe and stable. The floor of the extraction area will be ripped to assist in the keying of soil to be spread over this area (refer to **Section 3.13.3.3**).

Final profiling will be undertaken to ensure drainage of rainfall and runoff to the southwestern corner of the extraction area to promote water storage and prevent waterlogging of the floor.

Surface

Following the removal of infrastructure, compacted areas and roads within the Project Site will be ripped to break-up the hardstand surface to allow for re-vegetation. The disturbed areas will be reshaped to appropriate grades and the final landform will be free draining.

What limited overburden or excess subsoil is available would be used to create undulations on the surface landform. A bulldozer, front-end loader or backhoe would be used to shape this material such that water drains to the retained water storage (SD-1) to the southeast.

The profiled landform will be ripped or scarified to allow for the application of growth media and seedstock.

3.13.3.3 Growth Media and Vegetation

Topsoil stockpiles will be re-spread over the profiled final landform including the floor of the proposed final void. The depth of topsoil spread will be dependent on the amount salvaged, however, the objective is to provide for between 10 cm and 20 cm. If necessary, topsoil or other suitable growth media will be sourced off-site to replicate pre-extraction topsoil levels.

The proposed final land use for the Quarry site is low intensity grazing and passive biodiversity conservation for small areas of native vegetation. Appropriate native grass and woodland tree species will be used to replicate pre-extraction vegetation and to ensure compatibility with surrounding native vegetation. Seed to be used for revegetation activities would be obtained from a local, reputable nursery or seed wholesaler and until required would be stored off the Project Site in a cool, dry place.

Fertiliser and water would be applied over the reseeded areas as necessary and a weed control program would be undertaken in conjunction with other property activities.

3.13.3.4 Monitoring

The need for ongoing monitoring will be determined following the establishment of vegetation communities. At a minimum, the condition of established vegetation will be monitored annually until the vegetation communities established are considered self-sustaining and representative of pre-extraction vegetation. Vegetation monitoring will be undertaken by a suitably qualified ecologist and the findings will be reviewed annually to determine if additional management measures are required to ensure the establishment of suitable vegetation communities e.g. weed and pest management programs.

Any retained water bodies, including the sediment basins, will be stabilised and tested prior to relinquishment to ensure they are capable of supporting future land uses common in the area e.g. stock use. Additionally, water quality runoff will be assessed prior to relinquishment to ensure that no water quality impacts are predicted from the final landform drainage design.

3.13.3.5 Implementation

Implementation of the rehabilitation strategy and achievement of rehabilitation objectives for the Project Site is the responsibility of the Quarry Manager. The critical requirements in regards to implementation of the Project Site's rehabilitation strategy are as follows.

- Ensure that the extraction area remains within the approved limits and conditions of development consent.
- Understand the commitments made in this EIS with respect to rehabilitation.
- Ensure rehabilitation monitoring obligations are adhered to (if required).
- Ensure funds are provided to achieve the project site's rehabilitation and final landform.
- Ensure site personnel are aware of rehabilitation objectives and requirements to achieve the final landform.

The Proponent will allocate a value to be spent each year for the purposes of rehabilitation. The cost to rehabilitate the Project Site will be reviewed periodically to ensure suitable allocation of funds over the ensuing years to rehabilitation.

3.14 Alternatives Considered

A number of alternatives were considered when planning the Project, as identified in **Table 3.6**.

Table 3.6 Alternatives Considered

Alternative	Description	Comment
Modified extraction area	An extraction area of reduced surface area but increased depth (below the approved maximum depth of 240 mAHD).	Potential impacts on groundwater eliminated this option from consideration.
	An extraction area of the same surface area but increased depth (below the approved maximum depth of 240 mAHD).	Potential impacts on groundwater eliminated this option from consideration. The extractable resource would be increased to > 5 Mtpa, thereby triggering assessment as State Significant Development.
	Extension of the extraction area to the west (with reduction in extension to the north and south). The better quality basalt occurs to the west and recovery of this could be maximised.	Potential impacts on an Aboriginal heritage item and native vegetation eliminated this option from consideration.
Modified stockpile area	A smaller stockpiling area was considered which would reduce the stockpiling capacity below the objective 250,000 t.	The current stockpile area occurs over land cleared by the previous, landowner and does not impact on any areas of biodiversity or heritage significance. The need to retain relatively large quantities of basalt to supply the Inland Rail Project eliminated this option from consideration.

Alternative	Description	Comment
Lower production rate	A production rate lower than the proposed rate of up to 490,000 tpa.	A production rate lower than the proposed rate of up to 490,000 tpa would reduce competitiveness to supply the Inland Rail Project. As such, this option was eliminated from consideration.

A final alternative considered was one of doing nothing, i.e. continuing to operate in accordance with the existing consent and Quarry plan. The 'do nothing' option was considered undesirable as it does not allow Regional Hardrock to maximise the efficient use of an existing high-quality resource to meet the needs of major infrastructure projects in the region while providing economic benefits to the local community. Without the Project, the Quarry would be limited in its ability to assist in meeting the peak demands of major infrastructure projects.

If this demand is not able to be met by existing approved resources, a greenfield development may be required. A greenfield development would have increased direct environmental impacts and would not represent an efficient use of existing resources approved for this purpose. The existing Quarry operates in a 'closed system', with reduced environmental impacts as there is minimal opportunity for potential contaminants to escape into surrounding environments. Establishing a new Quarry would see a similar setup, however, the extent of disturbance required to establish this operational system would be significant and unnecessary as the existing Quarry has potential to expand with minimal disturbance to the environment or nearby receptors.

4.0 Issue Identification and Prioritisation

4.1 Issue Identification

4.1.1 Approach

In order to undertake a comprehensive assessment of the environmental impacts arising from the proposed modification, appropriate emphasis needs to be placed on those issues likely to be of greatest significance to the local environment, neighbouring landowners and residents, and the local and broader community. To ensure this has occurred, the following has been undertaken to identify relevant environmental issues for assessment:

- a program of community and government agency consultation,
- a review of environmental planning documentation, and
- a review of environmental performance.

4.1.2 Stakeholder Engagement

4.1.2.1 Community Consultation

On 9 November 2020, Mr Scott Lancaster (Regional Group Major Projects Manager) visited the landowners and residents considered most likely to be affected by the Project. Where owners or residents were available, Mr Lancaster discussed the Project and invited feedback on issues of concern. To each person, a Community Information Sheet (CIS), containing key details on the proposed Project and an invitation to identify key issues of concern, was provided. Where Mr Lancaster was unable to meet with the landowner or resident on the day, a copy of the CIS (which is provided as **Appendix 3**) was left in the property letterbox or at the door of the residence.

Table 4.1 provides a summary of the consultation undertaken, issues raised, any follow-up completed and the relevant section in the EIS where the issues are addressed. As identified in **Table 4.1**, concerns. Queries and feedback have been taken into consideration in the relevant sections of this EIS.

4.1.2.2 Government Consultation

A Preliminary Environmental Assessment was initially submitted to the DPIE, along with DPIE Form A, on 6 August 2020 to support a request for SEARs for the Project. At that time, acquisition of Lot 1 DP1265657, on which the Quarry is located, was pending exchange of contracts and settlement and the DPIE requested the request for SEARs be reissued once acquisition was complete.

On 27 August 2020, the PEA, Form A and request for SEARs was resubmitted. After consulting with relevant integrated and other government agencies, SEARs were issued for the proposed quarry extension on 24 December 2020.

Table 4.2 provides a tabulated summary of the DPIE issued SEARs, along with the section of the EIS in which these are addressed.

Table 4.1 Community Consultation

Property Reference[1]	Face to Face Discussion	Letterbox Drop	Issues Raised	Follow-up Response	Addressed in Section
B	✓		No issues raised		
C	✓		Raised dust from the Private Haul Road as an issue		**Section 5.3**
D		✓	Raised an issue as to the impact of drilling and blasting on groundwater resources		**Section 5.5**
E	✓		No issues raised		
F	✓		No issues raised		
G	✓		No issues raised		
I	✓		Requested an opportunity to meet with a representative from Regional Group to discuss the Project	The General Manager of Regional Group emailed the landowner on 16 November 2020 and offered to meet again to discuss the Project.	-
			Noted that there was an insufficient amount of time allowed to respond to the CIS		-
			Queried the source and volume of water required for Quarry operations and the impact of water use on surrounding farms		**Sections 5.4** (Surface Water) & **Section 5.5** (Groundwater)
			Queried how the Proponent will control dust from operations and asked about the possibility of sealing the Private Haul Road		**Section 5.3**
			Noted potential impacts of operation times and vehicle movements. The property owner suggested that onsite works should be limited to standard business hours and trucks should be limited to 8.00 am to 6.00 pm. The property owner suggested that Saturday hours should be reduced		**Section 5.1** (traffic) and in **Section 5.2** (noise)
			Suggested that trucks be limited to not using compression brakes as there are two residential properties near where the turning lane is located		**Section 5.2**
N	✓		No issues raised		
P	✓		No issues raised		
Q		✓	Email received on 13 November 2020 with concerns raised over extra crushing noise, extra truck movements and resultant dust caused, and potential impacts on surface water.	The General Manager of Regional Group emailed the landowner on 16 November and offered to meet again to discuss the Project.	**Section 5.1** (traffic), **Section 5.2** (noise), **Section 5.3** (air quality)

Note 1: Refer to **Figure 2.1**

Table 4.2 Coverage of SEARs

SEARs for the Project	Addressed in Section
General Requirements	
The Environmental Impact Statement (EIS) for the development must comply with the requirements in Clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. In particular, the EIS must include:	
• an executive summary;	p. i
• a comprehensive description of the development, including: ○ a detailed site description and history of any previous quarrying on the site, including a current survey plan;	**Sections 1.3, Section 2.0**
○ identification of the resource, including the amount, type, composition;	**Section 3.4.1**
○ the layout of the proposed works and components (including any existing infrastructure that would be used for the development);	**Section 3.0** and **Figure 3.1**
○ an assessment of the potential impacts of the development, as well as any cumulative impacts, including the measures that would be used to minimise, manage or offset these impacts;	**Section 5.0**
○ a detailed rehabilitation plan for the site;	**Section 3.13**
○ any likely interactions between the development and any existing/approved developments and land uses in the area, paying particular attention to potential land use conflicts with nearby residential development	**Section 7.3**
○ a list of any other approvals that must be obtained before the development may commence;	**Section 4.1.3** and **Table 4.6**
○ the permissibility of the development, including identification of the land use zoning of the site;	**Section 4.1.3.5**
○ identification of sensitive receivers likely to be affected by the development using clear maps/plans, including key landform areas, such as conservation areas and waterways;	**Figure 2.1**
• a suitable monitoring and reporting procedure to ensure that the total resource extracted by the development does not exceed 5 million tonnes;	**Section 3.4.6**
• a conclusion justifying why the development should be approved, taking into consideration:	
○ alternatives	**Section 3.14**
○ the suitability of the site	**Section 7.3.2**
○ the biophysical, economic and social impacts of the project, having regard to the principles of ecologically sustainable development, and	**Section 7.2.1** and **Section 7.2.2**
○ whether the project is consistent with the objects of the *Environmental Planning and Assessment Act 1979*; and	**Section 7.2.3.1**
• a signed declaration from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.	Following copyright

SEARs for the Project	Addressed in Section
Consultation	
In preparing the EIS for the development, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers and any surrounding landowners that may be impacted by the development.	**Section 4.1.2.2**
The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.	**Section 4.1, Table** 4.1 and **Tables 4.3** to **4.8**
Noise	
Including a quantitative assessment of potential: • construction and operational noise and off-site transport noise impacts of the development in accordance with the *Interim Construction Noise Guideline, NSW Noise Policy* for Industry and *NSW Road Noise Policy* respectively.	**Section 5.2** and **Appendix**
• reasonable and feasible mitigation measures to minimise noise emissions; and	**Section 5.2.5**
• monitoring and management measures;	**Section 5.2.5**
Blasting and Vibration	
• Proposed hours, frequency, methods and impacts; and	**Sections 2.2.4, 5.2.4.4** and **5.2.6.5**
• an assessment of the likely blasting and vibration impacts of the development, having regard to the relevant ANZEC guidelines and paying particular attention to impacts on people, buildings, livestock, infrastructure and significant natural features;	**Section 5.2.6.5** and **Appendix 6**
Air	
Including an assessment of the likely air quality impacts of the development in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW. The assessment is to give particular attention to potential dust impacts on any nearby private receivers due to construction activities, the operation of the quarry and/or road haulage;	**Section 5.3** and **Appendix 7**
Water	
Including: • a detailed site water balance and an assessment of any volumetric water licensing requirements, 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;	**Section 5.4.5**
• identification of any licensing requirements or other approvals required under the *Water Act* 1912 and/*or Water Management Act 2000*;	**Section 5.4.2**
• 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)	**Section 5.4.2**
• 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 activities that could cause erosion or sedimentation issues, and the proposed measures to prevent or control these impacts;	**Sections 5.4.4** and **5.4.6**
• an assessment of any likely flooding impacts of the development;	**Sections 2.4.1** and **5.4.6.3**

SEARs for the Project	Addressed in Section
• an assessment of potential 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; and	**Sections 5.4.5** and **5.4.6**
• a detailed description of the proposed water management system, water monitoring program and other measures to mitigate surface and groundwater impacts;	**Sections 5.4.4** and **5.5.4** (and **Figures 5.4** to **5.6**)
Biodiversity	
Including: • accurate predictions of any vegetation clearing on site;	**Sections 5.6.2, 5.6.4** and **Figure 5.7**
• a detailed assessment of the potential biodiversity impacts of the development paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems undertaken in accordance with Sections 7.2 and 7.7 of the *Biodiversity Conservation Act 2016*; and	**Section 5.6.5** and **Appendix 8**
• a detailed description of the proposed measures to maintain or improve the biodiversity values of the site in the medium to long term, as relevant;	**Sections 5.6.4**
Heritage	
Including: • an assessment of the potential impacts on Aboriginal heritage (cultural and archaeological), including evidence of appropriate consultation with relevant Aboriginal communities/parties and documentation of the views of these stakeholders regarding the likely impact of the development on their cultural heritage; and	**Section 5.7.4** and **Appendix 9**
• identification of Historic heritage in the vicinity of the development and an assessment of the likelihood and significance of impacts on heritage items, having regard to the relevant policies and guidelines listed in Attachment 1;	**Section 5.8**
Traffic and Transport	
Including: • accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for transportation of quarry products;	**Section 5.1** and **Appendix 5**
• an assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road networks, detailing the nature of the traffic generated, transport routes, traffic volumes and potential impacts on local and regional roads;	
• an assessment of cumulative traffic impacts on local and State road networks	
• a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network (particularly the proposed transport routes) over the life of the development;	
• evidence of any consultation with relevant roads authorities, regarding the establishment of agreed contributions towards road upgrades or maintenance; and	
• a description of access roads, specifically in relation to nearby Crown roads and fire trails;	
Land Resources	
including an assessment of:	

SEARs for the Project	Addressed in Section
• potential impacts on soils and land capability (including potential erosion and land contamination) and the proposed mitigation, management and remedial measures (as appropriate);	**Sections 5.9** and **5.10**
• potential impacts on landforms (topography), paying particular attention to the long-term geotechnical stability of any new landforms (such as overburden dumps, bunds etc); and	
• the compatibility of the development with other land uses in the vicinity of the development, in accordance with the requirements of Clause 12 of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007	**Section 4.1.3.3**
Waste	
including estimates of the quantity and nature of the waste streams that would be generated or received by the development and any measures that would be implemented to minimise, manage or dispose of these waste streams;	**Sections 3.10**
Hazards	
including an assessment of the likely risks to public safety, paying particular attention to potential bushfire risks and the transport, storage, handling and use of any hazardous or dangerous goods;	**Section 5.12**
Visual	
including an assessment of the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, including with respect to any new landforms;	**Section 5.11**
Social and Economic	
an assessment of the likely social and economic impacts of the development, including consideration of both the significance of the resource and the costs and benefits of the project; and	**Section 5.13**
Rehabilitation	
• a detailed description of the proposed rehabilitation measures that would be undertaken throughout the development and during quarry closure;	**Section 3.13.3**
• 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; and	**Section 3.13**
• the measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy, recognising that a rehabilitation bond will likely be required as a condition of any future development consent.	**Section 3.13.3.5**

The request for assessment requirements was provided to relevant government agencies and public authorities by the DPIE between 9 September and 5 November 2020 with the following providing feedback in relation to assessment requirements.

- Biodiversity and Conservation Division of DPIE – 17 September 2020.
- Department of Primary Industries (Fisheries) – 9 September 2020.
- Department of Primary Industries (Agriculture) – 16 September 2020.

- Geological Survey of NSW, Mining, Exploration & Geoscience (MEG) – 14 September 2020.
- NSW Environment Protection Authority – 15 September 2020.
- DPIE: Crown Lands – 21 September 2020.
- Transport for NSW – 15 October 2020.
- NSW Rural Fire Service – 28 October 2020.
- NSW Natural Resources Access Regulator – 5 November 2020.

Table 4.3 provides a tabulated summary of the comments and assessment requirements received from these agencies, along with the EIS of the section in which these are addressed.

Table 4.3 Agency Issues and Coverage

SEARs for the Project	Addressed in Section
Biodiversity Conservation Division	
General Requirements	
The EIS must assess the impact of the proposed development on biodiversity values to determine if the proposed development is "likely to significantly affect threatened species" for the purposes of Section 7.2 of the *Biodiversity Conservation Act 2016* (BC Act).	**Section 5.6** and **Appendix 8**
The exact nature of the impact should be confirmed by applying the Biodiversity Offset Scheme Entry Thresholds tool and a Test of Significance. Any determined impacts must be managed in a Biodiversity Development Assessment Report.	
The EIS must consider the likely impacts to water from the proposed development, and risks associated with flooding are to be addressed	**Sections 2.4.1, Section 5.4** and **Section 5.5**
Where there is potential for the development to be within, adjacent to, or in close proximity to NPSW managed conservation estate (or watercourse that flows directly into NPSW managed conservation estate) then the EIS must address likely impacts Consideration of the matters identified in the Guidelines for developments adjoining land managed by the Office of Environment & Heritage (OEH 2013) where a proposal adjoins or is immediate vicinity of NPWS managed estate, or is upstream of NPWS managed estate, Department under the *National Parks and Wildlife Act 1974*.	**N/R**
Biodiversity	
Biodiversity impacts related to the Project are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method.	**Section 5.6** and **Appendix 8**
The BDAR must document the application of the avoid, minimise and offset hierarchy including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	**Section 5.6** and **Appendix 8**

SEARs for the Project	Addressed in Section
The BDAR must include details of the measures proposed to address the offset obligation as follows: • the total number and classes of biodiversity credits required to be retired for the Project. • the number and classes of like-for-like biodiversity credits proposed to be retired. • the number and classes of biodiversity credits proposed to be retired in accordance with the variation rules. • any Project to fund a biodiversity conservation action. • any Project to make a payment to the Biodiversity Conservation Fund.	**Section 5.6**
If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	N/A
The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the Biodiversity Conservation Act 2016.	**Appendix 8**
NPWS Managed Estate	
Where NPWS managed estate is likely to be impacted, the EIS should include the following (as appropriate): A description of the mitigation and management options that will be used to prevent, control, abate or minimise identified direct and indirect impacts associated with the proposal. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.	**N/R** **(NPWS Estate not affected)**
Water	
THE BCD advises the EIS is to maps features relevant to water, describe background conditions for any water resource likely to be impacted by the proposal, assess the impacts on water quality and assess the impact of the proposal on hydrology.	**Section 5.4** and **Section 5.5**
Department of Primary Industries (Agriculture)	
DPI advises that the Environmental Impact Statement for extractive industry Projects must consider any surrounding agricultural industries and resources as potential receptors of identified impacts. The guidelines below provide information on potential agricultural impacts for consideration by these types of development. • Land Use Conflict Risk Assessment Guide • Agricultural Issues for Extractive industry Development • Infrastructure Projects on rural land	**Section 5.10**
Regional NSW – Geological Survey of NSW, Mining, Exploration & Geoscience (MEG)	
All environmental reports (EIS or similar) accompanying Development Applications for extractive industry lodged under the Environmental Planning & Assessment Act 1979 should include a resource assessment which: • Documents the size and quality of the resource and demonstrates that both have been adequately assessed; and • Documents the methods used to assess the resource and its suitability for the intended applications.	**Section 3.4.1**

SEARs for the Project	Addressed in Section
Environment Protection Agency	
The EPA requires the following to be adequately described and assessed: 1. Confirmation of the entity that would be the holder of any environment protection licence issued by the EPA. 2. Noise and vibration – proximity to any sensitive receivers and identification of noise sources and mitigation measures. 3. Air quality – proximity to any sensitive receivers and identification of dust and other air emissions and mitigation measures during both construction and operational activities. 4. Erosion and sediment control and site wide water management.	**Sections 4.1.3.2, 5.2** and **5.3, 5.4.4.** **Appendix 6** and **Appendix 7**
By virtue of Clauses 19 and 16 of Schedule 1 of the Protection of the Environment Operations Act 1997 (POEO Act), the Proponent would also require an environment protection licence issued from the EPA, should approval be granted. The Proponent would need to apply separately to the EPA for such a licence.	**Section ?**
Transport for New South Wales	
A Traffic Impact Assessment (TIA) should be prepared to outline measures to address and manage traffic related issues generated by the development.	**Section 5.1** and **Appendix 5**
The documentation submitted should address the potential impacts on the road network associated with the development during the lifetime of the project, the works required to the existing road infrastructure, the measures to be implemented to maintain the standard and safety of the road network, and the procedures to monitor and ensure compliance.	
A Transport Management Plan and Driver Code of Conduct may be required to outline measures to manage traffic related issues generated by the development.	
For guidance in the preparation of the TIA the applicant is referred to the Austroads publications, particularly the Austroads Guide to Traffic Management Part 12 - Traffic Impacts of Development and Part 3 - Traffic Studies and Analysis and the "Guide to Traffic Generating Developments" prepared by the RTA and similar documentation. As a minimum the TIA is to address the existing and anticipated additional traffic generation on the surrounding road network, peak traffic volumes, vehicle types, travel routes for vehicles accessing the site and provide recommendations for any mitigation measures, such as intersection upgrades, considered necessary to address traffic related impacts.	
Natural Resources Access Regulator	
NRAR is aware that the private haul road crosses over a 3rd order waterway (Calf Pen / Boothaguy Creek) via an existing bed level crossing. If any upgrades are planned to this crossing, or should any activities be included in the final development application that are within waterfront land, NRAR will need to be consulted in regards to the requirement for a Controlled Activity Approval under the Water Management Act 2000	Noted No upgrades required.

In responding, DPI (Fisheries), DPIE: Crown Lands and the NSW RFS did not raise any matters require specific consideration.

A full copy of the SEARs, including the individual assessment requirements of the consulted agencies, is reproduced in **Appendix 2** of this document. Included as an attachment to the SEARs, was correspondence and assessment requirements of Gilgandra Shire Council (discussed below)

The Proponent provided a copy of the PEA to Gilgandra Shire Council in August 2020 seeking assessment requirements. A response from Gilgandra Shire Council was received on 14 September 2020 and **Table 4.4** provides a summary of the comments and assessment requirements received, along with the EIS of the section in which these are addressed.

Table 4.4 Gilgandra Shire Council raised Issues and Coverage

Comment/Issue	Addressed in Section
Land disturbed by quarry activities beyond 2 ha should be assessed in the EIS as not being currently disturbed unless lawful disturbance and be demonstrated	Section 5.6
The ability to use Ostlers Lane and Berida-Innisfail Road has expired and was restricted to trucks carrying less than 32 t of material in any case	Section 1.3
Gilgandra Shire Council will expect that the private haulage road will be made all weather to avoid tracking mud onto the Oxley Highway and to ensure public roads are not used in wet weather. A traffic Management Plan should be included in the EIS	Section 5.1
A sediment and erosion plan for the quarry, material storage areas and the private haulage route should be included in the EIS	Section 5.4.4
The EIS will need to provide sufficient information to allow Gilgandra Shire Council to address the following LEP clause: 7.1 Biodiversity protection 1) The objective of this clause is to maintain terrestrial and aquatic biodiversity, including the following - a) protecting native fauna and flora, b) protecting the ecological processes necessary for their continued existence, c) encouraging the recovery of native fauna and flora and their habitats. 2) This clause applies to land identified as “Biodiversity Sensitivity” on the Sensitivity Biodiversity Map. 3) Before determining a development application for development on land to which this clause applies, the consent authority must consider any adverse impact of the proposed development on the following - a) native ecological communities, b) the habitat of any threatened species, populations or ecological community, c) regionally significant species of fauna and flora or habitat, d) habitat elements providing connectivity. 4) Development consent must not be granted to development on land wo which this clause applies unless the consent authority is satisfied that - a) the development is designated, sited and will be managed to avoid any adverse environmental impact, or b) if that impact cannot be avoided - the development is designated, sited and will be managed to minimise that impact, or c) if that impact cannot be minimised - the development will be managed to mitigate that impact.	Section 5.6
The EIS will need to explain the differences in native vegetation assessment (compared to the 2017 EIS) and clearly describe the current vegetation communities and the impact of the proposed quarry on them	Section 4.1.4 (prior clearing) and Section 5.6

Comment/Issue	Addressed in Section
The ecological impact of losing tree hollows and what can be done to offset any impacts needs to be addressed in the EIS	Section 5.6
Gilgandra Shire Council will expect biodiversity to be addressed comprehensively with appropriate offsets to unavoidable impacts addressed in the EIS. This assessment will need to include work on the private haulage route	Section 5.6
The impacts of dust, noise, vibration and blasting will need to be assessed specifically to this site and not solely by reference to other similar sites. Data collected from blasting and crushing operations conducted on this site in relation to the existing quarry approval should be included	Sections 5.2 and 0
The EIS should address site facilities including toilets, drinking and hand washing water and wastewater disposal at the site that meets Gilgandra Shire Council requirements	Section 3.8
An assessment of bushfire hazard and risk is expected and storage of water for firefighting should also be addressed in the EIS	Section 5.12.3
The land is subject to the Siding Spring Observatory - maintaining dark sky provisions in Gilgandra LEP 2011. This will need to be addressed in the EIS	Section 4.1.3.4
Gilgandra Shire Council will expect a comprehensive Aboriginal archaeological assessment of the subject land by a suitably qualified person including consultation with the relevant LALC	Section 5.7
Council will expect a clear plan and timetable for site rehabilitation including milestones for rehabilitation within the first five years and then over the life of the Quarry to avoid problems in the long term once the resource has been exhausted	Section 3.13
A community and stakeholder engagement report including direct consultation with property owners within 1 km of the Quarry site and wider community views and feedback	Section 4.1.2
The EIS will address the form and content requirements of all relevant legislation and the requirements of other agencies	Sections 4.1.2 and 4.1.3

4.1.3 Strategic and Statutory Context

This section provides details of the relevant State and Commonwealth legislation and planning provisions and a discussion of their application to the Project.

4.1.3.1 Commonwealth Legislation

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), approval from the Commonwealth Minister for the Environment is required for any action that may have a significant impact on matters of National Environmental Significance. These matters are:

- World Heritage Places
- National Heritage Places
- Wetlands of International Significance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth Marine Parks

- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development.

The only provisions of this legislation which are potentially relevant to the Project relate to potential impacts on migratory species, threatened species, or ecological communities listed under the EPBC Act. Further detail regarding the assessment of impacts on biodiversity and these matters of national environmental significance is provided in **Section 5.6**. The Project is not predicted to significantly impact on migratory species, threatened species or ecological communities listed under the EPBC Act and referral to the Commonwealth Minister for the Environment is not required.

4.1.3.2 NSW Legislation

Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is administered by the DPIE and local government. It is the primary legislation governing environmental planning and assessment in NSW.

In determining a development application, the consent authority must take into consideration the matters referred to in section 4.15(1). These matters for consideration and the sections where they are addressed in this EIS are provided in **Table 4.5**. An assessment of relevant environmental impacts associated with the Project is contained in **Section 5.0**.

Table 4.5 Section 4.15(1) Matters for Consideration

Matters for Consideration	Relevant EIS Section
(a) the provisions of— (i) any environmental planning instrument	Section 4.1.3
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and	N/R
(iii) any development control plan	Section 4.1.3.5
(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4	Not Applicable
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph)	Not Applicable
(v) repealed that apply to the land to which the development application relates,	Not Applicable
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	Section 5.0
(c) the suitability of the site for the development	Sections 2.0 and 7.3.2
(d) any submissions made in accordance with this Act or the regulations	Not Applicable
(e) the public interest	Section 7.3

The objectives of the EP&A Act relevant to the Project are as follows:

- Facilitate ecologically sustainable development (ESD).

  Consideration of the principles of ecologically sustainable development has been addressed in **Section 7.2.2**.

- Promote and co-ordinate the orderly and economic use and development of land

  The Project provides for the continuation and improved efficiency of an extractive industry supplying basalt aggregates and gravel products. The Project will facilitate the future development of land by enabling the efficient rehabilitation of the Quarry site to a landform suitable for agricultural or other agreed purposes.

- Protect the environment including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.

  As discussed in **Section 5.0**, the Project is unlikely to result in any additional impacts to native flora and fauna, ecological communities or habitats.

  Measures to protect the environment are presented as a consolidated summary in **Section 6.0**.

- To provide public involvement and participation in the planning and assessment process.

  The public have been consulted regarding the Project and have been given the opportunity to provide input to the EIS process and will be provided the opportunity to make a submission during the exhibition process. Further details of the consultation process are provided in **Section 4.1.2**.

On the basis of the above, it is considered that the Project meets the relevant objectives of the EP&A Act.

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the EPA and provides licences relating to air, water, and noise pollution, and waste management. An environmental protection licence (EPL) will be required for the operation of the proposed quarry, given that it will produce emissions relating to noise, air and water impacts. The Quarry currently operates under EPL 21093 (refer to **Appendix 1**), which was transferred from the previous owner/operator of the Quarry in August 2020, and which will be varied subject to General Terms of Approval to be issued by the EPA following review of the development application.

Water Management Act 2000

The *Water Management Act 2000* (WM Act) controls the extraction and use of water, the construction of works such as dams and weirs, and the carrying out of activities in or near water sources in NSW. 'Water sources' are defined very broadly to include any river, lake, estuary or place where water occurs naturally on or below the surface of the ground and NSW coastal waters.

Part 2 of the WM Act applies to the requirement to obtain a licence for the 'taking of water' from a water source. An access licence entitles its holder to specified shares in the available water within a specified water management area or from a specified water source. It enables the licence holder to take water from the environment in accordance with specified rates and conditions under the terms of the licence. The licensing provisions apply to areas of NSW that have a water sharing plan (WSP).

The extraction area has been designed to remain above the groundwater table and so will not require an approval under the WM Act for the void constructed. As noted in **Section 3.9.2**, the Quarry will potentially require groundwater to supplement water obtained from surface water harvest. This will require either the existing bore on Lot 2 DP1265657 (GW011693) or the new bore currently being drilled to obtain a Water Supply Work / Use Approval (in accordance with Sections 89 and 90) for industrial purpose. Once approved, a Water Access Licence will be required for the volume of water extracted each year (in accordance with Section 61).

Other NSW Legislation

A summary of the other State environmental and planning legislation potentially relevant to the Project is provided in **Table 4.6**.

Table 4.6 Summary of Other State Legislation

Act	Comment	Further Approval Required?
National Parks and Wildlife Act 1974 **(NP&W Act)**	An Aboriginal Heritage Impact Permit is required under Section 90 of the NP&W Act to harm an Aboriginal object. The site does not contain any identified Aboriginal archaeological sites and as such there is currently no requirement to obtain specific approvals relating to Aboriginal cultural heritage.	No
Heritage Act 1977 **(Heritage Act)**	No heritage sites will be affected, and no excavation permits are required under this Act for works associated with the Project.	No
Environmentally Hazardous Chemicals Act 1985 **(EHC Act)**	The EPA is granted power under the EHC Act to assess and control chemicals and declare substances to be chemical wastes. A licence is required for any storage, transport or use of prescribed chemicals. The Project will not result in any changes to the storage, transport or use of prescribed chemicals.	No
Roads Act 1993 **(Roads Act)**	The Roads Act determines the rights of the public and adjacent landowners to use public roads and establishes procedures for the opening and closing of public roads. Under the Roads Act applications are required to be made for the closure of roads and for works in road reserves. The RMS was provided with a preliminary version of the Traffic Impact Assessment for the Project and did not identify any issues with road capacity. No road closures or road works are therefore proposed as part of this Project.	No
Crown Land Management Act 2016 **(Crown Lands Act)**	The Crown Lands Act commenced on 1 July 2018 to improve the way that Crown reserves are managed and to strengthen community involvement. As noted above, no road closures or road works are proposed as part of the Project and no areas of Crown land would be affected.	No

4.1.3.3 State Environmental Planning Instruments

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 200*7* (Extractive Industries SEPP) regulates the permissibility and assessment requirements for mining, petroleum production, extractive industries and related development. The Extractive Industries SEPP outlines where various extractive industry activities are permissible both with and without development consent. The Extractive Industries SEPP also defines mining, petroleum production and extractive industries developments that are prohibited, exempt or complying developments.

Part 3 of the Extractive Industries SEPP requires specific matters to be considered in relation to development applications. These include:

- Compatibility with other surrounding land uses (including other extractive industries) (refer to various parts of **Section 5.0**)
- Natural resource and environmental management (refer to **Sections 5.6, 5.9** and **5.10**)
- Resource recovery (refer to **Section 1.0**)
- Transport (refer to **Section 5.1**)
- Rehabilitation (refer to **Section 3.13**).

State Environmental Planning Policy (Koala Habitat Protection) 2019

It is noted that the former SEPP 44 was repealed and to be replaced by this SEPP. As of December 2020, the SEPP had not been endorsed by NSW parliament and is not currently in force. For the purpose of this EIS, it is considered the most relevant to the assessment of impact on koala or koala habitat.

The Project Site is identified as an area that could provide habitat for koalas. A biodiversity assessment has been completed (refer to **Appendix 8**) and determined that no koala habitat is present.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

Hazardous and offensive industries, and potentially hazardous and offensive industries, relate to industries that, without the implementation of appropriate impact minimisation measures, would (or potentially would) pose a significant risk in relation to the locality, to human health, life or property, or to the biophysical environment.

In accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33), the hazardous materials to be held or used within the Quarry site are required to be identified and classified in accordance with the risk screening method contained within the *Appendix 4* of *Applying SEPP 33 January 2011* (DoP, 2011). Hazardous materials are defined within that document as substances falling within the classification of the Australian Code for the Transportation of Dangerous Goods by Road and Rail (Dangerous Goods Code) (Department of Infrastructure, Transport, Regional Development and Local Government, 2009).

The Applicant notes that the potentially hazardous goods that would be used or stored within the Project Site would include diesel and other hydrocarbons, which are classified as Combustible Liquids (C1). As no other flammable materials would be used or stored on the Project site, Combustible Liquids (C1) are not considered to be potentially hazardous (refer to Section 7.1 of DoP, 2011). No risk screening is therefore required and SEPP 33 is not considered further in this EIS.

4.1.3.4 Regional Planning Matters

The land is subject to the Siding Spring Observatory - maintaining dark sky provisions in Gilgandra LEP 2011. This is addressed below.

Dark Sky Planning Guideline

The Dark Sky Planning Guideline (DPE, 2016) is required to be considered for planning approval applications for Designated Development within 200 km of the Siding Springs Observatory and for planning approval applications within the Dubbo Regional LGA. The proposed modification is located within 200 km of the Siding Springs Observatory.

The approved hours of operation for the Quarry (refer to **Section 3.11**) are 7.00 am to 6.00 pm Monday to Friday and 7.00 am to 3.00 pm on Saturday. Truck haulage is permitted between 5.00 am and 10.00 pm Monday to Friday and 5.00 am to 6.00 pm on Saturday. The hours of operation ensure light emissions from the Quarry will not affect the Siding Springs Observatory. Dust emissions from the Quarry will be managed in accordance with the existing Air Quality Management Plan (AQMP) to ensure the proposed modification does not contribute to artificial skyglow.

4.1.3.5 Local Planning Requirements

Gilgandra Local Environmental Plan 2011

The Project Site is located within the RU1 Primary Production zone under the *Gilgandra Local Environmental Plan 2011*. Extractive industries are permissible within this zone with development consent and are consistent with the following objective of the zone:

> *To allow the development of non-agricultural land uses that are compatible with the character of this zone.*

The maps of the Gilgandra LEP have been reviewed and there are no restrictions with respect to heritage (Map HER_002) or water resources (Map CL1_002). The Project Site is identified over an area of 'Biodiversity Sensitivity' (Map NRB_002). As such, Clause 7.1 Biodiversity Protection applies to the development application. Clause 7.1 requires that:

3. *Before determining a development application for development on land to which this clause applies, the consent authority must consider any adverse impact of the proposed development on the following:*
    a. *native ecological communities,*
    b. *the habitat of any threatened species, populations or ecological community,*
    c. *regionally significant species of fauna and flora or habitat,*
    d. *habitat elements providing connectivity.*
4. *Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:*
    a. *the development is designed, sited and will be managed to avoid any adverse environmental impact, or*
    b. *if that impact cannot be avoided—the development is designed, sited and will be managed to minimise that impact, or*
    c. *if that impact cannot be minimised—the development will be managed to mitigate that impact.*

These factors are considered in **Section 5.6** which includes avoidance, minimisation and mitigation measures.

Gilgandra Development Control Plan 2011

Section 6.3 of the Gilgandra Development Control Plan 2011 (the DCP) provides the minimum standards for assessment of extractive industries in rural zones. **Table 4.7** identifies the key matters requiring assessment, the relevant sub-section of the DCP and section of the EIS where each matter is addressed.

Table 4.7 Extractive Industries in Rural Zones – DCP Matters for Consideration

Matter (DCP Section)	Description (paraphrased)	Section
Consultation	Evidence of consultation with relevant community groups and local residents	**4.1.2**
Visual Amenity (6.3.1)	Extractive industries must, where appropriate, provide setbacks capable of minimising the visual impact of extraction and processing sites, particularly when viewed from surrounding private and public places.	**5.9**
Noise and Vibration (6.3.2)	An impact assessment of noise sources and modelled noise emissions may be required. The assessment must indicate the proposed measures to maintain the acoustic amenity of the area.	**5.2**
Air Quality and Pollution Control (6.3.3)	Air quality associated with an extractive industry must be managed. These controls must also be extended to the transportation of material from the site, requiring the coverage of all loads leaving the operation.	**0**
Water Resources (6.3.4)	The management of water resources (including ground and surface) within and around the site must be detailed by a comprehensive Water Strategy which must be submitted to Gilgandra Shire Council at the time of development application.	**5.4** & **5.5**
Transport (6.3.5)	Details regarding the extraction and transportation of material to and from the proposed site must be included in the environmental assessment. The design and development of access and haulage roads must be consistent with the requirements of the relevant standards.	**5.1**

4.1.4 Environmental Performance

Operations at the Quarry have been limited to small production volumes to supply local construction projects. As a result, there is limited information available on environmental performance.

It is noted that a Water Management Plan has been prepared for the Quarry, however, a review of compliance with this plan indicates that there have been some modification to water management. In particular, a small sediment basins to the south-east of the approved disturbance footprint for the collection of dirty runoff, which was to discharge and flow to a larger storage dam towards the south-east of the Quarry site, has not been constructed. The capacity of the larger storage dam (SD-1) is sufficiently large enough to accept runoff from a design rainfall event (5-day 95th percentile) and as such the potential for pollution via sediment laden water discharge is appropriately managed.

An inspection of recent aerial photography indicates that there has been clearing of land and stockpiling of material in excess of 2 ha. With respect to this disturbance, the following is noted:

- The land clearing was undertaken over several years (commencing 2017) by the former landowner in accordance with land clearing exemptions provided by Part 2 of Schedule 5A of the *Local land Services Act 2013*. The Proponent notes these activities were undertaken prior to acquisition of Lot 1 DP1265657 and understood these to be permissible at the time of acquisition.
- The stockpiles of extracted and crushed materials have been removed or relocated within the nominated 2 ha footprint of DA 2017/218A by the Proponent.

The Proponent is not aware of any complaints made to the previous operator by neighbours or environmental regulators.

4.2 Issue Prioritisation

For each of the environmental issues identified (refer to **Section 4.1**), a preliminary analysis of the possible impacts was undertaken to determine the specific assessment requirements and level of priority associated with each. This analysis was undertaken in conjunction with a review of the currently approved operations to determine whether the Project would result in any material change to the impacts assessed originally (and therefore warrant further assessment).

The possible impacts of the Project and their level of priority are summarized in **Table 4.8**.

Table 4.8 Summary of Potential Adverse Impacts Resulting from the Proposed Modification

Environmental Issue	Identification				Potential Effect	Priority/Coverage
	CC	GC	PD	EP		
Traffic and Transport	✓	✓	✓		Increased transport associated with the Project has the potential to impact local traffic and a traffic impact assessment is required.	High Priority. A Traffic Impact Assessment has been completed by Cardno (refer to **Section 5.1** and **Appendix 5**)
Noise	✓	✓	✓		While no new noise emission sources are proposed, the increased production and haulage could result in increased noise levels received at receivers surrounding the Quarry.	High Priority. A Noise Impact Assessment has been undertaken to assess the predicted noise emissions against relevant criteria (refer to **Section 5.2** and **Appendix 9**).
Air Quality	✓	✓	✓		While no new air emission sources are proposed, the increased intensity of operations could result in an increase particulate matter levels at receivers surrounding the Quarry.	High Priority. An Air Quality Impact Assessment has been undertaken to assess the predicted air emissions against relevant criteria (refer to **Section 5.3** and **Appendix 7**).
Surface Water	✓	✓	✓	✓	Effective management of water as part of the Quarry operations is a key consideration for the Quarry. The Project will increase the production rate of the Quarry therefore an assessment of the water requirements and potential surface water impacts has been undertaken.	Medium Priority. The Quarry Water Management System, erosion and sediment control management and water balance has been reviewed and management measures provided to mitigate impacts (refer to **Section 5.4**).

Environmental Issue	Identification				Potential Effect	Priority/Coverage
	CC	GC	PD	EP		
Groundwater		✓	✓		The Project does not include an increase in the depth of extraction area which was previously assessed as above the groundwater table	Low Priority. A desktop groundwater assessment has been undertaken (refer to **Section 5.5**).
Biodiversity		✓	✓	✓	The Project requires an increase in the area of disturbance which could potentially impact on local biodiversity. It is noted that large areas of the Quarry site have been pasture improved and cleared of native vegetation reducing the potential for the presence of native vegetation.	Medium Priority Field survey of the Quarry site and assessment of potential impacts has been completed in compliance with *Biodiversity Conservation Act 2016* requirement (refer to **Section 5.6**).
Cultural Heritage		✓	✓		The Project requires an increase in the area of disturbance which could potentially impact on or sites of cultural heritage significance. It is noted previous field survey of land on the Quarry site (OzArk, 2017) did not identify any sites and assessed the probability of intact sites being present as low.	Medium Priority Field survey and impact assessment of the Quarry site has been completed in consultation with local Aboriginal representatives (refer to **Section 5.7**). A desktop review of historic (non-Aboriginal) heritage has been completed (refer to **Section 5.8**).
Land Resources (Landforms, Soils and Agricultural Resources)		✓	✓		The overall approach to rehabilitation of the Quarry will remain unchanged, however, some modification to the proposed final landform will be required given the increase in area.	Low Priority A review of the proposed final landform and rehabilitation has been provided (refer to **Section 5.9**).
Visual Amenity			✓		The Project will increase the area of disturbance and with the potential for larger stockpiles of Quarry products could increase the visibility of operations. It is noted that the closest vantage point to the Quarry site remains several kilometres away.	Low Priority **Section 5.11** provides a review of the potential visibility of the Quarry from local vantage points.
Hazard and risk			✓		Existing operations at the Quarry are not considered as hazardous or offensive. The proposed modification will not result in any changes to the existing operations which would alter this classification. No changes likely to influence potential for fire on the Quarry site are proposed.	Low Priority **Section 5.11.5** provides a review of the potential hazards associated with the Project, management and assessment of residual impacts.

Environmental Issue	Identification				Potential Effect	Priority/Coverage
	CC	GC	PD	EP		
Waste Management		✓			The Project would result in an increase in the production rate and as a result an increase in the volume of waste produced. No wastes produced by the Quarry are considered to be dangerous or hazardous with standard management practices to be implemented.	Low Priority A review of waste management at the Quarry is provided in **Section 3.10** based on the request for assessment made by the EPA. No further assessment required.
Contaminated land			✓		A November 2020 search of the NSW EPA contaminated land database identified that there are no registered contaminated sites in proximity to the Quarry	Further assessment not required.
Socio-economic Setting		✓	✓		The Quarry provides a source of employment and economic contribution to the Gilgandra economy which would be increased should the Project be approved. The Quarry has the potential to impact on surrounding properties, however, the potential for adverse impact is considered reasonably minimal given the relative isolation of the Quarry and proposed management of operations.	Medium Priority. The relative costs (impacts) and benefits (contributions) of the Proposed Modification are reviewed and assessed (refer to **Section 5.13**).

CC = Community Consultation GC = Government Consultation and Environmental Assessment Requirements
PD = Planning and Policy Documents EP = Environmental Performance

5.0 Environmental Impact Assessment

5.1 Traffic

5.1.1 Introduction

The SEARs require an assessment of the potential impact of the Project on traffic and transport with specific reference to the provision of:

- accurate predictions of the road traffic generated by the construction and operation of the development
- assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road networks
- description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network
- evidence of any consultation with relevant roads authorities, regarding the establishment of agreed contributions towards road upgrades or maintenance, and
- description of access roads.

TfNSW, consulted by DPIE in the preparation of the SEARs, requested the EIS be supported by a Transport Impact Assessment prepared by a suitably qualified person in accordance with the Austroads Guide to Traffic Management part 12, the Roads and Maritime Supplement to Austroads and the RTA Guide to Traffic Generating Developments. A Traffic and Transport Impact Assessment (TTIA) for the Project was undertaken by Cardno (2021) to address the SEARs and requirements of TfNSW. A complete version of Cardno (2021) is provided as **Appendix 5**, with the following sub-sections drawing on information presented in that report to describe the existing traffic environment, predicted changes to the traffic environment as a result of the Project, the proposed management and mitigation measures and an assessment of traffic related impacts.

5.1.2 Local Setting

5.1.2.1 Road Network

The key road network relevant to the Project is as follows.

Oxley Highway

The Oxley Highway (State Highway No 11) is under the care and maintenance of TfNSW, linking the Mitchell Highway at Nevertire to the Castlereagh Highway at Gilgandra. In the vicinity of its site, Oxley Highway is a two-way two-lane road with a posted speed limit of 110 km/hr with lane widths of 3.5 m and sealed shoulders of at least 0.5 m.

The Oxley Highway is approved for use by heavy vehicles up to 25/26 metre B-double vehicles by TfNSW.

Private Haul Road

As described in **Section 3.3.4.2**, the Private Haul Road is a road designed for heavy or bulk transfer of materials by haul trucks. Within an easement of 22 m, the Private Haul Road comprises a compacted gravel road of 7.0 m, with a 0.75 m shoulder on both side, and roadside drainage (tables and spoon drains) of approximately 1.5 m on both sides of the road (refer to **Figure 3.2**).

Other local roads in the local setting are as follows.

- Berida Innisfail Road. A local unsealed road under the care and maintenance of the local council which links the Oxley Highway in the north to Leeches Creek Road in the south. The main section of the carriageway in Berida Innisfail Road is approximately 10 m wide. The road is configured as a two-lane carriageway with one lane provided for each direction.
- Ostlers Lane. A local road under the care and maintenance of the local council which provides access from Berida-Innisfail Road to the Berakee and several other properties. The main section of the carriageway in Ostlers Lane is approximately 8 m wide. The road is configured as a two-lane carriageway with one lane provided for each direction.

Neither of these roads are to be used for the purpose of Quarry product transportation.

5.1.2.2 Traffic Volumes and Performance

Traffic counts undertaken 980m west of Berida-Innisfail Road near Collie between 17 and 30 April 2015 identified an average of 368 vehicles per day (vpd), evenly split between east and west bound. 17 % of traffic was classed as heavy vehicle. Reported in the *Oxley Highway Draft Corridor Strategy* (TfNSW, 2016), an annual growth rate of 1.4 % was quoted for the Oxley Highway.

With reference to the *Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings*, and other data collected in the Gilgandra LGA, Cardno (2021) have assumed the proportion of traffic within peak hour periods will be 8 % of daily traffic on weekdays and 7 % on Saturdays.

Cardno (2021), with reference to *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis*, Cardno (2021) confirm Level of Service (LOS) provide by both lanes of the Oxley Highway to be A, with a peak hour flow of 30 vehicles per hour (vph).

5.1.2.3 Public Transport

Gilgandra School Bus (GA 01, GP 02) serviced by Ogdens Coaches runs along Oxley Highway between Gilgandra and Collie. A second Gilgandra School Bus (GA 06, GP 06), also serviced by Ogdens Coaches, runs along Berida Innisfail Road. **Figure 5.1** provides the routes for these services which run between the following times:

- GA 01, GP 02 (Gilgandra- Collie): travelling between:
    - 7.57 am and 8.54 am (and expected to pass the Private Haul Road intersection between 8.15 am and 8.25 am), and
    - 3.20 pm and 4.21 pm (and expected to pass the Private Haul Road intersection between 3.50 pm and 4.05 pm)
- GA 06, GP 06 (Gilgandra – Berida-Innisfail Road): travelling between:
    - 7.50 am and 8.54 am, and
    - 3.18 pm and 4.30 pm.

Source: Modified after Cardno (2021) – Figure 3-6

Figure 5.1 School Bus Services

5.1.2.4 Crash History

Cardno (2021) reviewed crash data for the period 2014 to 2018 and identified the following.

- There were no crashes observed at Oxley Highway at Berida-Innisfail Road intersection, or along the alignment of Private Haul Road intersection.
- The majority of crashes are concentrated near the Oxley Highway/Newell Highway intersection.

The results indicate that the existing frequency of crashes is low along Oxley Highway in the vicinity of the Private Haul Road intersection. Cardno (2021) state it is their expectation that the Project would not have a tangible impact on the crash rates at the subject site.

5.1.3 Assessment Methodology

A full description of the assessment methodology implemented by Cardno (2021) is provided by Section 2.0 of that report (refer to **Appendix 5**). In summary,

- Analysis of existing conditions was completed through desktop review of aerial imagery, traffic and road maps, local road data collection and access to publicly available databases. In the collection and compilation of this data, the potential effects of the Covid-19 pandemic on current and future traffic is acknowledged by Cardno (2021), however, it is noted that the data relied upon to established existing conditions (refer to **Section 5.1.2**) was collected prior to March 2020.
- Assessment of parking requirements in accordance with Gilgandra Shire Council's (DCP). For the most part, car parking for employees and visitors has been determined on a first principle approach based on existing and forecast operating conditions.
- The traffic impact of the Project has been determined through:
    - intersection analysis using SIDRA version 8
    - turn warrant criteria based on the relevant Austroads Guide to Road Design guideline, and
    - mid-block assessment based on the criteria within both the TfNSW Guide and *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis*.

The assessment has considered Stage 1 and Stage 2 of the application, each with different traffic profiles and design years. The scenarios assessed for the peak hour assessment are based on the following:

- 2025 Design Year (Base)
- 2025 Design Year (Base + Stage 1 Development)
- 2045 Design Year (Base), and
- 2045 Design Year (Base + Stage 2 Development)

The future year assessments include consideration of regional traffic growth along with the arterial road network (being Oxley Highway).

5.1.4 Predicted Changes to Traffic Environment

5.1.4.1 Roads and Intersections

No changes to roads or intersections are proposed as these are currently considered suitable for the proposed level of traffic.

5.1.4.2 Traffic Volumes

The Project will increase the volume of traffic from the Project Site onto the Oxley Highway by approximately 6 times (under maximum production levels) during Stage 1, reducing to levels equivalent to the current development consent in Stage 2. Noting the average number of truck movement per day will be 70 (approximately 4 per hour), this does not represent a major increase in the average number of truck movements of the existing Quarry (when operating). The increase in traffic during operations will be noticeable in three ways.

- The number of days during which transport operations are undertaken will increase. While the Quarry currently operates very intermittently on a campaign basis to supply small local contracts, operations will be far more consistent when supplying the Inland Rail Project.
- The maximum number of trucks entering and exiting the Project Site will increase from 10 to 20.
- The hours during which trucks enter and exit the Project Site will increase, noting that between 5.00 am and 6.00 am, only pre-loaded trucks will exit the Quarry site and between 6.00pm and 10.00pm, only returning trucks will enter the Quarry site.

5.1.5 Operational Safeguards and Management Measures

5.1.5.1 Operational Safeguards and Management Measures

In order to ensure that the traffic and transport impacts of the Project are minimised, the following management and mitigation measures would be implemented.

- The intersection of the Private Haul Road and the Oxley Highway will be regularly inspected and maintained in good working condition.
- The Private Haul Road will be regularly watered and recompacted to prevent excessive dust emissions and prevent degradation of the road surface.
- The Proponent will enforce the hours of operation for transport. Drivers who do not comply (arrive early/exit late) will be subject to further action.

- A Traffic Management Plan will be prepared which identifies strategies to manage the ongoing impacts of Quarry traffic or address Quarry traffic related matters raised by the local community or council.
- A Driver Code of Conduct, identifying required driver behaviour and enforcement mechanisms for drivers of heavy vehicles, including subcontractors, regularly accessing the Quarry, would be developed and enforced. Regional Group maintains Driver Code of Conducts at all of the quarries it owns and operates.
- Ensure that all loads are covered prior to leaving the Quarry site to prevent loose materials falling onto the roadway or the creation of excessive dust.
- Ensure that all laden heavy vehicles are weighed prior to leaving the Quarry site to ensure that mass limits are not exceeded. Reliance would be placed on drivers to advise the Proponent of the relevant load limits for non-Proponent owned vehicles.

5.1.6 Assessment of Impacts

5.1.6.1 Car Parking Assessment

The Quarry site will provide for 24 car parking spaces, including 1 disabled car parking space, to account for the maximum number of employees anticipated to work on the Quarry site at any given time. In reality, the number of employees would be less than 24, allowing additional car parking spaces for contract personnel and visitors.

Gilgandra Shire Council's DCP does not provide rates for quarry or similar extractive industrial sites and therefore the provision of car parking based on the employee requirements of the site is adequate.

5.1.6.2 Traffic Impact Assessment

Intersection Assessment

Using the SIDRA Intersection 8.0 software package, the following key indicators of intersection performance were calculated for the Private haul Road – Oxley Highway intersection was reviewed under background and background + development Stages 1 and 2 for years 2025 and 2045.

- Level of Service (LOS) measured from A (Good Operation) to F (Unsatisfactory and requires additional capacity)
- Average Vehicle Delay (AVD), and
- Degree of Saturation (DoS) where DOS in the order of 0.7 or less generally represent satisfactory intersection operation and when DOS exceeds 0.9 queues can be anticipated.

The SIDRA Intersection modelling for peak hour traffic, incorporating the additional traffic generated by the Project is summarised in **Table 5.1**.

Table 5.1 Intersection Performance

Intersection	Weekday AM/PM Peak			Saturday Peak		
	DoS	AVD (sec)	LoS	DoS	AVD (sec)	LoS
2025 Design Year (Base)	0.017	6.4	A	0.016	6.	A
2025 Design Year (Base + Stage 1 Traffic)	0.022	6.4	A	0.020	6.4	A

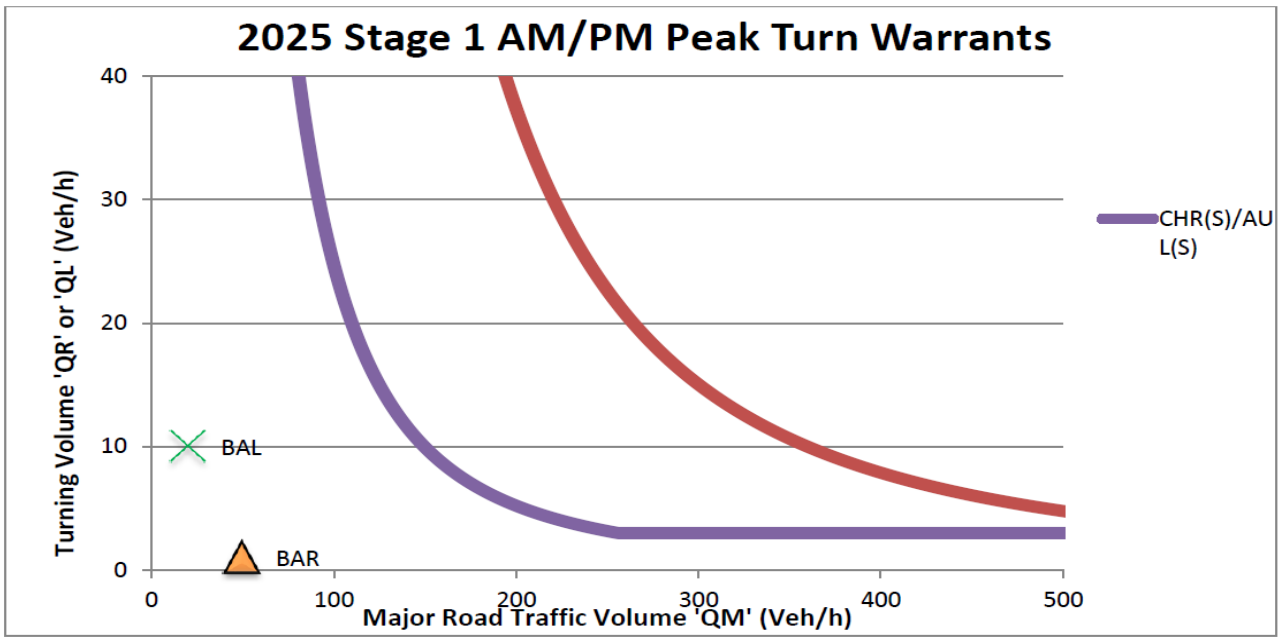
Intersection	Weekday AM/PM Peak			Saturday Peak		
	DoS	AVD (sec)	LoS	DoS	AVD (sec)	LoS
2045 Design Year (Base)	0.021	6.5	A	0.019	6.4	A
2045 Design Year (Base + Stage 2 Traffic)	0.022	6.6	A	0.019	6.5	A

Source: Modified after Cardno (2021) – Table 7-9

The results illustrate that the addition of traffic from the Project would have minimal impact on intersection performance.

Turn Warrant Assessment

Figure 5.2 reviews the traffic levels (during Stage 1) of the Project against the turn warrants of AustRoads Guide to Road Design – Part 4A – Unsignalised and Signalised Intersections.



Source: Modified after Cardno (2021) – Figure 7-6

Figure 5.2 Project Traffic and AustRoads Traffic Warrants

Based on the assessment of Project traffic against the AustRoads Warrants, Cardno (2021) conclude a BAL/BAR treatment, which is currently in place, as sufficient for the volume of traffic to be generated.

Cardno (2021) consider an acceleration lane for vehicles exiting the Private haul Road as unnecessary given that:

- the highest traffic generation from the Project will be restricted to the initial five years of operation
- the amount of opposing eastbound traffic on the Oxley Highway is relatively low, at some 20 vehicles during the peak hour, or 1 vehicle every 3 minutes allowing for sufficient gaps in the traffic stream to accommodate the peak hour generation from the Proposal, and
- there is adequate sight lines to/from the west for vehicles emerging from the Private Haul Road such that there is no road safety deficiency identified that would otherwise be mitigated by the provision of an acceleration lane.

Mid-block Assessment

Cardno (2021) competed the mid-block road capacity assessment using criteria contained within *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis*. **Table 5.2** presents the results of the mid-block assessment for the Private Haul Road and Oxley Highway.

Table 5.2 Mid-block Assessment

Road	Direction	2025				2045			
		Mon-Fri		Saturday		Mon-Fri		Saturday	
		Volume	LOS	Volume	LOS	Volume	LOS	Volume	LOS
Oxley Highway	Eastbound	19	A	17	A	31	A	27	A
	Westbound	30	A	28	A	32	A	28	A
Private Haul Road	Eastbound	10	A	10	A	10	A	10	A
	Westbound	10	A	10	A	10	A	10	A

Source: Modified after Cardno (2021) – Tables 7-11 and 7-12

The assessment of mid-block volumes confirm these will remain acceptable when Project traffic is added.

5.1.6.3 Road Safety

While noting that the volume of traffic on the Oxley Highway will increase as a result of the Project, the roads and intersections will remain well within capacity and therefore not result in any increased road hazard. The Proponent is aware of local school bus services and will ensure all drivers adhere to a Driver Code of Conduct.

5.1.7 Conclusion

It is concluded that the Project is unlikely to impact on local traffic conditions. While an increase in overall truck movements is proposed, this is mitigated in so far that:

- The intersection onto the Oxley Highway has been purpose built for the Quarry traffic
- There is no history of road accidents along this section of the highway, and
- the road would remain well below capacity and intersection performance would remain good (LoS A and DoS < 0.025).

5.2 Noise and Vibration

5.2.1 Introduction

The SEARs require an assessment of the potential impact of the Project on noise, blasting and vibration (refer to **Table 4.2**). A Noise and Vibration Impact Assessment (NVIA) for the Project was undertaken by MAC (2021) with reference to the following guideline documents:

- NSW Environment Protection Authority's (EPA's), Noise Policy for Industry (NPI), 2017
- NSW Department of Environment and Climate Change (DECC), Interim Construction Noise Guideline (ICNG), 2009
- NSW Department of Environment, Climate Change and Water (DECCW), NSW Road Noise Policy (RNP), 2011

- Australian Standard AS2187.2-2006 (AS2187.2) – Explosives-Storage and Use Part 2: Use of Explosives
- Australian and New Zealand Environment Conservation Council (ANZECC), 1990, Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration.

A complete version of MAC (2021) is provided as **Appendix 6**, with the following sub-sections providing:

- A description of the local noise environment and sensitive receivers (**Section 5.2.2**)
- An overview of the applicable noise and blasting criteria (**Section 5.2.3**)
- A description of the assessment methodology (**Section 5.2.4**)
- A summary of proposed noise mitigation and monitoring (**Section 5.2.5**)
- An assessment of residual impacts following the implementation of those controls (**Section 5.2.6**).

5.2.2 Existing Environment

5.2.2.1 Noise Sources

The noise climate in the area surrounding the Quarry reflects the variety of land uses and noise generating activities of the local setting. Noises which may be audible at surrounding residences include the following:

- Traffic on the Oxley Highway, Ostlers Lane and other local roads.
- Existing operations at the Berakee Quarry.
- Earthworks associated with the quarry and nearby commercial developments.
- Agricultural and rural noises such as farm machinery, stock, birds and insects.
- Domestic noises such as lawn mowers, pumps, dogs, etc.
- Wind generated noises such as wind in trees.

5.2.2.2 Background Noise Levels

Background noise monitoring has not been completed for the Project Site. The NPI provides a process for establishing noise criteria for consents and licences, enabling the EPA to regulate noise emissions scheduled premises under the *Protection of the Environment Operations Act 1997* (POEO Act). In low noise environments, such as rural environments, minimum assumed Rating Background Levels (RBLs) apply within the NPI and can be adopted in lieu of completing background noise measurements. This is considered the most conservative method for establishing noise criteria for the Project.

The minimum assumed RBLs and background noise levels for the Project are:

- Minimum Day RBL = 35 dBA
- Minimum Evening RBL = 30 dBA
- Minimum Night RBL = 30 dBA.

5.2.2.3 Sensitive Receivers

As noted in **Section 2.1** and identified on **Figure 2.1**, 17 receivers comprising primarily of rural residences have been identified in proximity to the Project.

5.2.3 Assessment Criteria

5.2.3.1 Project Noise Trigger Levels

Project Noise Trigger Levels (PNTLs) are derived in accordance with the EPA's NPI which provides a benchmark or objective for assessing a site. It is. The PNTL is not intended for use as a mandatory requirement but is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response.

Project Intrusiveness Noise Level (PINL)

The PINL LAeq(15 minute) is the RBL + 5 dB and seeks to limit the degree of change a new noise source introduces to the existing environment. The minimum assumed RBLs as per the NPI have been adopted for the Project in lieu of background noise level monitoring. The PINLs for the Project are as follows:

- Minimum Day (7.00 am to 6.00 pm Monday – Saturday; 8.00 am to 6.00 pm Sunday and Public Holidays) = RBL 35 dBA + 5 dBA
- Minimum Evening (6.00 pm to 10.00 pm) = RBL 30 dBA + 5 dBA
- Minimum Night (10.00 pm to commencement of day period) = RBL 30 dB(A) + 5 dBA.

Project Amenity Noise Levels (PANL)

The PANL is determined by comparing the existing ambient noise levels resulting from industrial noise sources with the recommended acceptable ambient noise levels for the respective noise amenity areas. The PANL at a receiver depends on the type of receiver and the noise amenity area of each receiver. Receivers potentially affected by the Project are residential within the Rural amenity areas. The relevant PANLs for the Project, based on the surrounding noise environment at the receivers are shown in **Table 5.3**. Furthermore, where the PANL is applicable and can be satisfied, the assessment of cumulative industrial noise is not required.

Table 5.3 Project Amenity Noise Levels – Rural Noise Amenity Area

Receiver Type	Noise Amenity Area	Time of Day	Recommended amenity noise level
Residence	Rural	Day	50
		Evening	45
		Night	40

Source: Modified after MAC (2021) – Table 8.

Notes: The recommended amenity noise levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.
Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7 of the NPI.
Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Project Noise Trigger Levels

The NPI states that there is no 'one-size-fits-all' approach to determine the impact from an existing industry. The following governing principles should be applied when determining the PNTL and/or assessment requirements for existing industry:

- The PNTLs should not be applied as mandatory noise limits. The PTNL is the level used to assess noise impact and drive the process of assessing all feasible and reasonable control measures.
- The PNTL is the lower (i.e. more stringent) value of the PINL and the PANL.
- Where an existing industry has been in operation for more than 10 years and existing site operations exceed the PANL, the PANL may be adopted as the PTNL to assess existing, and existing plus proposed site operations, as relevant.

The PNTLs for receivers surrounding the site are given in **Table 5.4**.

Table 5.4 Project Noise Trigger Levels $L_{Aeq(15\ minute)}$ dB(A)

Receiver Type	Period	PINL	PANL	PNTL
Residential	Morning Shoulder (6.00 am to 7.00 am Monday to Saturday	35	43	35
	Day (7.00 am to 6.00 pm Monday to Saturday; 8.00 am to 6.00 pm Sunday and Public Holidays)	40	53	40
	Evening (6.00 pm to 10.00 pm)	35	48	35

5.2.3.2 Maximum Noise Level Assessment

The potential for sleep disturbance from maximum noise level events from a project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed the following criteria, a detailed maximum noise level event assessment should be undertaken:

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

Based on the Project's RBL's (refer to **Section 5.2.2.2**), the screening noise levels at residential receivers are:

- $L_{Aeq(15\ minute)}$ of 40 dB(A), and
- L_{Amax} of 52 dB(A).

Where night-time noise levels exceed these screening levels a detailed maximum noise level event assessment should be undertaken.

5.2.3.3 Road Traffic Noise

Criteria for assessment of noise from traffic on public roads are set out in the NSW Road Noise Policy (RNP) (DECCW, 2011). The RNP sets out noise criteria that provide for a degree of amenity appropriate for the land use and land category. For some industries such as mines and extractive industries, that are not served by arterial roads, a principal haulage route may be identified. The RNP states that noise criteria for a principal haulage route should match those for arterial/sub-arterial roads, as the principal haulage route may carry a different level and mix of traffic to local roads. In accordance with the RNP, the noise criteria for 'Freeway/arterial/sub-arterial road' category has been adopted for the Project's inbound and outbound transport routes, consistent with the classification as a principal haulage route (refer to **Table 5.5**).

Table 5.5 Road Traffic Noise Criteria

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7.00 am to 10.00 pm)	Night (10.00 pm to7.00 am)
Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/ sub-arterial roads generated by land use developments	$L_{Aeq(15\ hour)}$ 60 dBA (external)	$L_{Aeq(15\ hour)}$ 55 dBA (external)

Source: Modified after MAC (2021) – Table 11.
Note: For road noise assessments, the day period is from 7am to 10pm (ie there is no evening assessment period as there is with operational noise). Night is from 10pm to 7am.

The RNP also states that, where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB, which has been accepted as the threshold of perceptibility to a change in noise level.

5.2.3.4 Construction Noise Management

The construction noise target levels are the Noise Management Levels (NML) provided in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) as shown in **Table 5.6**.

Table 5.6 Noise Management Levels (NML)

Time of day	Noise Management Level LAeq(15 minute)	All receivers
Recommended Standard Hours: Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm No work on Sundays and Public Holidays	Noise affected RBL[1] + 10 dB(A)	45
	Highly noise affected 75 dB(A)	75
Outside recommended standard hours (Evening 6.00 pm to 10.00 pm)	Noise affected RBL + 5 dB(A)	35
Outside recommended standard hours (Night 10.00 pm to 7.00 am)	Noise affected RBL + 5 dB(A)	35

Source: Modified after MAC (2021) – Table 4.
Note 1: RBL is the Rating Background Level defined in the INP (EPA, 2000)

5.2.3.5 Blasting Guidelines

Noise and vibration levels from blasting are assessable against criteria established in the Australian and New Zealand Environment Conservation Council (ANZECC) – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration. The blasting limits are generally consistent with the guideline levels contained within AS2187:2006 Part 2 – Explosives - Storage and Usage – Part 2. Where compliance is achieved, the risk of human annoyance is minimised.

Furthermore, for damage induced vibration, German Standard DIN 4150 - Part 3: 1999 provides the strictest guideline levels of vibration velocity for evaluating the effects of vibration in structures.

- The recommended maximum overpressure for airblast is 115 dB linear peak. The level of 115 dB may be exceeded on up to 5% of the total number of blasts over 12 months, however, should not exceed 120 dB linear peak at any time.
- Peak particle velocity (PPV) from ground vibration should not exceed 5mm/s for more than 5% of the total number of blasts over 12 months, however, the maximum level should not exceed 10mm/s at any time.

5.2.4 Assessment Methodology

5.2.4.1 On-site Operational Noise

Assessment of operational noise was conducted using the iNoise (Version 2020) noise modelling software, using sound power level spectra for each of the Quarry noise sources derived from on-site measurement or from MAC's database of measured quarry noise sources. To predict noise levels at the potential noise receivers, the model incorporated a 3-dimension digital terrain map, relevant noise source data, ground type, shielding such as barriers and/or adjacent buildings, and atmospheric information All noise sources were assumed to be operating for the full 15 minute assessment period simultaneously.

A worst case modelling scenario was assessed to represent typical operational noise emissions from the Project and is representative of noise emissions of quarrying activities to a depth of 240m AHD. The scenario is summarised below:

- Stripping of soil by bulldozer or excavator to expose the basalt resource. Soil would be spread onto the amenity bund or placed in wind row stockpiles within the Extraction Area footprint
- The in-situ rock would be fragmented using conventional drill and blast techniques
- Extracted Quarry material would be transferred direction to a mobile crushing unit (MCU) or to the Run-of-Mine (ROM) stockpile by front-end loader.

The modelling was undertaken under meteorological conditions considered to be features of the local setting (in accordance with the NPI classification for meteorological features) for each scenario as follows:

- Neutral (calm) conditions – no wind
- Inversion conditions – Stability Class F.

Based on analysis of weather date during the period September 2017 to September 2019 from the Bureau of Meteorology's (BOM) Dubbo Airport (AWS) weather station located approximately 58 km south-south-east of the Quarry site, prevailing winds are not applicable for the assessment and the relevant meteorological conditions adopted are summarised in **Table 5.7**.

In assessing sleep disturbance, a typical L_{Amax} noise source of 117 dB was used to represent transient events associated with loading trucks with quarry products to the assessed residential receivers under F Class stability conditions (representing worst case conditions).

Table 5.7 Modelled Site Specific Meteorological Parameters

Assessment Condition	Temperature	Wind Speed/Direction	Relative Humidity	Stability Class
Morning Shoulder - Inversion	10°C	2 m/s/all directions	90%	F
Day - Calm	20°C	N/A	60%	N/A
Evening - Inversion	15°C	2 m/s/all directions	70%	F

Source: Modified after MAC (2021) – Table 16.

Note: Morning Shoulder – the period from 6am to 7am Monday to Saturday; Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening – the period from 6pm to 10pm.

5.2.4.2 Road Traffic Noise

MAC (2021) applied the US Environment Protection Agency's road traffic calculation method to predict the L_{Aeq} noise levels from site trucks travelling past sensitive receivers along the Oxley Highway. This method is an internationally accepted theoretical traffic noise prediction model and is ideal for calculating road traffic noise where relatively small traffic flows are encountered.

For the purpose of L_{Aeq} noise level prediction, MAC (2021) considered a worst case scenario on Ostlers Lane to the Oxley Highway as follows:

- up to 35 loads per day (70 movements) and up to a maximum of 10 loads per hour (20 movements)
- approximately 12 light vehicle movements associated with the Project per day.

5.2.4.3 Construction Noise

The construction scenario adopted a generic construction fleet representative of plant used in the relocation/establishment of site offices and amenities (refer to **Table 5.8**).

Table 5.8 Construction Equipment

Item	Sound Power Level (dB(A))
Backhoe (small) (x1)	103
Road Truck (x1)	102
Grader (x1)	104
Hand power tools	97
Total fleet	**108**

Source: Modified after MAC (2021) – Table 14.

5.2.4.4 Blasting and Vibration

Blast overpressure and vibration results have been calculated using the method given in AS2187-2 Explosives – Storage and use Part 2: Use of explosives, 2006 and ICI Explosives Blasting Guide, as applicable to blasting in hard rock.

5.2.5 Controls, Safeguards and Management Measures

5.2.5.1 Operational Noise

The following operational safeguards, controls and management measures would be implemented at the Quarry.

- Activities will be restricted to the approved hours of operation.
- No extraction or processing during the evening and early morning shoulder periods.
- The crushing equipment will be relocated to the floor of the extraction area once sufficient space is opened up (likely within 2 years).
- Dump heights from trucks, front-end loaders and conveyors would be minimised.
- Frequency modulated reversing alarms will be used preferentially on all mobile equipment.
- Regular maintenance will be undertaken on all equipment.
- Internal roads would be well maintained to minimise body noise from empty trucks.
- Dialogue with neighbours will be maintained to ensure any concerns over operational noise are addressed.

The above safeguards and controls have been incorporated into the noise model developed for the Project by MAC (2021) to assess the likely change to local noise levels (refer to **Section 5.2.6**).

5.2.5.2 Traffic Noise

While the movement of heavy vehicles is already a feature of local roads, the Applicant will implement the following safeguards and controls to minimise the potential for any increase in overall noise levels.

- Transport operations will adhere to the approved hours of operation. Truck despatch will occur from 6.00 am, however, no quarrying, processing or loading of trucks will occur before 7.00 am.
- The Proponent will refuse entry to poorly maintained vehicles, or those reported to generate excessive noise levels.
- The Proponent requires all truck drivers comply with a Drivers Code of Conduct outlining procedures for reducing noise impacts during transportation within the Project Site and off site.
- The Proponent requires all drivers to obey all traffic signs, speed zones and operate in a safe and courteous manner at all times.

5.2.5.3 Blasting

Each blast would be designed to:

- achieve the required degree of fragmentation,
- satisfy all environmental criteria, and
- contain all fly rock within the nominated blast envelope.

The Proponent would implement the following blasting and vibration mitigation measures throughout the life of the Project.

- Design and implementation of each blast by a suitably qualified blasting engineer or experienced shot-firer.
- Modify blast designs, mitigation measures and operating procedures, if required, on the basis of monitoring results.
- Initiate blasts between the hours of 9.00 am and 5.00 pm Monday to Friday only. No blasts would be initiated outside these hours, except for safety or emergency reasons.
- Establish and maintain an environmental complaints line and register of complaints in accordance with the requirements of the Environment Protection Licence, once issued.
- Respond promptly to any issue of concern or complaint raised by the community or a government agency.

5.2.5.4 Monitoring

Noise

The NMP will include a provision for attended noise monitoring within the community in response to received complaints, if any. The operator attended noise measurements and recordings will be conducted to quantify noise emissions from the Quarry as well as the overall level of ambient noise.

When required, the operator will quantify and characterise the energy equivalent (L_{Aeq}) intrusive noise level from the project over a 15-minute measurement period. In addition, the operator will quantify and characterise the overall levels of ambient noise over the 15 minute measurement interval. Instrumentation used during the monitoring will be equivalent to a Type 1 meter with 1/3 octave band analysis and have audio recording functionality for post processing source identification. 1/3 octave band analysis will be required to establish whether modification factors in accordance with the NPI are to be applied.

All acoustic instrumentation used as part of the attended monitoring program will be designed to comply with the requirements of AS IEC 61672.1-2019, Electroacoustics - Sound level meters -Specifications and will have current calibration certificates. All instrumentation will be programmed to record statistical noise level indices in 15-minute intervals including L_{Amax}, L_{Amin} and L_{Aeq}.

Instrument calibration will be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA. The measurement position(s) will be selected considering:

- weather conditions such as rain and wind, insect noise
- the location and direction of any noise source/s
- the most sensitive position at the affected receiver
- the need to avoid reflecting surfaces (where possible).

Blasting

The Applicant proposes to monitor each blast for ground vibration and overpressure. The locations of monitoring would include those sensitive receivers most likely to be affected by blasting emissions.

5.2.6 Assessment of Impacts

5.2.6.1 Operational Noise

Table 5.9 presents the predicted noise levels at the residential receivers surrounding the Quarry site during calm and prevailing meteorological conditions. Contours maps which presents interpolated images of noise levels surrounding the Quarry are provided in MAC (2021) (refer to **Appendix 6**).

Table 5.9 Predicted Operational Noise Levels

Receiver	Predicted Noise Level (dB) ($L_{Aeq(15min)}$)		
	Shoulder[1]	Day	Evening[1,2]
PNTL	35	40	35
R1	<30	<30	<30
R2	33	31	<30
R3	<30	<30	<30
R4	<30	<30	<30
R5	<30	<30	<30
R6	<30	<30	<30
R7	<30	<30	<30
R8	<30	<30	<30
R9	<30	<30	<30
R10	<30	<30	<30
R11	<30	<30	<30
R12	<30	<30	<30
R13	<30	<30	<30
R14	<30	<30	<30
R15	<30	<30	<30
R16	<30	<30	<30
R17	<30	<30	<30

Source: Modified after MAC (2021) – Table 20

Notes:

1. Assessed during inversion conditions.
2. Trucks returning to Quarry Site during evening only.

The results of the predictive modelling show that noise emissions from the Quarry satisfy the PNTL at all non-project related residential receivers, for the operational scenario.

5.2.6.2 Maximum Noise Level

Considering the maximum noise levels from transient events, MAC (2021) predicts the maximum noise level screening criteria will be easily satisfied with the highest predicted LAmax noise level of <30 dB(A) at all receivers which is well below the screening criteria of 52 dB(A).

5.2.6.3 Construction Noise

MAC (2021) predicts $L_{Aeq(15min)}$ noise emissions for construction would comfortably satisfy the construction noise management levels for all assessed receivers with noise levels predicted to remain < 30 dB(A), well below the day period Noise Management Level of 45 dB(A).

5.2.6.4 Road Traffic Noise

Based on the maximum daily traffic movements nominated in **Section 5.1.4.2**, **Table 5.10** presents predicted existing traffic noise, additional traffic noise and combined traffic noise along with the proposed increase.

Table 5.10 Road Traffic Noise – Residential Receivers

Offset Distance (m)	Period	Criteria	Traffic Noise (dB(A))		Change
			Existing Traffic[1]	Existing + Proposal Traffic	
1 Coonamble Street (Collie)					
70 m	Day	60	35.4	37.1	+1.7
	Night	55	32.6	34.0	+1.4
1840 Oxley Highway					
100 m	Day	60	31.8	33.4	+1.6
	Night	55	<30	30.4	+1.5

Source: Modified after MAC (2021) – Table 22

The traffic noise contribution from the Quarry is predicted to remain well below the relevant day and night assessment criteria for the nearest residential receivers on the Oxley Highway.

5.2.6.5 Blasting and Vibration

Regional Hardrock proposed to undertake approximately 12 blasts per year of 40,000 to 45,000 tonnes per blast. The blasting pattern will require approximately 110 drill holes at 15 m in depth for each blast. Blast modelling undertaken by MAC (2021) indicates that for blasts up to a Maximum Instantaneous Charge (MIC) of 50 kg, will satisfy relevant ANZECC overpressure and vibration criteria.

Effects of Vibration on Infrastructure from Blasting

The nearest significant infrastructure to the Quarry is the Oxley Highway approximately 6.3km to the north of the Quarry. MAC (2021) have determined vibration levels at the Oxley Highway to be well below 5mm/s and therefore unlikely to adversely impact the road surface or condition.

Effects of Blasting on Animals and Livestock

Blast effects resulting from the Quarry are predicted to be, at worst for overpressure up to 103dBZ, and for vibration up to 0.14mm/s at the nearby residential receiver locations. MAC (2021) notes that the calculated blast over pressure and vibration levels are well below the regulatory criteria and considerably lower than other sources of overpressure that horses or livestock are likely to be already subjected to such as lightning strikes which are typically between 120dBZ and 130dBZ[2].

[2] Equine Health Impact Statement – Drayton South Coal Project (2015)

5.3 Air Quality

5.3.1 Introduction

An assessment of the air quality impacts of the Project has been prepared by Jacobs Group (Australia) Pty Limited (Jacobs) in general accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (Approved Methods) (EPA, 2016). The Air Quality Impact Assessment (AQIA) (Jacobs, 2021) is provided in **Appendix 7** and a summary of findings is presented below.

5.3.2 Existing Environment

5.3.2.1 Meteorology

Meteorological conditions are important for determining the direction and rate at which emissions from a source will disperse. The key meteorological requirements of air dispersion models are, typically, hourly records of wind speed, wind direction, temperature, and atmospheric stability.

Although there is no on-site meteorological station at the Project, the Bureau of Meteorology (BoM) operates an automatic weather station near Trangie approximately 51 kilometres to the southwest. Annual meteorological data collected at the station from 2015 to 2019 are provided in **Table 5.11**.

Table 5.11 Annual Meteorological Statistics

Statistic	2015	2016	2017	2018	2019
Percent complete (%)	99.1	99.9	100	99.9	99.9
Mean wind speed (m/s)	3.4	3.3	3.4	3.5	3.7
99th percentile wind speed (m/s)	8.2	8.7	8.9	9.4	9.8
Percentage of calms (%)	5.1	7.0	5.4	4.8	5.1
Percentage of winds >6 m/s (%)	8.6	8.8	8.6	11.7	13.4

Source: Jacobs (2021)

Annual meteorological datasets used for the purpose of dispersion modelling in NSW are required to contain records that are at least 90% complete. As listed, more than 90% of data were captured at the Trangie Research Station automatic weather station for all five years reviewed.

5.3.2.2 Background Air Quality

Emissions to air will occur from a variety of activities including material extraction, material handling, material transport, processing, and wind erosion of stored materials and exposed surfaces. These emissions would mainly comprise of particulate matter in the form of total suspended particulates (TSP), particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM_{10}), particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$) and deposited dust (those particles which deposit on surfaces). There would also be relatively minor emissions from machinery exhausts such as carbon monoxide (CO), oxides of nitrogen (NOx) and particulate matter.

Although the is no air quality monitoring undertaken at or directly around the Project, there a number of regional monitors operated by DPIE. Details of these monitoring locations are provided in **Table 5.12**.

Table 5.12 Nearby Air Quality Monitoring Stations

Station location	Operated by	Approximate distance (km) and direction from the Project Site	Type	Pollutant(s) monitored
Gunnedah	DPIE	Regional air quality monitoring station	TEOM/BAM	PM_{10}, $PM_{2.5}$
Bathurst	DPIE	Regional air quality monitoring station	TEOM/BAM	PM_{10}, $PM_{2.5}$
Orange	DPIE	Regional air quality monitoring station	TEOM/BAM	PM_{10}, $PM_{2.5}$
Dubbo	DPIE	Regional air quality monitoring station	DustTrak	PM_{10}, $PM_{2.5}$ and TSP

TEOM = Tapered element oscillating microbalance and BAM = Beta attenuation monitor
Source: Modified after Jacobs (2021) – Table 4-5

The rate of data capture at each of the four monitors is summarised in **Table 5.13**.

Table 5.13 Data Capture Rates for DPIE Monitoring Stations

Year	DPIE Gunnedah (TEOM)	DPIE Bathurst (TEOM)	DPIE Orange (TEOM)	DPIE RAQMIN Dubbo (DustTrak)
PM_{10}				
2015	ND	99.5	ND	*76.8*
2016	ND	93.2	ND	*41.0*
2017	ND	97.3	ND	*70.0*
2018	98.1	98.4	ND	*83.9*
2019	91.8	99.2	94.0	95.3
$PM_{2.5}$				
2015	ND	ND	ND	ND
2016	ND	*64.7*	ND	ND
2017	ND	97.3	ND	*40.0*
2018	98.1	98.6	ND	*83.4*
2019	94.2	98.6	94.0	91.7
TSP				
2015	ND	-	ND	92.1
2016	ND	-	ND	63.3
2017	-	-	ND	98.5
2018	-	-	ND	*83.7*
2019	-	-	-	94.9

Source: Modified after Jacobs (2021) – Table 4.5
'ND' = No data, station not yet commissioned '-' = not measured at station *Underlined italics* = below 90% quality objective

As listed PM_{10} and $PM_{2.5}$ capture rates higher than 90% were met at the three DPIE TEOMs except for $PM_{2.5}$ at Bathurst in 2016 when the measurement of this pollutant commenced. Less than 90 per cent of hours were available from the Dubbo DustTrak except in 2019. This indicates the suitability of the data from the DPIE TEOMs for the purpose of the assessment.

A more detailed review of available monitoring data and establishment of background levels is provided by Jacobs (2021) (refer to **Appendix 7**).

5.3.3 Air Quality Criteria

The EPA has developed assessment criteria for:

- TSP, to protect against nuisance amenity impacts
- PM_{10} and $PM_{2.5}$ to protect against health impacts
- deposited dust, to protect against nuisance amenity impacts.

Most of the EPA criteria are drawn from national standards for air quality set by the National Environmental Protection Council of Australia (NEPC) as part of the National Environment Protection Measures (NEPM). These criteria are outlined in **Table 5.14** and apply to existing and potential sensitive receptors such as such as residences, schools and hospitals.

Table 5.14 NSW EPA Impact Assessment Criteria for Key Emissions

Pollutant	Averaging Period	Criteria	Source
PM_{10}	24-hour	50 µg/m^3	EPA (2016)/DoE (2016)
	Annual	25 µg/m^3	
$PM_{2.5}$	24-hour	25 µg/m^3	EPA (2016)/DoE (2016)
	Annual	8 µg/m^3	
TSP	Annual	90 µg/m^3	EPA (2016)/NHMRC (1996)
Deposited dust (insoluble solids)	Annual (maximum increase)	2 g/m^2/month	EPA (2016)/NERDDC (1998)
	Annual (maximum total)	4 g/m^2/month	

Source: Modified after Jacobs (2021) – Table 3.2

The relative change in emissions is also be considered when considering the impact of the Project on local air quality (where background levels are equal to or exceed criteria). Jacobs (2021) have assumed a background $PM_{2.5}$ concentration of 9 µg/m^3 (exceeding the EPA, 2016, criteria of 8 µg/m^3) and therefore the relative increase in concentration is considered.

In accordance with the NSW Voluntary Land Acquisition and Mitigation Policy (VLAMP) (2018), mitigation or acquisition rights may apply where, even with best practice management, the development contributes to exceedances of the particulate matter criteria specified in **Table 5.14**.

5.3.4 Assessment Methodology

5.3.4.1 Overview

The AQIA has been prepared in consideration of the NSW EPA's Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (Approved Methods) (EPA, 2016) with an emphasis on emissions of particulate matter, the key pollutant typically associated with quarrying operations. The approach included three key elements as follows.

1. Identification of key representative operational scenario for the approved and proposed Quarry and development of an emissions inventories for each.

2. Development and running of a dispersion model based on the local terrain, meteorological conditions and proposed locations of key emission sources of the Proposed Modification.

3. Assessment of the predicted emission and deposition levels at sensitive receivers generated by the modified Quarry operations (including traffic movements on the Private Haul Road) and prediction of cumulative impacts when background air quality is accounted for.

A summary of these three key components of the methodology is provided below, with a full description included in **Appendix 7**.

5.3.4.2 Emissions Inventories

Estimates of emissions to air from the Project including dust (particulate matter) from the increased area and rate of activities are required by the dispersion model. Total dust emissions were estimated by analysing details of the Project and identifying the location and intensity of dust-generating activities. Operational parameters have been combined with emissions factors developed both locally and by the United States Environmental Protection Agency (US EPA).

The emission factors used for this assessment have been drawn largely from the following sources:

- 'Emission Estimation Technique Manual for Mining' (NPI, 2012), and
- AP 42 (US EPA, 1985 and updates).

Dust emission inventories were developed for two scenarios, existing and proposed operations. Proposed emissions were estimated for both Stage 1 (years 1 to 5) and Stage 2 (years 6 to 30). **Table 5.15** below summarises the estimated annual TSP, PM_{10} and $PM_{2.5}$ emissions (in kg/y) for the assessment scenarios.

Table 5.15 Estimated Emissions to Air

Source/activity	Estimated annual emissions (kg/y)								
	Existing operations			Proposed operations (Stage 1)			Proposed operations (Stage 2)		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Drilling	32	17	1	212	110	6	106	55	3
Blasting	19	10	1	75	39	2	37	19	1
Dozers on raw materials	669	162	70	4,184	1,011	439	2,008	485	211
Excavators loading raw materials to trucks	163	77	12	996	471	71	244	115	17
Hauling raw materials from pit to ROM	1,095	312	16	13,419	3,816	191	3,286	935	47
Unloading raw materials to ROM	480	172	24	2,940	1,054	147	720	258	36
Front end loader loading raw product to crushing and screening	81	38	4	498	235	25	122	58	6
Primary crushing	400	160	20	2,450	980	123	600	240	30
Secondary crushing	1,200	480	60	7,350	2,940	368	1,800	720	90
Tertiary crushing	1,200	400	60	7,350	2,450	368	1,800	600	90
Screening	500	172	25	3,063	1,054	153	750	258	38

Source/activity	Estimated annual emissions (kg/y)								
	Existing operations			Proposed operations (Stage 1)			Proposed operations (Stage 2)		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Front end loader loading product stockpiles	81	38	4	498	235	25	122	58	6
Wind erosion from ROM stockpiles	85	44	6	680	350	51	680	350	51
Wind erosion from product stockpiles	340	175	25	3,484	1,796	261	3,484	1,796	261
Wind erosion from exposed surfaces	637	329	48	6,458	3,329	484	6,458	3,329	484
Excavators loading product to trucks	163	77	8	996	471	50	244	115	12
Hauling product off-site	48,115	13,682	684	258,775	73,586	3,679	63,373	18,021	901
Overall total	**55,260**	**16,344**	**1,068**	**313,426**	**93,937**	**6,443**	**85,835**	**27,413**	**2,285**

Source: Modified after Jacobs (2021) – Table 5.1

5.3.4.3 Dispersion Modelling

The CALPUFF computer-based air dispersion model was used to predict ground-level concentrations and deposition levels due to the identified emission sources, and the model predictions have been compared with relevant air quality criteria. The choice of model has considered the expected transport distances for the emissions, as well as the potential for temporally and spatially varying flow fields due to influences of the locally complex terrain, non-uniform land use, and potential for stagnation conditions characterised by calm or very low wind speeds with variable wind directions.

The CALPUFF model, through the CALMET meteorological pre-processor, simulates complex meteorological patterns that exist in a particular region. The effects of local topography and changes in land surface characteristics are accounted for by this model.

5.3.5 Air Quality Management

Consistent with *Section 5.1.3* of the Approved Methods, for environments were background air quality conditions are already elevated and where it has been demonstrated that there would be no attributable additional exceedances of the EPA's impact assessment criteria, best practice management practices are to be implemented to "minimise emissions of air pollutants as far as practical". **Table 5.16** summarises the controls to be implemented at the Quarry.

Table 5.16 Dust management measures

Source/activity	Control measure	Control Efficiency	Timing	Responsibility
Drilling for blasting	Water sprays	70 %	Prior to, during and post-drilling	Site operator
Hauling of materials in trucks	Watering of haul route	50 %	Regularly when in-use	Site operator
Loading/unloading of materials	Water sprays	50 %	During loading and unloading activities	Site operator

Source/activity	Control measure	Control Efficiency	Timing	Responsibility
Primary, secondary and tertiary crushing	Water sprays with dust supressing additives, enclosure of dust-generating components	50 %	During crushing	Site operator
Screening	Water sprays with dust supressing additives	50 %	During screening	Site operator
Wind erosion from exposed surfaces and stockpiled materials	Watering	50 %	Regular watering during operations	Site operator

Source: Modified after Jacobs (2021) – Table 5.2

5.3.6 Impact Assessment

The incremental and cumulative concentrations of airborne particulate matter and deposited dust were predicted by Jacobs (2021) at 12 receivers surrounding the Project Site (refer to **Figure 2.1**). The following provides a summary of the modelling predictions and assessment of impacts.

5.3.6.1 PM_{10}

Table 5.17 presents the predicted annual average concentration of PM_{10} at the 12 receivers.

Table 5.17 Predicted Annual Average PM_{10} Concentration

Receiver	Due to quarry (µg/m³)			Change as a result of the Project (µg/m³)		Background (µg/m³)	Cumulative (µg/m³)		Criterion (µg/m³)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R01	0.1	0.5	0.1	0.4	0.1	18.9	19.3	19.0	25
R02	<0.1	0.3	0.1	0.3	0.1		19.2	19.0	
R03	<0.1	0.3	<0.1	0.2	<0.1		19.0	18.9	
R04	<0.1	0.2	0.1	0.3	<0.1		19.1	18.9	
R05	<0.1	0.1	<0.1	0.1	<0.1		19.0	18.9	
R06	<0.1	0.2	0.1	0.1	<0.1		19.0	18.9	
R07	<0.1	<0.1	<0.1	<0.1	<0.1		18.9	18.9	
R08	<0.1	0.1	<0.1	<0.1	<0.1		18.9	18.9	
R10	<0.1	0.1	<0.1	0.1	<0.1		19.0	18.9	
R11	<0.1	0.2	0.1	0.2	<0.1		19.1	18.9	
R12	<0.1	0.3	0.1	0.2	<0.1		19.1	18.9	
R15	<0.1	<0.1	<0.1	<0.1	<0.1		18.9	18.9	

Source: Modified after Jacobs (2021) – Table 7.1

Table 5.17 shows that during stages 1 and 2 of the Project, cumulative annually averaged PM_{10} concentrations were predicted to remain below the EPA's criterion of 25 µg/m³.

Regarding daily averaged PM_{10}, there were 10 instances where background concentrations exceeded the EPA's criteria at the DPIE Gunnedah station in 2018. Consistent with guidance presented in the Approved Methods it was reviewed whether the Project would cause additional days of exceedance at surrounding sensitive receivers. This review including maximum 24-hour PM_{10} contributions from existing and proposed operations at sensitive receivers, and whether the number of exceedances per year would change is presented in **Table 5.18**.

Table 5.18 Review of change in number of days with PM_{10} concentrations exceeding 50 (µg/m³)

Receiver	Maximum 24-hour contribution due to existing quarry operations (µg/m³)	Number of exceedances per year (existing)	Maximum 24-hour contribution due to proposed quarry operations (µg/m³)		Number of exceedances per year (Proposed)		Change in number of exceedances per year	
			Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
R01	0.37	10	3.16	0.81	10	10	0	0
R02	0.51		3.24	0.95	10	10	0	0
R03	0.25		1.83	0.51	10	10	0	0
R04	0.22		1.78	0.48	10	10	0	0
R05	0.14		0.99	0.27	10	10	0	0
R06	0.21		1.65	0.45	10	10	0	0
R07	0.08		0.54	0.14	10	10	0	0
R08	0.08		0.74	0.20	10	10	0	0
R10	0.11		0.73	0.22	10	10	0	0
R11	0.27		1.94	0.51	10	10	0	0
R12	0.31		1.97	0.53	10	10	0	0
R15	0.06		0.38	0.10	10	10	0	0

Source: Modified after Jacobs (2021) – Table 7.2

5.3.6.2 $PM_{2.5}$

Table 5.19 presents the predicted annual average concentration of $PM_{2.5}$ at the 12 receivers.

Table 5.19 Predicted Annual Average $PM_{2.5}$ Concentration

Receiver	Due to quarry (µg/m³)			Change as a result of the Project (µg/m³)		Background (µg/m³)	Cumulative (µg/m³)		Criterion (µg/m³)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R01	<0.1	0.04	0.01	0.03	0.01	9	9.03	9.01	8
R02	<0.01	0.03	0.01	0.03	0.01		9.03	<9.01	
R03	<0.01	0.01	<0.01	0.01	<0.01		9.01	<9.01	
R04	<0.01	0.02	0.01	0.01	<0.01		9.01	<9.01	
R05	<0.01	0.01	<0.01	0.01	<0.01		9.01	<9.01	
R06	<0.01	0.01	<0.01	0.01	<0.01		9.01	<9.01	
R07	<0.01	<0.01	0.01	0.01	<0.01		<9.01	<9.01	
R08	<0.01	<0.01	<0.01	<0.01	<0.01		<9.01	<9.01	

Receiver	Due to quarry (µg/m³)			Change as a result of the Project (µg/m³)		Background (µg/m³)	Cumulative (µg/m³)		Criterion (µg/m³)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R10	<0.01	0.01	<0.01	0.01	<0.01		9.01	<9.01	
R11	<0.01	0.02	<0.01	0.01	<0.01		9.01	<9.01	
R12	<0.01	0.02	0.01	0.01	<0.01		9.01	<9.01	
R15	<0.01	<0.01	<0.01	<0.01	<0.01		<9.01	<9.01	

Source: Modified after Jacobs (2021) – Table 7.3

Noting that the annual $PM_{2.5}$ concentration (9 µg/m³) already exceeds the EPA's 8 µg/m³ criterion, **Table 5.19** shows how negligible increases (i.e. less than 3%) were predicted at the identified surrounding sensitive receivers as a result of the Project.

There were five instances in 2018 when daily $PM_{2.5}$ concentrations exceeded 25 µg/m³ at the DPIE Gunnedah monitoring station. As such it was reviewed whether the Project could result in additional days of exceedance at surrounding sensitive receivers. This review including the maximum daily $PM_{2.5}$ contribution from existing and proposed operations at the quarry, and whether the number of exceedances per year at sensitive receivers would change is presented below in **Table 5.20**.

Table 5.20 Review of change in number of days with PM2.5 concentrations exceeding 25 (µg/m³)

Receiver	Maximum 24-hour contribution due to existing quarry operations (µg/m³)	Number of exceedances per year (existing)	Maximum 24-hour contribution due to proposed quarry operations (µg/m³)		Number of exceedances per year (Proposed)		Change in number of exceedances per year	
			Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
R01	0.04	5	0.30	0.09	5	5	0	0
R02	0.05		0.32	0.10	5	5	0	0
R03	0.03		0.18	0.05	5	5	0	0
R04	0.02		0.18	0.06	5	5	0	0
R05	0.01		0.11	0.03	5	5	0	0
R06	0.02		0.18	0.06	5	5	0	0
R07	0.01		0.06	0.02	5	5	0	0
R08	0.01		0.06	0.02	5	5	0	0
R10	0.01		0.07	0.02	5	5	0	0
R11	0.02		0.13	0.04	5	5	0	0
R12	0.02		0.14	0.05	5	5	0	0
R15	<0.01		0.03	0.01	5	5	0	0

Source: Modified after Jacobs (2021) – Table 7.4

As **Table 5.20** shows, the number of exceedances of the EPA's daily criterion (25 µg/m³) was not predicted to change as a result of the Project.

TSP

Table 5.21 presents the predicted annual average concentration of TSP at the 12 receivers.

Table 5.21 Predicted Annual Average TSP Concentration

Receiver	Due to quarry (µg/m³)			Change as a result of the Project (µg/m³)		Background (µg/m³)	Cumulative (µg/m³)		Criterion (µg/m³)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R01	0.1	0.7	0.2	0.6	0.1	40	10.6	40.1	90
R02	0.1	0.5	0.2	0.5	0.1		40.5	40.1	
R03	<0.1	0.2	0.1	0.2	<0.1		40.2	<40.1	
R04	<0.1	0.2	0.1	0.2	<0.1		40.2	<40.1	
R05	<0.1	0.2	<0.1	0.1	<0.1		40.1	<40.1	
R06	<0.1	0.2	0.1	0.2	<0.1		40.2	<40.1	
R07	<0.1	0.1	<0.1	<0.1	<0.1		<40.1	<40.1	
R08	<0.1	0.1	<0.1	0.1	<0.1		40.1	<40.1	
R10	<0.1	0.1	<0.1	0.1	<0.1		40.1	<40.1	
R11	0.1	0.4	0.1	0.4	<0.1		40.4	<40.1	
R12	0.1	0.7	0.2	0.5	0.1		40.5	40.1	
R15	<0.1	0.1	<0.1	0.1	<0.1		<40.1	<40.1	

Source: Modified after Jacobs (2021) – Table 7.5

As displayed, it is predicted that the Project would not cause cumulative annual TSP concentrations exceeding the EPA's 90 µg/m³ impact assessment criterion.

5.3.6.3 Deposited Dust

Table 5.22 presents the predicted annual average deposited dust at the eight receivers.

Table 5.22 Predicted Annual Average Deposited Dust

Receiver	Due to quarry (µg/m³)			Change as a result of the Project (µg/m³)		Background (µg/m³)	Cumulative (µg/m³)		Criterion (µg/m³)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R01	0.01	0.09	0.02	0.07	0.01	2.6	2.67	2.61	4.0
R02	0.01	0.09	0.03	0.07	0.01		2.67	2.61	
R03	0.01	0.04	0.01	0.04	<0.01		2.64	<2.61	
R04	0.01	0.03	0.01	0.03	<0.01		2.63	<2.61	
R05	0.01	0.03	0.01	0.03	<0.01		2.63	<2.61	
R06	<0.01	0.03	0.01	0.02	<0.01		2.62	<2.61	
R07	<0.01	0.01	<0.01	0.01	<0.01		2.61	<2.61	
R08	<0.01	0.02	0.01	0.02	<0.01		2.62	<2.61	
R10	<0.01	0.02	<0.01	0.01	<0.01		2.61	<2.61	
R11	0.01	0.05	0.01	0.04	<0.01		2.64	<2.61	
R12	0.02	0.12	0.03	0.10	0.01		2.70	2.61	
R15	<0.01	0.01	<0.01	0.01	<0.01		2.61	<2.61	

Source: Modified after Jacobs (2021) – Table 7.6

Compliance with the EPA's criterion is predicted.

5.3.6.4 Summary and Interpretation

Jacobs (2021) predicts that, based on dispersion modelling carried out in accordance with regulatory guidelines, the Project will not result in unacceptable changes to local air quality. The annual average emissions will remain well below the nominated criteria and no additional exceedance of 24 maximum particulate matter concentrations are predicted at residences surrounding the Quarry site and Private Haul Road.

The potential for elevated dust emissions will be managed through the implementation of best-practice controls consistent with the Approved Methods.

5.4 Surface Water

5.4.1 Local Setting

5.4.1.1 Water Users

The primary land use potentially impacted by runoff from the Project immediately downslope of the Project Site is agriculture.

As of 2 November 2021, there were 21 water access licences within the Marthaguy Creek water source with a total entitlement of 10,930 unit shares (or 10,930 ML for a water allocation of 1 ML/share) with the primary usage for irrigation.

5.4.1.2 Water Quality

NSW Water Quality Objectives (WQOs) are agreed environmental values and long-term goals for NSW's surface waters which are used across NSW to guide catchment management.

Table 5.23 presents the NSW WQOs for the Macquarie Bogan catchment considered relevant to the Project operation and receiving environment.

Table 5.23 NSW Water Quality Objectives

Parameter	Units	Aquatic Ecosystems[1]	Irrigation	Livestock Drinking Water
pH	-	6.5 – 8.0	-[2]	-
Electrical Conductivity (EC)	µS/cm	30 – 350	1,000[3]	3750[4]
Turbidity	NTU	2 - 25	-[2]	-[2]

Notes

[1] WQOs for upland river systems

[2] No water quality objective value or range provided

[3] Tolerance to salinity is crop specific. The value presented is the lowest EC provided (i.e. for the least salt tolerant species) in *Table 4.2.5 Tolerance of plants to salinity in irrigation waters* of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council (ANZECC), 2000).

[4] Approximate EC value that will have no adverse effects on dairy cattle based on the total dissolved solids concentration of 2,400 mg/L provided in *Table 4.3.1 Tolerances of livestock to total dissolved solids (salinity) in drinking water* of ANZECC 2000 and a conversion factor of 0.64 EC (µS/cm)/1 (TDS mg/L).

The Gilgandra Shire Council Development Control Plan does not specify water quality targets but does indicate the requirement for appropriate management of water resources through preparation of a comprehensive Water Strategy including water quality parameters. The proposed water quality management measures for the Project are detailed in **Section 5.4.4.2**.

5.4.2 Regulatory Framework

Extraction of water in NSW is managed under two legislative acts: *Water Act 1912* and *Water Management Act 2000*.

The objective of the *Water Management Act 2000* is the sustainable and integrated management of water in NSW and is based on the concept of ecologically sustainable development by defining water access and water sharing strategies within NSW. The *Water Management Act 2000* supersedes the provisions of the *Water Act 1912* in regard to water take when a Water Sharing Plan (WSP) is in place and in regard to works adjacent to or within watercourses. Where WSPs have not commenced the provisions of the *Water Act 1912* continue to apply.

WSPs have been developed across NSW to protect the fundamental environmental health of water sources, whilst at the same time securing sustainable access to water for all users in the long-term. The WSPs specify maximum water extractions and allocations and provide water users with a clear picture of when and how water will be available for extraction.

The Project is located within the area covered by the WSP for the *Macquarie-Bogan Unregulated Rivers Water Sources 2012* and as such, water management at the Project is governed by the *Water Management Act 2000*. The *Macquarie-Bogan Unregulated Rivers Water Sources 2012* WSP consists of 30 unregulated river water sources. Specifically, the Project site is located within the Marthaguy Creek water source.

All water extraction in NSW, apart from some exemptions for government authorities and basic landholder rights extractions, must be authorised by a water licence. Intercepted runoff from undisturbed upstream or upslope catchments is licensable subject to harvestable rights considerations. Where surface water runoff captured by a Project is from disturbed catchments, and the function of the storage is for pollution control purposes, it is considered to be exempt from licensing based on the following schedules in the *Water Management (General) Regulation 2018*:

Schedule 4

12 Excluded works

(1) Any landholder—in relation to the taking of water from or by means of an excluded work referred to in item 1, 2, 3, 4, 6, 7 or 9 in Schedule 1 that is situated on the land, for the purposes and in the circumstances specified in Schedule 1 in respect of the work.

Schedule 1

3 Dams solely for the capture, containment and recirculation of drainage and/or effluent, consistent with best management practice or required by a public authority (other than Landcom or the Superannuation Administration Corporation or any of their subsidiaries) to prevent the contamination of a water source, that are located on a minor stream.

5.4.2.1 Environmental Protection Licence

EPL 21093, provided in full in **Appendix 1**, specifies obligations relating to environmental management under the POEO Act and the Regulations made under the POEO Act. Conditions L1, L2, O4, M2 and M3 of the EPL relate specifically to water management. These conditions are listed in **Table 5.24** below.

Table 5.24 EPL 21093 Conditions relating to Water Management

<table>
<tr><th>EPL Condition Number</th><th>EPL Condition</th></tr>
<tr><td colspan="2">L1 Pollution of Waters</td></tr>
<tr><td>L1.1</td><td>Except a may be expressly provided in any other condition of this licence, the licensee must comply with Section 120 of the Protection of the Environment Operations Act 1997.</td></tr>
<tr><td colspan="2">L2 Concentration Limits</td></tr>
<tr><td>L2.1</td><td>For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.</td></tr>
<tr><td>L2.2</td><td>Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.</td></tr>
<tr><td>L2.3</td><td>To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.</td></tr>
<tr><td>L2.4</td><td>Water and/or Land Concentration Limits
POINT 1
<table>
<tr><th>Pollutant</th><th>Units of Measure</th><th>50 Percentile Concentration Limit</th><th>90 Percentile Concentration Limit</th><th>3DGM concentration limit</th><th>100 percentile concentration limit</th></tr>
<tr><td>Oil and Grease</td><td>Milligrams per litre</td><td></td><td></td><td></td><td><10</td></tr>
<tr><td>pH</td><td>pH</td><td></td><td></td><td></td><td>6.5-8.5</td></tr>
<tr><td>TSS</td><td>Milligrams per litre</td><td></td><td></td><td></td><td><50</td></tr>
</table></td></tr>
<tr><td>L2.5</td><td>The limits specified under Condition L2.4 for the sediment pond identified as EPA licence discharge point 1 do not apply when the discharge occurs solely as a result of a rainfall event measured at the premises which exceeds;
- a total of 50 millimetres of rainfall over any consecutive 5 day period.</td></tr>
<tr><td>Note:</td><td>A 50 mm rainfall depth is defined by the publication Managing Urban Stormwater: Soils and Construction (Landcom, 4th Edition, July 2006) as the rainfall depth in millimetres for a 95th percentile 5 day rainfall event for the 'Central Tablelands and Central Western Slopes' (Dubbo) consistent with the storage capacity (recommended minimum design criteria) for Type D sediment retention basins as described in Managing Urban Stormwater Volume 2E: Mines and Quarries (DECC 2008).</td></tr>
<tr><td>L2.6</td><td>The concentration limit for total suspended solids stipulated by condition L2.4 for EPA identification point 1 is deemed not to have been breached where:
a) the water discharged is covered by condition L2.5; or
b) when not covered by condition L2.5, the water discharged (in accordance with licence conditions O4.4 and O4.5) is within the pH range 6.5-8.5 and has a turbidity of no more than 40 NTU at the time of the discharge; and
c) the EPA is advised within 3 working days of the completion of the sample testing and analysis as required by condition M2.2 of any results above the licence limit.</td></tr>
</table>

<table>
<tr><th>EPL Condition Number</th><th>EPL Condition</th></tr>
<tr><td>Note:</td><td>The purpose of condition L2.6 is to expediate the assessment and subsequent discharge of the clarified water from the stormwater control structures (sediment ponds).</td></tr>
<tr><td colspan="2">O4 Other Operating Condition</td></tr>
<tr><td colspan="2">Management of Sediment Ponds</td></tr>
<tr><td>O4.4</td><td>The sediment pond identified as EPA identification number 1 (licence discharge point 1) under condition P1.2 must be drained or pumped out within five (5) days following rainfall in order to maintain the design storage capacity of the basin.</td></tr>
<tr><td>O4.5</td><td>Water discharged to comply with condition O4.4 may only be discharged from sediment ponds via licence discharge point 1 where the water complies with the discharge limits specified under condition L2.4 for licence discharge point 1.</td></tr>
<tr><td>O4.6</td><td>The licensee must undertake maintenance to desilt all sediment ponds to retain their design storage capacities.</td></tr>
<tr><td colspan="2">M2 Requirement to monitor concentration of pollutants discharged</td></tr>
<tr><td>M2.1</td><td>For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:</td></tr>
<tr><td>M2.2</td><td>Water and/or Land Monitoring Requirements
POINT 1
<table>
<tr><th>Pollutant</th><th>Units of Measure</th><th>Frequency</th><th>Sampling Method</th></tr>
<tr><td>Oil and Grease</td><td>Milligrams per litre</td><td>Daily during discharge</td><td>Grab Sample</td></tr>
<tr><td>pH</td><td>pH</td><td>Daily during discharge</td><td>In situ</td></tr>
<tr><td>Total suspended solids (TSS)</td><td>Milligrams per litre</td><td>Daily during discharge</td><td>Grab Sample</td></tr>
</table></td></tr>
<tr><td colspan="2">M3 Testing Methods – Concentration Limits</td></tr>
<tr><td>M3.1</td><td>Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.</td></tr>
</table>

5.4.3 Potential Surface Water Impacts

The potential surface water impacts associated with the Project are:

- A decline in downstream water quality associated with stormwater discharges containing high sediment loads (during construction and operation) and elevated pH (during operation).
- Loss of catchment yield to Boothaguy Creek to the north and Bundijoe Creek to the south.
- An increase in demand for potable water from the Gilgandra Shire Council supply to meet production demands.
- Changes to stream stability and riparian health due to changes in environmental flows and water quality.

5.4.4 Management Measures and Operational Controls

5.4.4.1 Operation

Existing Water Management System

A Water Management Plan (WMP) for the Quarry has been prepared by R.W. Corkery & Co (2018). The WMP incorporates a Soil and Water Management Plan (SWMP) which was prepared in reference to *Managing Urban Stormwater: Soils and Construction, Volume 1* (Landcom, 2004), *Volume 2C Unsealed Roads* (DECC, 2008a) and *Volume 2E Mines and Quarries (*DECC, 2008b) (hereafter referred to as "the Blue Book"). At the time of preparation of the SWMP none of the proposed management measures had been implemented.

A review of recent aerial imagery for the project indicates that changes have been made to the water management system since the preparation of the SWMP. The existing Water Management System (WMS) comprises of:

- One sediment basin: SD-1 with an approximate capacity of 3 ML.
- A dirty water diversion bund along the southern edge of the existing works boundary which directs surface flows towards SD-1.

As displayed in **Figure 5.3** the existing WMS comprises overland flow from a high point on the western side of the existing extraction area and through the crushing and stockpiling area to SD-1. SD-1 serves as a sediment basin, capturing runoff from the existing infrastructure and stockpiling areas. Localised runoff is also captured within the existing quarry pit. The SWMP will be updated to reflect the current site WMS.

The existing WMP indicates that water usage at the Quarry would be limited to that required to reduce dust emissions and water will be managed in a manner that minimises the possibility of discharge. This will not change as a result of this modification.

Harvestable Rights

Harvestable rights under the *Water Management Act 2000* allow a land holder to capture up to 10% of the average annual runoff on their property. The harvestable rights for a property is estimated based on the total area of the landholding and the average annual runoff (in ML/ha/year) for the location. The harvestable right for the Quarry land parcel with a total area of 69 ha is estimated to be 4.14 ML/year (*NSW Farm Dams Calculator)*. However, as per Section 5.4.2, all water to be captured within the Quarry WMS is from disturbed catchments and is therefore exempt from Harvestable Rights and there is no requirement for licensing.

Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Approved Extaction Area
- Approved Crushing and Stockpile Area
- Catchment - existing disturbed
- Catchment - existing undisturbed
- Haul Road

FIGURE 5.3

Existing Water Management System and Catchments

Image Source: ESRI (2020) Data source: NSW LPI (2020)

Proposed Water Management System

The proposed Project WMS will consist of two general catchment areas as follows:

- The dirty water catchment which includes the stockpiling area and a portion of the processing area. This catchment has an elevated risk of coarse sediment in stormwater runoff.
- The extraction area catchment. This area will be self-containing as extraction progresses.

The intent of the proposed operational WMS is to:

- minimise the risk of dirty water (i.e. water with elevated concentrations of suspended solids) discharging off-site.
- minimise the import of water by maximising the reuse of captured stormwater and recycled water to meet operational water demands.

A plan and schematic of the proposed Project WMS is presented in **Figure 5.4** and **Figure 5.5**. To ensure the stormwater pollutant risks are adequately managed the operational Project WMS will incorporate a range of controls and mitigation measures including:

- All excess water generated during processing of material will be captured and reused for production demands.
- The stockpiling area and a portion of the processing area will drain to SD-1 to allow settling of course solids.
- During high or prolonged rainfall events excess water may discharge from SD-1 a suitably designed energy dissipation structure and drain away from the project site via overland flow.

Potable water for amenities usage will be provided from a rainwater tank linked to site offices and amenities buildings or trucked in during dry weather. Amenities wastewater will be disposed of via an appropriately designed on-site wastewater management system.

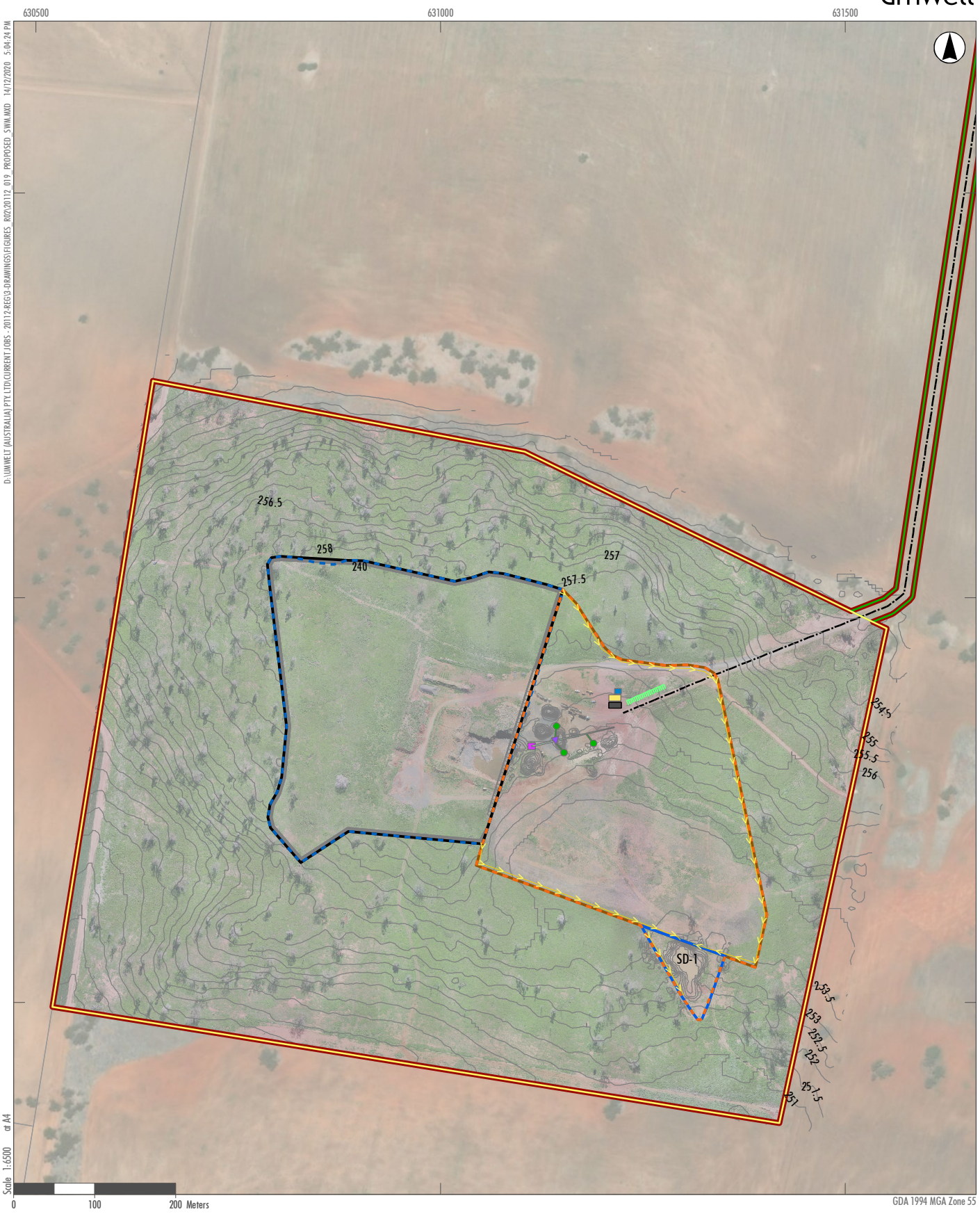
Section 5.4.5 presents the operational site water balance modelling methodology and results. The operational site water balance model was used to predict bore and potable water demands, volumes of captured stormwater reuse and volumes and frequency of stormwater discharges from the proposed Project WMS.

The existing SWMP prepared for the Quarry site by R.W. Corkery (2018) will be reviewed and updated following approval of the Project. **Section 5.4.6** of this report reviews the adequacy of the nominated surface water controls, potential for discharge and likelihood of impacts based on the proposed WMS.

5.4.4.2 Construction

Appropriate erosion and sediment controls (ESCs) will be established to limit soil erosion and minimise sediment transport off-site during the construction phase of the Project. The ESCs will be detailed in a site-specific Erosion and Sediment Control Plan (ESCP) incorporated in the site Water Management Plan prior to any earthworks being undertaken. The ESCP will include a detailed ESC drawing(s). ESCs will be designed, constructed and managed in accordance with Landcom's *Managing Urban Stormwater Soils and Construction* (the Blue Book) (2004). During the construction of the Project all ESCs will be regularly inspected and maintained as required to ensure that all controls are in place and effective.

The following sections outline the anticipated controls to be implemented for the construction phase of the Project.



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Extraction Area
- Stockpile Area
- Sediment Basin
- Crib Room
- Amenities
- Site Office
- Secondary Cone Crusher
- Primary Jaw Crusher
- Conveyor
- Stockpile
- Catchment - proposed - disturbed
- Catchment - proposed extraction area
- Proposed Dirty Diversion Drain
- Haul Road
- Final Landform Contours (0.5m)
- Car Parking

FIGURE 5.4

Operational Water Management System Plan

Image Source: ESRI (2020) Data source: NSW LPI (2020)

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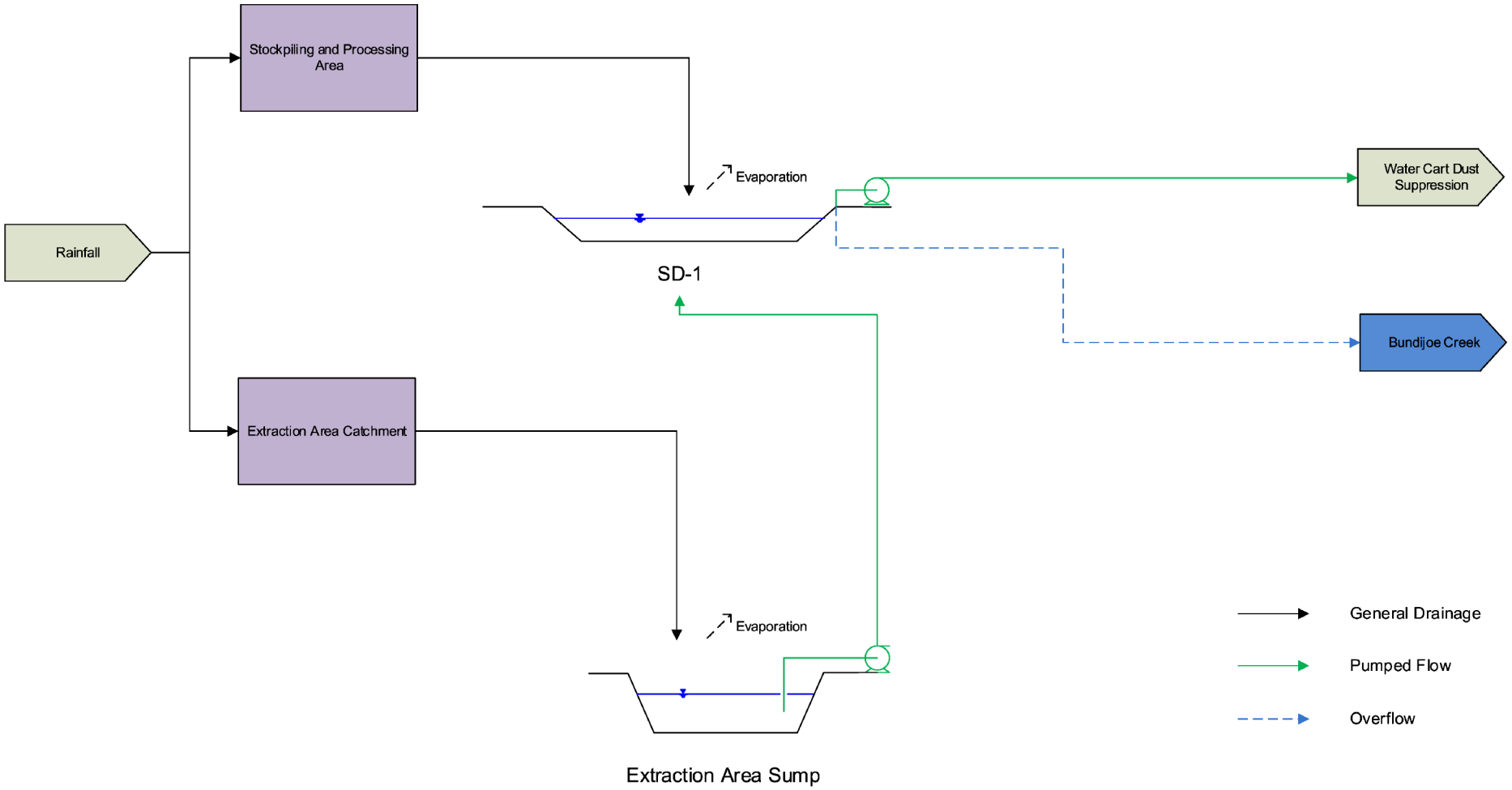


FIGURE 5.5

Operational Water Management System Schematic

Minimise Extent and Duration of Disturbance

Where practicable, the soil erosion hazard on the site due to land disturbance will be kept as low as possible. Land disturbance will be limited as per the requirements of **Table 5.25**.

Table 5.25 Limitations to Land Disturbance

Land Use	Limitation	Comments
Construction areas	Disturbance is to be no further than 5 m (preferably 2 m) from the edge of any essential engineering activity as shown on the plans.	Where appropriate, work zones will be demarcated with signage and/or barricading.
Site access areas and roads	Limited to a maximum width of 10 m.	The site superintendent will determine and mark the locations of these zones onsite. Where appropriate, works boundaries will be marked with a barrier mesh, sediment fencing, or similar materials. Access is to be limited to designated access tracks only as much as practicable.
Remaining lands	Entry prohibited except for essential works as approved by the site superintendent.	ESC plan to be updated for these works as required.

Staging of Works

ESC measures will be installed in the following sequence prior to construction works commencing:

- Install stabilised site access.
- Install sediment fence downslope of work area.
- Construct sediment basin to required design volume.
- Install clean and dirty water diversion bunds around the work area.

Site Access Management Measures

- Site access will be restricted to the minimum practical number of locations.
- Site exit points will be appropriately managed to minimise the risk of sediment being tracked onto sealed public roadways.
- Stormwater runoff from access roads and stabilised entry/exit points will drain to an appropriate sediment control device.
- Site access points will be constructed in accordance with the Blue Book *Standard Drawing SD6-14 Stabilised Site Access* (refer to **Appendix 4**).
- Suitable all-weather maintenance access will be provided to all sediment control devices.

General Site Management

- All fuels, chemicals and liquids are to be stored in an impervious bunded area a minimum of 50 m away from:
    - rivers, creeks or any areas of concentrated water flow

- flooded or poorly drained areas
- slopes above 10%.

- Refuelling of plant and equipment is to be undertaken in an impervious bunded area.
- Emergency spill kits will be kept on site at all times. All staff will be made aware of the location of the spill kits and trained in their use.
- Site spoil must be lawfully disposed of in a manner that does not result in ongoing soil erosion or environmental harm.

Soil and Stockpile Management

- Spoil is to be placed in designated stockpile locations within the site. Temporary stockpiles are to have sediment fencing installed on the downslope side and a clean water diversion bund installed on the upslope side in accordance with the Blue Book *Standard Drawing SD4-1 Stockpiles* (refer to **Appendix 4**) to protect from run-on water.
- Ensure stockpiles of erodible material that have the potential to cause environmental harm are:
  - constructed on the contour at least 2 m (preferably 5 m) away from hazard areas, particularly areas of likely concentrated water flows, e.g. roads, slopes steeper than 10% etc.
  - constructed greater than 40 m away from the top bank of drainage lines
  - stabilised or provided with an appropriate protective cover (synthetic, mulch, or vegetative) if they are to be in place for more than 10 days.

Clean Water Diversion

- Wherever reasonable and practicable, "clean" surface waters will be diverted away from sediment control devices and any untreated, sediment-laden waters. This will primarily be achieved through the use of temporary lined (with geofabric or similar) diversion bunds.
- Temporary clean water diversion drains/berms will be installed in accordance with the Blue Book Standard Drawing *SD5-5 Earth Bank (low flow)* and *SD5-6 Earth Bank (high flows)* (as appropriate) (refer to **Appendix 4**).

Sediment Control Measures to Prevent Off-Site Damage

- All reasonable and practicable measures will be taken to prevent, or at least minimise, the release of sediment from the site.
- Sediment control barriers (i.e. sediment fences) will be installed in accordance with the Blue Book *Standard Drawing SD 6-8 Sediment Fence* (refer to **Appendix 4**) in appropriate locations to contain the coarser sediment fraction (including aggregated fines) as near as possible to their source.
- Sediment control devices will be de-silted and made fully operational as soon as reasonable and practicable after a sediment-producing event, whether natural or artificial, if the device's sediment retention capacity falls below 75% of its design retention capacity.
- Temporary soil and water management structures will be removed only after the lands they are protecting are stabilised appropriately in accordance with the requirements of the Blue Book (Landcom, 2004).

Sediment Basin

During construction (and operation) SD-1 will be operated as a sediment basin in accordance with Blue Book *Standard Drawing SD 6-4 Earth Basin - Wet* (refer to **Appendix 4**). In order to contain runoff from the stockpiling and processing site for a five day, 95th percentile design rainfall event (50.7 mm) including a sediment storage zone sized for 12 months of soil loss as calculated based on site specific soil and rainfall conditions using the Revised Universal Soil Loss Equation (RUSLE) the capacity of SD-1 will need to be 3.97 ML. Presently the capacity of SD-1 is approximately 3 ML. As such, the capacity of SD-1 will be increased to accommodate the required design capacity for the extended stockpile area. To allow for additional operational water storage and quarry pit dewatering will be increased to accommodate 5 ML total capacity (4 ML for sediment management and 1 ML freeboard to allow for storage of water on site).

Sediment Basin Water Quality

Under the POEO Act, there is a legal responsibility to ensure that runoff leaving a construction site (including water discharged from sediment basins after storm events) meets acceptable water quality criteria. Condition L2 of EPL 21093 for the project specifies concentration limits for discharges from specified monitoring/discharge points. EPL 21093 lists discharge Point 1 relating to "sediment basin 1" as described in the existing quarry WMP however as indicated in **Section 5.4.4.1** this sediment basin has not been constructed. As such EPL 21093 will be modified to reassign "Point 1" as listed under the EPL to SD-1.

The parameters to be monitored in the management of sediment basins and their assessment criteria are listed in **Table 5.26** in accordance with the Blue Book (Landcom, 2004) and EPL 21093.

Table 5.26 Water Quality Discharge Criteria and Monitoring Requirements – Point 1 (EPL 21093)

Parameter	Limits	Monitoring Frequency	Sampling Method
Total suspended solids (TSS)	< 50 mg/L	During any discharge	Grab sample
pH	6.5 to 8.5	During any discharge	In situ
Oil and Grease	<10 mg/L	During any discharge	Grab sample

The limits specified under Condition L2.4 of EPL 21093 do not apply when the discharge occurs solely as a result of a rainfall event measured at the premises which exceeds a total of 50 mm of rainfall over any consecutive five day period. A 50 mm rainfall depth is defined by the Blue Book (Landcom, 2004) as the rainfall depth in millimetres for a 95th percentile 5 day rainfall event for the 'Central Tablelands and Central Western Slopes' (Dubbo) consistent with the storage capacity for Type D sediment retention basins as described in Managing Urban Stormwater Volume 2E: Mines and Quarries (DECC, 2008).

In order to expedite the assessment and subsequent discharge of clarified water from stormwater control structures (i.e. sediment basins) in accordance with EPL 21093 the concentration limit for total suspended solids stipulated by condition L2.4 for discharge point 1 is deemed not to have been breached where:

a) The water discharged occurs solely as a result of rainfall measured at the premises which exceeds a total of 50 mm of rainfall over a consecutive five-day period; or

b) The water discharged is within the pH range 6.5 to 8.5 and has a turbidity of no more than 40 NTU at the time of the discharge; and

c) The EPA is advised within 3 working days of the completion of the sample testing and analysis as required by condition M2.2 of EPL 21093 of any results above the licence limit.

Sediment Basin Management

The sediment basin will be treated (if required), dewatered and, if required, de-silted to restore the design containment capacity of the sediment basin settling zone within five days following a rainfall event. Captured water from the sediment basin will be utilised for dust suppression or applied to undisturbed areas on-site (at a rate that does not generate runoff) and allowed to infiltrate into the soil.

Site Rehabilitation

- Disturbed areas will be progressively stabilised as works are completed, where practical, and the area of exposed land minimised as much as practicable.
- All erosion and sediment control measures shall be maintained in a functioning condition during construction until all construction activities are completed and full stabilisation of the site is achieved (i.e. > 70% ground cover across the whole of the disturbed area.

Inspection, Maintenance and Incident Response

Site Monitoring

- During construction, visual monitoring of water quality within the sediment basin (i.e. turbidity, hydrocarbon spills/slicks) will be undertaken:
    - weekly
    - after runoff generating rainfall
    - as required to identify any potential spills or deficient erosion and sediment controls.
- All water quality data, including dates of rainfall, dates of testing, testing results and dates of water release, will be kept in an on-site register.
- All erosion and sediment controls will be inspected:
    - weekly
    - prior to forecast rainfall events greater than or equal to 10 mm in the next 24-hour period
    - after rainfall events greater than or equal to 10 mm in a 24-hour period.
- All inspections will be documented on a check sheet and all actions identified will be closed out within a reasonable and practical time frame. The check sheet will record:
    - the condition of every sediment control employed
    - maintenance requirements (if any) for each sediment control
    - the volumes of sediment removed from sediment retention systems, where applicable
    - the site where the sediment is disposed

Site Maintenance

- All erosion and sediment control measures, including drainage control measures, will be maintained in proper working order at all times during their operational lives.
- Sediment removed from sediment traps and places of sediment deposition will be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.
- Required repairs to all controls will be undertaken immediately where practical. Controls will be put back in place if they are moved for any reason.

- All sediment fences and detention systems will be kept in good working condition. In particular, attention will be given to:
    - recent works to ensure that they have not resulted in diversion of sediment laden water away from protection measures
    - degradable products (i.e. sediment fence) to ensure they are replaced as required
    - sediment removal as required.

5.4.5 Site Water Balance

5.4.5.1 Scope

A daily time step water balance model (the Model) of the operational phase of the Project was developed in the GoldSim modelling software platform to predict:

- the gross operational water balance (excludes potable water imports and off-site discharges)
- a detailed net water balance for the median gross water balance year
- the likely water import demand
- the volume and frequency of stormwater discharges.

5.4.5.2 Model Basis and Assumptions

Climate Data

Rainfall data for the period 1900 to 2019 was sourced from the SILO climate database which daily rainfall data for gridded locations based on interpolated BoM station records.

Pan evaporation data was also sourced from the SILO climate database which provides daily evaporation data based on interpolated BoM monitoring records.

Water Demands

The Project water demands are haul road and stockpile dust suppression and evaporative losses from water storages. Water demands for dust suppression have been estimated based on an evaporation-rainfall deficit, i.e.:

- if rainfall exceeds pan evaporation then there is no dust suppression demand; or
- if evaporation exceeds rainfall, the dust suppression demand is equal to pan evaporation minus rainfall

Evaporative losses from water storages have been based on an evaporation pan factor of 0.8.

5.4.5.3 Results

Gross Water Balance

Table 5.27 presents the statistical 10th, 50th and 90th percentile gross water balance results (excludes off site discharges and water imports) for the Project.

Table 5.27 Gross Water Balance Results – Stage 1

Statistic	Result (ML/year)
10th percentile	-10.7
50th percentile	-5.7
90th percentile	-0.7

The gross water balance results show that the Project would operate with a water deficit in most years with groundwater and/or potable water imports required.

Net Water Balance

Table 5.28 presents the net water balance results for the modelled rainfall year closest to the gross water balance 50th percentile prediction for the Project.

Table 5.28 Median Year Net Water Balance

Parameter	Result (ML)
Inflows	
Rainfall Runoff	16.2
Water Import Demand	5.5
Total Inflows	***21.7***
Evaporation	8.1
Operational Demands	13.6
Off-site Discharges	0
Total Outflows	***21.7***
Change in Storage	0
Net Water Balance	**0**

Imports and Discharges

Table 5.29 presents the predicted water import demand volume statistics for the Project.

Table 5.29 Water Import Demands

Statistic	Result (ML/year)
Minimum	0
10th percentile	0.7
50th percentile	5.7
90th percentile	10.7
Maximum	17.4

The results presented in **Table 5.29** demonstrate that the Project has a significant water import demand in all years. As such, an alternate water source is required to ensure water security for the project.

Table 5.30 and **Table 5.31** present the predicted discharge volume and frequency statistics respectively for the Project.

Table 5.30 Detention Basin Discharge Volumes for SD-1

Statistic	Discharge (kL/year)
Minimum	0
10th percentile	0
50th percentile	0
90th percentile	6.7
Maximum	20.9

Table 5.31 Detention Basin Discharge Frequency for SD-1

Statistic	Discharge Frequency (days/year)
Minimum	0
10th percentile	0
50th percentile	0
90th percentile	3.0
Maximum	10.0

The results presented in **Table 5.30** and **Table 5.31** demonstrate that excess stormwater from the Project will be discharged off-site only during wet years. Note that the water balance model was based on the proposed WMS (refer to **Section 5.4.4**) and the discharge predictions are based on SD-1 having an increased capacity of 5 ML.

5.4.6 Impact Assessment

5.4.6.1 Water Quality

Water quality impacts on downstream receiving waterways, including Marthaguy Creek, are expected to be negligible. The proposed WMS will ensure all runoff from the disturbed catchment that has the potential for elevated concentrations of sediment is captured for reuse in SD-1 to meet operational demands.

As the sediment basin SD-1 will be designed and operated as sediment basin for the construction phase of the Project to contain runoff from a 5 day 95th percentile rainfall event in addition to the implementation of a range of erosion and sediment control measures, water quality impacts during construction will also be minimised.

5.4.6.2 Water Quantity

Runoff from the existing Project site presently drains towards Bundijoe Creek. Runoff from the Quarry site will be managed within the Project WMS to contain stormwater that may have elevated concentrations of suspended solids. During storm events exceeding the containment capacity of the Quarry site WMS, excess treated runoff will drain to Bundijoe Creek via overland flow after spilling from SD-1. Surplus stormwater will discharge onto an energy dissipation structure and/or via a level spreader that will be designed to ensure non-erosive overland flow during a peak discharge event.

Water balance modelling predicts an average annual discharge from the Quarry site WMS to be approximately 2.1 ML/year which is less than the estimated average runoff from the undeveloped WMS catchment of 12.3 ML (based on an average regional runoff of 0.60 ML/ha/year, NSW Farm Dams Calculator, 2020). This is a consequence of the Quarry site capturing stormwater for pollution control purposes and reusing the stormwater for operational demands rather than importing groundwater or potable water.

As identified in **Section 5.4.5.3** in order to ensure water security for the Project, water will need to be imported from an external source. As indicated in **Section 3.9.2.2** a groundwater bore is currently being drilled on the Quarry site and based on the productivity of the bore on the neighbouring property, a flow rate of greater than 1 L/s (approximately 31 ML/year) is expected. The maximum water import demand of the Project as indicated in **Table 5.29** is 17.4 ML/yr, therefore the bore will have the capacity to supply the Quarry with a sufficient amount of water for ongoing operations. A Water Access Licence will be obtained as well as sufficient unit shares in the groundwater source (via a controlled allocation or trading) to supply groundwater to the Quarry.

5.4.6.3 Flooding and Stream Stability

As indicated in **Section 2.4.1** the Project will not be located on flood prone land. As such, no impacts on flood regimes in the catchment are expected as a result of the Project.

Excess stormwater runoff from the Quarry site WMS will discharge from SD-1 onto an energy dissipation structure and/or level spreader designed to ensure non-erosive overland flow during a peak discharge event. Given the Project will, on average result in a reduction in runoff draining to Bundijoe Creek (refer to **Section 5.4.5.3**), no impacts on stream stability are expected as a result of the Project.

5.5 Groundwater

5.5.1 Introduction

The SEARs require the EIS to include an assessment of the potential impacts of the Project on water which include the following requirements relevant to the assessment of groundwater resources:

- assessment of any volumetric water licensing requirements or other approvals required
- identification of any licensing requirements or other approvals required under the *Water Act 1912* and/or *Water Management Act 2000*
- a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant WSP
- an assessment of the likely impacts of the development on the quality and quantity groundwater resources, and
- a description of the proposed water management system, water monitoring program and other measures to mitigate surface water impacts.

The following sub-sections have been prepared by Umwelt and provide a review of the local groundwater setting, potential impacts on groundwater, proposed management and mitigation measures and assessment of groundwater-related impacts.

5.5.2 Local Setting

5.5.2.1 Local Planning Considerations

The Project Site is not located over an area of groundwater vulnerability, as identified by Map Sheet CL1_002 of the Gilgandra LEP 2011.

5.5.2.2 Groundwater Table

In order to establish the local hydrogeological setting of the Project Site, the following investigations were completed:

- Observation of the resource drilling completed over the Project Site.

  No groundwater was reported as being encountered during the drilling of the 22 exploration holes across the Project Site. Five of these holes were drilled to depths exceeding 18m.

- Monitoring of exploration drill holes.

  During a site inspection of the Quarry site (2017), the occurrence of water within the open exploration holes was investigated. Using a tape measure and weight ("plopper"), it was established that there was a shallow layer of water (<100 mm) at the base of eight holes tested.

  The water level within these exploration holes has been assessed by similar method since 2017 with no water encountered at times and the water level rising following significant rainfall.

  This is indicative of surface runoff accumulation within a low permeability setting.

- Drilling for a planned production bore on the Quarry site

  The Proponent is completing drilling within and through the basalt 1.3 km to the north of the Quarry site approximately to establish a water bearing zone from which a production bore can be established. Drilling has exceeded 400 m in depth, with the basalt continuing to 130 m below surface, with no water bearing zones being encountered.

This assessment is supported by analysis of local groundwater bore data held by the DPI Water Registered Groundwater Works database.

- A review of groundwater data contained by the DPI Water Registered Groundwater Works database (for registered groundwater works located within a 5km radius of the approximate centre of the extraction area) (http://allwaterdata.water.nsw.gov.au/water.stm).

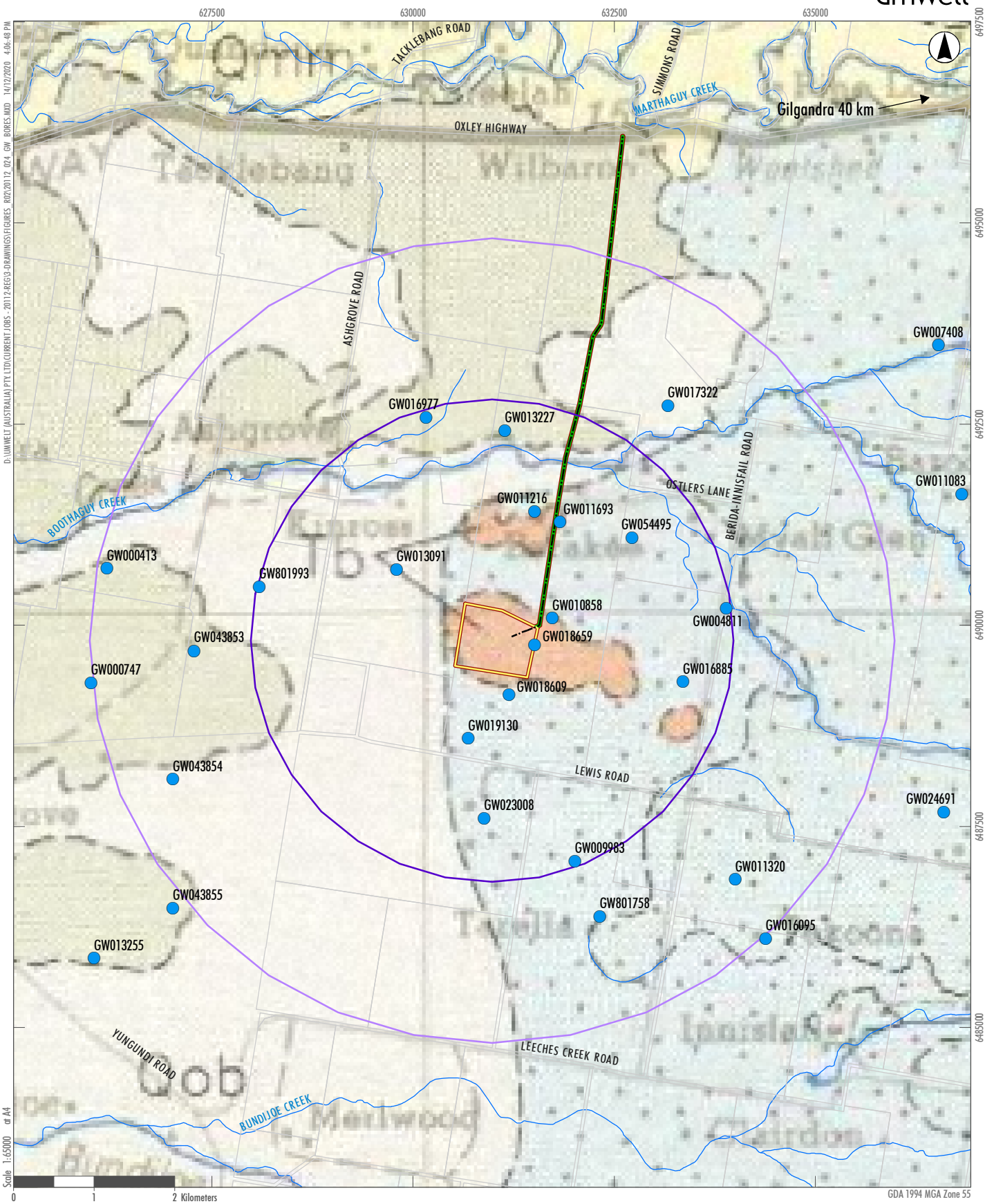
- A total of 27 registered groundwater works were identified within the search area (refer to **Figure 5.6**). Information on the surface elevation, bore depth, water bearing zones, water bearing geology and yield of the closest 12, which occur within 3km of the Project Site and are most likely to intersect the basalt geology of the extraction area, are summarised in **Table 5.32**. **Appendix 10** includes the Works Summaries for these bores from which this information has been drawn.

  Of the analysed groundwater records, the water bearing zones occur predominantly in sedimentary rock (sandstone and shale) at depths below 20m.

  Water bearing zones have been identified in the basalt, however, not in the bores closest to the Quarry site (GW18659 and GW10858). Where recoverable water has been identified within the basalt this is at depth below the maximum extraction depth of the extraction area (240m AHD):

  - 162 mAHD in GW004811
  - 237 mAHD in GW016885, and
  - 235 mAHD in GW054495.

  Located at the top of a local high point, and limited to a depth of 20m, the proposed extraction activities would not intercept any groundwater.



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- 3km Buffer
- 5km Buffer
- Haul Road
- Drainage Line
- Groundwater Bores

Gelology

- Tertiary Basalt
- Marra Creek Formation Alluvium
- Carrebear Formation Alluvium
- Carrebear Formation Alluvium
- Pilliga Sandstone

FIGURE 5.6

Groundwater Bores

Image Source: Nyngan 1:250000 Geology Data source: NSW DFSI (2020), Nyngan 1:250000 Geology Map

Table 5.32 Groundwater Bores

Bore Reference[1]	Elevation (mAHD)	Depth (m)	Water Bearing Zone		Geological Properties / Description	Yield (L/s)
			M bgl	mAHD		
GW018659	250	2.05	None	-	basalt	N/A
GW010858	250	37.8	22.8 – 22.9	227	Shale	0.23
GW018609	250	51.5	35.3	215	Shale	0.06
GW011216	245	46.0	18.2	227	Clay	N/A
GW011693	245	18.8	18.5 – 18.6	227	Shale	0.95
GW016885	255	17.7	17.4 – 17.7	237	Basalt	0.38
GW019130	245	41.7	38.4 – 41.1	205	Sandstone	0.88
GW023008	245	47.8	39.3 – 46.3	205	Sandstone	0.76
GW009983	250	65.8	45.7 – 45.8	205	Sandstone	0.10
GW004811	255	100.5	92.9	162	Basalt	1.26
GW054495	250	18.3	14.6 – 14.9	235	Decomposed basalt	0.88
GW013091	245	60.0	37.4 – 37.7 41.4 – 41.7	212 205	Granite Shale	0.10 0.15

Note 1: Refer to **Figure 5.6** bgl = below ground level N/A = Not provide by Groundwater Works Summary Sheet
Source: DPI Water - Online Water Monitoring Network Database

There is no record of intersection of groundwater within any of the exploration drill holes on the Quarry site (to a depth exceeding 18 m, 240 mAHD) nor within a nearby bore (GW018659) drilled to a depth of 20m within the basalt on the Quarry site. Local records and advice from surrounding landowners indicate water is accessible within the basalt at a depth of between 235m and 237m AHD. This depth is below the maximum depth of the proposed extraction area and therefore, groundwater should not constrain the Project.

The above notwithstanding, **Section 5.5.3.2** provides a review of management measures to be implemented to prevent any unanticipated intersection of groundwater, and contingency measures that would be implemented in the unlikely event that groundwater is encountered during extraction.

5.5.2.3 Groundwater Dependent Ecosystems

A search of the Groundwater Dependent Ecosystems Atlas[3] confirms that no Groundwater Dependent Ecosystems (GDEs) have been identified on or adjoining the Project Site. Given the groundwater table is understood to occur at an elevation of between 235 and 237 mAHD below the Quarry site, no GDEs are expected to be present.

5.5.3 Groundwater Management

5.5.3.1 Potential Issues

Groundwater has been assessed as being below the proposed maximum depth of extraction and would not be intercepted by the extraction area. The lack of interaction between the extraction zone and local groundwater contained within the basalt indicates the Project would have limited if any impact on groundwater expression to local creeks (Boothaguy, Bundijoe and Marthaguy), which are more likely to receive discharge from local surficial springs of the dominant alluvial geology of the local setting.

[3] http://www.bom.gov.au/jsp/weave/gde.html

On the basis that there is unlikely to be any direct impact of the Project on groundwater or GDEs, the only identified groundwater-related management issue would be the potential contamination of local groundwater as a result of spills or leaks of hydrocarbons, or from explosives residues.

5.5.3.2 Design Features, Management Measures and Operational Controls

Groundwater Quantity

In the unlikely event that groundwater is encountered during extraction activities, work would be ceased immediately in that section of the Quarry and consultation with the local office of DPIE-Water undertaken to identify the appropriate mitigation measures to ensure the operations continue to comply with all licencing requirements.

Groundwater Quality

Hydrocarbons would be stored on the Project Site within a sealed and bunded areas conforming to the requirements of AS 1940. In the event of a spill or leak, Quarry management would be advised and the three phase mitigation strategy as follows.

- Phase 1 – Source Control: isolate the source of spill or leak and stop the leak either by maintenance or placing the leaking item within or over the fuel/oil storage area.
- Phase 2 – Recovery: recover as much as possible at the source by pumping free hydrocarbon from the surface and excavating hydrocarbon-contaminated materials. Contaminated materials would be stockpiled on site under cover and on an impermeable surface, e.g. a high-density polyethylene sheet. This material would later be bio-remediated on site and/or transported to an approved waste facility.
- Phase 3 – Remediation: transport the contaminated material to a designated area within the Project Site (away from natural or created drainage) for on-site bio-remediation ("land farming") or to a facility licensed to accept and treat hydrocarbon contaminated material.

5.5.4 Assessment of Impact

5.5.4.1 Aquifer Interference

The WM Act defines an aquifer interference activity as that which involves any of the following:

- Penetration of an aquifer
- interference with water in an aquifer
- obstruction of the flow of water in an aquifer
- the taking of water from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations, and/or
- the disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.

As the extraction of basalt will be to a maximum depth of 240 mAHD, which is above the local groundwater table as determined through on-site observations and a review of local groundwater data, the Project will not represent any of these activities. The Project is therefore not considered an aquifer interference activity.

5.5.4.2 Groundwater Availability

No incidental groundwater make is expected which could lead to reduction in the local groundwater table, and subsequently availability to other groundwater users.

The process of drilling and blasting could result in local fracturing of the basalt. Fractures in the basalt are generally where groundwater accumulates and can be accessed for the purpose groundwater use. It is possible that such fractures could create a preferential flow path for groundwater and draw water away from other sources which are accessed by local landowners. The likelihood of this occurring is considered highly unlikely in the local setting for the following reasons.

- The approach to blasting is to direct the energy away from the outer perimeter of the extraction area. That is, as minimal energy is directed into the outer wall, the potential for fracturing is minimised.
- The basalt is very dense and has a very low permeability. As a result, even if fractures develop, the flow of groundwater to these would be very slow.
- The majority of water producing bores are located in the non-basalt geology and would therefore be unaffected even in the event of a small fracture and accumulation of water within the basalt. Due to the very dense, low permeability characteristics of the basalt, flow of groundwater from aquifers which adjoin the basalt into the basalt is not likely.
- The water bearing zones of local bores are at or below 227 mAHD, a further 13 m below the maximum depth of the extraction area.

Groundwater to be extracted from an existing bore (GW011693) on the "Berakee" property or a new production bore under construction on the Quarry site would be undertaken only after obtaining the appropriate approval for industrial water use and water access licence.

On the basis of the above, no adverse impact on groundwater availability is predicted.

5.5.4.3 Groundwater Quantity

Groundwater would not be intercepted by the proposed extraction of basalt. This is supported by the registered groundwater bore database and observations over the three years since drilling on the Quarry site commenced.

However, in the unlikely event that groundwater seepage to the extraction area is identified or suspected, DPI Water would be immediately notified.

5.5.4.4 Groundwater Quality

Hydrocarbon spills or leaks not appropriately controlled and managed have the potential to contaminate groundwater. Given the implementation of these controls and management measures, the likelihood of contamination to groundwater is considered minimal.

Residues from blasting have the potential to introduce additional nutrients to the Quarry site, which in turn could flow to surrounding waterways. However, this risk is considered very small on the basis that any runoff from blasted areas would be contained within the extraction area and diverted to sediment basins or in-pit sumps. Furthermore, the concentration of nutrients would be comparable to that of fertilisers used on surrounding agricultural properties.

5.5.4.5 Groundwater Dependent Ecosystems

As there are no known GDEs on, or adjoining the Quarry site, nor any expected to occur on the Quarry Site, it is assessed the Proposal would have minimal to no potential to impact on GDEs.

5.6 Biodiversity

5.6.1 Introduction

The SEARs require the EIS to assess potential impacts to biodiversity within and surrounding the Project Site, including a description of measures that would be implemented to manage mitigate potential impacts. In addition, the Biodiversity & Conservation Division (BCD) have requested Biodiversity impacts related to the Project are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The EARs and BCD requirements are included in full as **Appendix 2**.

Following from previous assessment of the Quarry undertaken by OzArk Environmental and Heritage Management Pty Ltd (OzArk) to support the original development application (OzArk, 2017), Umwelt has completed an Ecological Assessment of the Project. Notably, this assessment determined the scale of impact did not exceed eth relevant threshold for entry into the NSW Biodiversity Offset Scheme and therefore requirement to complete a BDAR. The resulting report, referred to hereafter as Umwelt (2020), is presented in **Appendix 8**. The following sub-sections draw on information provided by Umwelt (2020) and:

- describe the predicted and observed regional and local flora, fauna and vegetation communities, including threatened flora and fauna species within the Project Site
- identify potential ecological impacts of the Project
- present proposed management and mitigation measures, and
- assess the likely impact.

5.6.2 Assessment Methodology

5.6.2.1 Overview and Scope

Umwelt (2020) combined a desktop and literature review with field survey of the Project Site to evaluate the type and quality of habitat that would be impacted and complete targeted survey to identify the presence of any species, populations or communities of conservation significance.

For the purpose of desktop and literature review, a 10km radius surrounding the Project Site was used to predict those species, populations and communities which could be present. Field survey was completed over the Project Site in its entirety

5.6.2.2 Desktop Assessment

Umwelt (2020) conducted a search of the following information sources to develop a predictive model for threatened flora and fauna to be recorded in the study area.

- Aerial photograph interpretation of the landscape and previous vegetation maps.
- Previous assessment within the local setting and the OEH maintained database of Biometric Vegetation Communities.

- Department of Planning, Industry and Environment (DPIE) Atlas of NSW Wildlife, Department of Agriculture, Water and Environment (DAWE) Protected Matters Database and Biodiversity Assessment Method (BAM) Calculator.
- Central West Lachlan State Vegetation Map (OEH 2016).

5.6.2.3 Field Assessment Methodology

A field survey was completed on 27 February 2020 with the objectives to:

- describe the nature and extent of vegetation removal
- determine if species, populations or communities listed under the schedules of the EPBC and BC Acts would be, or have potential to be, affected by the Project, and
- describe the quality and value of the habitat that would be affected by the Project.

Surveys were conducted in accordance with the BAM (OEH 2017) and included a Vegetation Integrity plot with full floristics, rapid vegetation assessments, targeted searches for key threatened species identified through the desktop assessment, and identification of key fauna habitat features present.

5.6.3 Local Setting

Inspection of the Project Site has confirmed the presence of a degraded form of PCT 98 Poplar Box – White Cypress Pine – Wilga – Ironwood shrubby woodland on red sandy-loam soils in the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion. Mature/senescent poplar box (*Eucalyptus populnea subsp. bimbil*) and White cypress pine (*Callitris glaucophylla*) dominate the overstorey with scattered kurrajong (*Brachychiton populneus*) and western rosewood (*Alectryon oleifolius*) also present. Ground cover is dominated by exotic species. Within the proposed impacted area of the Project, the majority has been mapped as non-native vegetation with isolated areas of degraded PCT 98 around the retained mature trees (refer to **Figure 5.7**).

No threatened flora or fauna species were recorded during field survey, which include targeted searches for two species of flora (Belson's panic and shrub sida) which were considered to have a moderate likelihood of occurring in the subject site and require surveys to be undertaken during specific seasons (December – April and September – February).

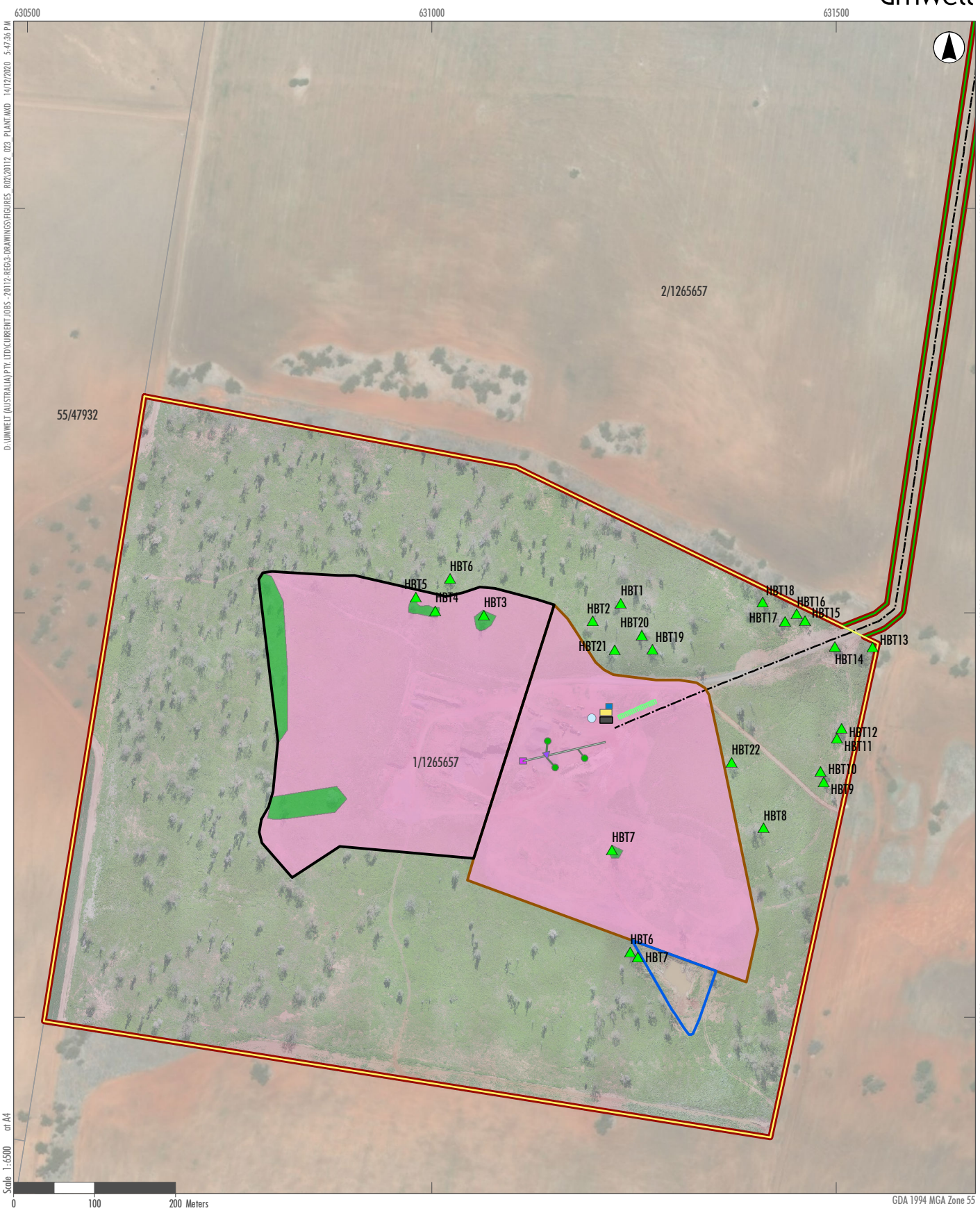
As a result of recent clearing undertaken by the previous landowner as allowable clearing activities under Schedule 5A of the *Local Land Services Act 2013*, only four habitat trees remain within the proposed impacted area of the Project Site (refer to **Figure 5.7**).

5.6.4 Impact Avoidance, Minimisation and Mitigation Measures

The Applicant has designed the Project to minimise impacts on threatened species by firstly avoiding and then mitigating potential biodiversity impacts.

The layout of the Project has been designed with the intent to minimise disturbance, avoid the clearing of remnant native vegetation. As noted in Umwelt (2020), by remaining largely within areas cleared by the previous landowner, clearing of native vegetation has been restricted to 0.8 ha. Unavoidable impact to habitat features would be limited to four habitat trees would be impacted

The following presents the design features, operational controls and management measures proposed to minimise and mitigate impacts on local biodiversity.



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Extraction Area
- Stockpile Area
- Sediment Basin
- Crib Room
- Amenities
- Site Office
- Secondary Cone Crusher
- Primary Jaw Crusher
- Conveyor
- Stockpile
- Car Parking
- Haul Road
- Hollow Bearing Trees
- Water Tank
- PCT 98 Poplar Box – White Cypress Pine – Wilga – Ironwood shrubby woodland on red sandy-loam soils in the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion
- Exotic/Disturbed

FIGURE 5.7

Plant Community Types and Habitat Features

Image Source: ESRI (2020) Data source: NSW DFSI (2020)

Clearing and Prevention of Over-clearing

- All personnel would be inducted, including identification of areas of approved disturbance and the legislative consequences unapproved disturbance. Induction records, including name, date, signed induction/re-induction forms, etc. would be maintained.
- The limits of approved disturbance areas would be identified on the ground through the use of permanent markers. Individual clearing programs within the approved disturbance areas would be identified through temporary markers such temporary fencing, flagging tape, para-webbing or similar.
- Vegetation would be removed in such a way to avoid damage to surrounding vegetation.
- Prior to clearing, trees would be inspected, immediately before pushing or felling, for nests or hollows before pushing or felling. If nesting or roosting fauna are observed, encourage the animals to relocate by clearing surrounding vegetation or engage a suitable wildlife handler to relocate the animal(s).
- Vegetation would be retained for use during rehabilitation operations.
- An Erosion and Sediment Control Plan would be prepared and implemented in accordance with Landcom (2004) (refer also **Section 5.4**).

Management of Weeds and Pathogens

- All ground-engaging machinery would be cleaned prior to arriving at or departing the Project Site.
- Where noxious weeds are encountered during clearing, these would be managed in accordance with the requirements of the *Noxious Weeds Act 1993* and/or any requirements of Gilgandra Shire Council.
- Pesticides would only be applied by a person trained and qualified to do so and in accordance with the requirements of the label.

Management of Pests

- All food scraps and rubbish would be appropriately disposed of in sealed receptacles to prevent providing forage habitats for foxes, rats, dogs and cats.

Management of Fallen Timber, Dead Wood and Bushrock

- Any fallen timber, dead wood and bush rock (if present) encountered would be left in situ or relocated to a suitable place nearby.
- Should rock require removal, this would be completed with suitable machinery so as not to damage the underlying rock or result in excessive soil disturbance.

Rehabilitation

- The final landform would be rehabilitated to re-establish a vegetation community consistent with a shrubby woodland (refer also **Section 3.13** and **Figure 3.3**).

5.6.5 Assessment of Impacts

The vegetation within the Project Site is highly modified and contains very little native vegetation or habitat features for threatened fauna species. Umwelt (2020) have determined that four threatened species could potentially use the Project Site and could therefore be adversely affected. Assessments of Significance were conducted for these species under both the BC Act and the EPBC Act where applicable with significant impacts to these species assessed as unlikely.

The Project will not impact on any land mapped as having biodiversity values (refer to **Figure 2.5**) and will only remove 0.8 ha of native vegetation. The Biodiversity Offset Scheme (BOS) is therefore not triggered and no further consideration of the Biodiversity Assessment Method (BAM) is required.

5.7 Aboriginal Cultural Heritage

5.7.1 Introduction

The SEARs identify "heritage" as a key issue for assessment in the EIS requiring "an assessment of the potential impacts on Aboriginal heritage (cultural and archaeological), including evidence of appropriate consultation with relevant Aboriginal communities/parties and documentation of the views of these stakeholders regarding the likely impact of the development on their cultural heritage".

OzArk Environment & Heritage Pty Limited (OzArk) was engaged to prepare an Aboriginal Archaeological Impact Assessment (AAIA) in accordance with the:

- Code of Practice for the Investigation of Aboriginal Objects in New South Wales (DECCW 2010)
- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011).

The AAIA is referred to as OzArk (2021) and is presented with this EIS as **Appendix 9**.

In 2017, OzArk completed a Due Diligence assessment for the initial Berakee Quarry (OzArk, 2017). No Aboriginal sites or sensitive landforms were identified during the assessment.

This subsection describes the regional archaeological context and setting, describes a predictive model for Aboriginal heritage locations, outlines the results of field investigations and assesses the significance and proposed management of an Aboriginal site, and Aboriginal heritage more generally, found through the investigation.

5.7.2 Local Setting and Existing Environment

5.7.2.1 Ethnohistory

The Project lies at the boundary of the areas associated with the Wailwan and Wiradjuri language groups (Horton 2004). People of the Wailwan group inhabited the area to the north surrounding the Macquarie Marshes and its tributary waterways. The area associated with the Wiradjuri people to the south of the study area is vast, from Gilgandra and Nyngan to Wagga Wagga, encompassing local groups with distinct cultural and social practices.

A detailed summary of the recorded history of the Wiradjuri people is presented in *Section 4 of* OzArk (2021).

5.7.2.2 Desktop Review

The desktop database searches conducted by OzArk (2021), and a summary of the survey results, are presented in **Table 5.33**. In summary, the database searches did not identify any recorded Aboriginal objects or sites within the Project Site.

Table 5.33 Database Search Results

Name of Database Searched	Date of Search	Search Area	Comment
Commonwealth Heritage Listings	28/9/2020	Gilgandra Shire LGA.	No places listed on either the National or Commonwealth heritage lists are located within the Project Site.
National Native Title Claims Search	28/9/2020	NSW	No Native Title Claims cover the Project Site.
AHIMS	25/9/2020	20 x 20 km centred on the Project Site.	9 AHIMS sites returned within the designated area.
Gilgandra LEP (2011)	28/9/2020	Dubbo LEP of 2011.	None of the Aboriginal places noted occur near the Project Site.

Source: Modified after OzArk (2021) – Table 4-3

Of the 9 AHIMS sites recorded, the majority (eight) are modified trees, with one artefact scatter identified.

5.7.2.3 Predictive Model

Based on the ethnohistory of the area surrounding the Project Site, and the results of the desktop assessment, OzArk (2021) developed a predictive model to establish the likely distribution of archaeological material against which the effectiveness and subsequent analysis of the survey results could be tested, compared and reasoned.

The predictive model provides the following interpretation as to the probability of specific site types occurring on the Project Site.

- Isolated finds may be present at any location within the Project Site.
- Open artefact scatters, defined as two or more artefacts within 50m and not within a rock shelter, are most likely to occur on level or low gradient contexts, along the crests of ridgelines and spurs, and elevated areas fringing watercourses or wetlands. As the Project Site is unlikely to have drawn Aboriginal people on a regular basis due to lack of water, artefacts associated with stone tool making could be present due to the occurrence of basalt.
- Culturally modified trees are the dominant site type in the vicinity of the study area. OzArk (2021) consider modified trees may be present as the basalt hills landscape is an extension of the Slopes landscapes where these trees have been recorded in the local area.
- Quarry sites could be present, given the underlying geology of the Project Site and known presence of outcropping basalt.
- Burial sites and bora/ceremonial sites are considered unlikely to be present.

5.7.3 Assessment Methodology and Results

The field investigations for the assessment were undertaken by Ms Stephanie Rusden (OzArk Senior Archaeologist, BS University of Wollongong, BA University of New England) on Tuesday 29 September 2020. Messrs Wayne and Russell Bamblett representing the Gilgandra Local Aboriginal Land Council (LALC) participated in the fieldwork investigations.

The study area was inspected by pedestrian transects focussing on areas of exposure and mature, native trees. *Figure 5.1* of OzArk (2021) (refer to **Appendix 9**) presents the alignment of pedestrian transect survey for both OzArk (2021) and OzArk (2017) over the Project Site. Survey coverage for OzArk (2021) excluded areas which were subject to the 2017 study for the existing Quarry. Effective survey coverage for OzArk (2021) was approximately 15%.

No landforms within the study area were assessed as likely to contain subsurface archaeological deposits. One previously unrecorded Aboriginal site, a scarred tree, was recorded during the fieldwork investigations (GDA20 Zone 55 630638E 6489858N) (refer to **Plate 5.1**). The scarred tree is located along the western boundary of Lot 1 DP 1265657. The site is 3.1 km west of Berida-Innisfail Road and 6.2 km south of the Oxley Highway. The scarred tree is located on a low crest in an area with scattered mature and regrowth trees. The tree exhibits one cultural scar which is elongated with irregular regrowth on one side.

Plate 5.1 Scarred Tree

5.7.4 Assessed Significance of the Recorded Site

OzArk (2021) have assessed the cultural value of the scarred tree as high in accordance with the views of the Aboriginal site officers who attended the survey. However, due to the frequency of this site type within the region and locality, the archaeological significance of the site is reduced. Furthermore, the tree is not associated with a landform displaying a high level of sub-surface archaeological potential and therefore has low research potential.

Despite scars on trees being typically less difficult for the layperson to interpret, the tree is located within a landscape which has been modified by agricultural practices and quarrying. As such, the scarred tree has been assessed by OzArk (2021) as having low aesthetic value.

Furthermore, the scarred tree does not have an apparent direct relationship to known historic Aboriginal sites (e.g. missions, massacre sites, etc.). Accordingly, the Project Site is assessed as having no historic value.

The scarred tree is located 170 m from the nearest impact associated with the Project (refer to *Figure 5.1* of OzArk (2021) - **Appendix 9**). As such, the scarred tree will not be impacted by the Project. The management and mitigation measures presented in **Section 5.7.5** would be sufficient to demonstrate no reduction in local and regional Aboriginal heritage values.

5.7.5 Management Measures

The following management measures would be undertaken by the Proponent:

- All land-disturbing activities must be confined to within the assessed area. Should the parameters of the proposed work extend beyond the assessed area, then further archaeological assessment may be required by a suitably qualified archaeologist.
- Inductions for staff undertaking the proposed work should indicate the location of the scarred tree and explain the legislative protection requirements for all Aboriginal sites and objects in NSW under the NPW Act and the relevant fines for non-compliance. Staff should be briefed on the Unanticipated Find Protocol and the identification of Aboriginal objects within the local region, with particular emphasis placed upon stone artefact identification.
- In the unlikely event that Aboriginal skeletal material is encountered, the Unanticipated Skeletal Remains Protocol should be followed.

5.8 Historic Heritage

5.8.1 Introduction

The SEARs require an assessment of the potential impact of the Project on historic heritage (refer to **Table 4.2**). **Section 5.8.2** identifies the sites of historic heritage significance within the local setting and **Section 5.8.3** reviews the potential for impact on these as a result of the Project.

5.8.2 Local Setting

A desktop search of the area covered by the Gilgandra Shire LGA was conducted in February 2020.

- Gilgandra Local Environmental Plan (LEP) 2011 – Schedule 5.
- State Heritage Register.
- Commonwealth Heritage List.
- Register of the National Estate (RNE).

There are no listed items within 5 km of the Project Site. The closest listed items are identified on the Gilgandra LEP and are located at Berida, on the northern side of the Oxley Highway opposite the intersection of Berida-Innisfail Road.

Field survey undertaken as part of the Aboriginal cultural heritage assessment did not identify any sites or artefacts of historic heritage significance.

5.8.3 Assessment of Impacts

Given the distance from the Project Site to any listed heritage items, the Project would have no direct impact on any known site or item of heritage significance.

5.9 Land Resources

5.9.1 Introduction

The SEARs require the EIS to include an assessment of the potential impacts of the Project on Land Resources, including:

- the potential impacts on the soils and land capability
- impacts on landforms and topography, and
- compatibility with other land uses (in accordance with the requirements of Clause 12 of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007).

The following sub-sections review the local setting of the Project Site with respect to these specific land features, identify the potential impacts and specific management issues, propose and describe the operational safeguards and management measures to be implemented by the Applicant, and assess the significance of any residual impacts following the implementation of these.

5.9.2 Local Setting

Section 2.3 describes the local setting of the Project Site with respect to landforms, soils, land capability and agricultural resources.

5.9.3 Management Issues and Constraints

5.9.3.1 Landforms

In order for rehabilitation of the Quarry site to be successful, allowing for the intended final land use to be undertaken, the final landform must be:

- geotechnically stable
- appropriate for the intended final land use, and
- non-polluting.

Noting the intention to retain a large void in the final landform (refer to **Section 3.13.1** and **Figure 3.3**), the final landform must also take into consideration the visual amenity of the local setting and not adversely impact on this.

5.9.3.2 Soils

As it is not expected the soils would be sodic, saline or significantly acidic, and assuming the soils are stripped and managed appropriately, the soil types occurring on the Project site would not pose a significant constraint on the Project. The soils are likely to present a moderate erosion hazard and emphasis on appropriate erosion and sediment controls is required to ensure there is no loss of these resources from the Quarry site.

The depth of soil over the Quarry site varies, however, field inspection indicates a combined topsoil/subsoil depth of 300mm to 500 mm could be recovered over the weathered basalt/clay overburden. Given the importance of soil resources as a growth medium for the rehabilitation of the Project site (refer to **Section 3.13.3.3**), conserving and managing the available soil resources prior to reuse in rehabilitation would remain an important consideration in Quarry management.

On the basis of the proposed activities, local soil resources and potential constraints identified above, the following impacts on soil resources may result and therefore require assessment.

- Degradation of soil quality as a consequence of stripping and replacement activities.
- Reduced availability for use in rehabilitation of the Project Site.

5.9.3.3 Land Capability

The current LSC of the Project Site identifies the level of capability for the land to which the land should be rehabilitated (unless reduced capability is proposed by virtue of the final landform, e.g. retained extraction batters). Factors which may affect the ability of the Applicant to return the final landform to the desired LSC, and therefore require assessment are as follows.

- Reduced capability of the final landform.
- Erosion of the rehabilitated final landform.

5.9.4 Design Features, Management Measures and Operational Controls

5.9.4.1 Landforms

Design Features

The extraction area would be designed with final faces which will be geotechnically stable in perpetuity. Initially, these faces will be designed at 75°, however, over the life of the Project and subject to further analysis it is likely a steeper face will be achievable given the very hard and dense nature of the basalt. Prior to the establishment of each terminal face of the extraction area, the Applicant would complete a geotechnical assessment to ensure that the slope will remain stable. This may require the final angle of the terminal face being shallower than 70°.

A safety bund will be constructed around the extraction area, however, this will not rise higher than 1 to 2 m and will be vegetated to ensure the soil and other resources contained are not sterilised over time.

The Processing and Stockpiling will be constructed at surface, i.e. without the need for any cut and fill work which would require future earthworks to rehabilitate.

The only potential pollutant of the final landform would be sediment runoff. This would be controlled through site stabilisation and revegetation works as described in **Section 5.4.4**.

Management Measures and Operational Controls

Prior to the respreading of soil over the final landform, an inspection would be completed to identify eroding surfaces. If identified, remedial earthworks would be undertaken to prevent any further slippage of material.

Prior to application of soil, the in situ materials would be lightly ripped or scarified parallel to the contour to assist in keying in the soils when applied. Similar scarification following the application of subsoil would be undertaken to assist in keying in the topsoil layer. Application of fertiliser would promote rapid establishment of groundcover which will further assist in stabilising the final slopes.

The Proponent would rehabilitate the Quarry progressively and regularly inspect completed areas of rehabilitation for signs of erosion or slippage of the underlying landform. In the unlikely event that this is identified, the Proponent would commission a geotechnical specialist to inspect and advise on appropriate remedial measures.

5.9.4.2 Soils

The Proponent is conscious of the need to conserve all soil resources available on those areas of the Project Site to be disturbed, and to ensure they are responsibly managed, erosion is prevented (in situ ahead of stripping, in stockpile, and when reapplied as part of rehabilitation), and are available for the rehabilitation of disturbed areas within the Quarry site.

Soil Stripping and Stockpiling Practices

The Applicant would implement the following safeguards with respect to the stripping and stockpiling of soil materials.

- Where practicable, undertake soil stripping in late spring or early summer.
- Preferential direct replacement of soil materials onto surfaces awaiting either temporary of final rehabilitation.
- Where stockpiling is required, the topsoil and subsoil would be stripped and stockpiled separately.
- Stockpiles would be constructed in accordance with Standard Drawing (SD) 4-1 of the "Blue Book (see **Appendix 4**) and restricted to the nominated disturbance footprint of the extraction area.
- A coverage of grass of 70% (or equivalent stabilisation) (C-Factor of 0.05) would be established over the stockpile within 120 days.
- The stockpiles would be isolated from upslope runoff by the construction of diversion embankments.
- Sediment fencing would be positioned downslope of stockpiles until an adequate level of stabilisation is achieved. The installation and maintenance of these features would comply with the recommendations provided by SD 6-8 of the Blue Book (refer to **Appendix 4**).

Soil Respreading Practices

The Applicant would implement the following controls with respect to the respreading of soil materials.

- As noted previously, soil stripped would be immediately respread over available areas of the final landform.
- Prior to respreading of the topsoil layer, the combined subsoil/imported soil profile layer would be ripped or scoured to allow keying of the topsoil. This would be especially important given the proposed sloping nature of the final landform.
- An alkaline (not acidifying) fertilizer would be added to the respread soil as required to assist with any nutrient deficiencies, e.g. N, P, S and Zn, and assist in vegetation establishment.

Soil Erosion Controls

In most cases, water management controls duplicate as a means of soil erosion control. A range of water management and drainage controls are outlined in **Section 5.4.4** which would be implemented to either divert "clean" water (via non-scouring drains/banks) around disturbed areas or direct runoff from disturbed areas ("dirty" water) to detention structures.

In addition to localised sediment control, the following general management procedures are proposed to limit the potential for soil erosion:

- The area stripped of soil at any one time would be minimised consistent with operational requirements. All areas to be stripped of topsoil would be clearly identified in advance and the depth of topsoils and subsoils available determined.

- Wherever possible, topsoil would be directly transferred onto areas requiring rehabilitation to encourage the germination of the contained propagules, maximise the success of rehabilitation and reduce the need for soil stockpiling.

- Earth bunds and soil stockpiles to be retained for in excess of 120 days, which do not establish a natural cover of grasses, would be seeded with a mixture of cover and perennial pasture species such as Microlaena, Phalaris, Fescue, Rye Grass, Cocksfoot and White Clover, plus an appropriate fertiliser, in combination with straw mulching and/or other treatments in specific areas such as drainage lines.

Soil Contamination

The only likely source of soil contamination as a result of the Project would be from spills or leaks of fuel or other hydrocarbon products. In the event that a hydrocarbon spill occurs, Quarry management would be advised and the three phase mitigation strategy as follows.

- Phase 1 – Source Control: isolate the source of spill or leak and stop the leak either by maintenance or placing the leaking item within or over the fuel/oil storage area.

- Phase 2 – Recovery: recover as much as possible at the source by pumping free hydrocarbon from the surface and excavating hydrocarbon-contaminated materials. Contaminated materials would be stockpiled on site under cover and on an impermeable surface, e.g. a high-density polyethylene sheet. This material would later be bio-remediated on site and/or transported to an approved waste facility.

- Phase 3 – Remediation: transport the contaminated material to a designated area within the Project Site (away from natural or created drainage) for on-site bio-remediation ("land farming") or to a facility licensed to accept and treat hydrocarbon contaminated material.

Occurrence of pre-existing soil contamination is not expected given the long history of the Project Site for agricultural activities. This notwithstanding, should evidence of soil contamination be identified, e.g. through identification of buried waste or other materials, discoloration of the soil, or poor vegetation growth, the Proponent would seek further advice from the EPA or Gilgandra Shire Council before proceeding to excavate this material.

5.9.4.3 Land Capability

The objective of the Proposal with respect to land capability and agricultural suitability is to return as much of the final landform to as high an LSC Class as possible. The objective LSC Classes of the final landform based on the proposed final slopes and vegetation identified on **Figure 3.3**.

- LSC Class 8. Extraction area walls would be incapable of sustaining agriculture due to the steep slope and lack of soil.

- LSC Class 4. The floor of the final void would have limitations with respect to drainage, permeability and water holding capacity, and could also suffer from reduced vegetation growth due to increased shading. This notwithstanding, a soil profile could be established over the floor of the void allowing for low to moderate intensity grazing.

- LSC Class 3. The Processing and Stockpiling Area and Infrastructure and Services Area would be profiled to replicate the pre-Quarry landform. Through re-application of subsoil, topsoil and with application of fertiliser, a return to high intensity agricultural activities equivalent to those which can be undertaken on the Project Site currently would be achievable.

If requested to be removed by the owners of the "Berakee" or "Wilgaroo" properties, the Private Haul Road would be decommissioned and rehabilitated to reinstate LSC Class 2 and 3 land, commensurate with current classification (refer to **Figure 2.3**).

The following design features, management measures and operational controls would be implemented by the Proponent to achieve these objectives.

Design Features

- All slopes would be inspected and confirmed as safe, stable, non-eroding and non-polluting.

- Drainage of the final landform would be to defined locations to prevent rilling and erosion caused by uncontrolled flow of surface water.

Management Measures and Operational Controls

- The proposed soil stripping, stockpiling and respreading measures and controls described in **Section 5.9.4.2** would assist in maintaining the value of the soil for rehabilitation purposes and therefore maximise land capability.

- The proposed surface water management controls to be implemented would ensure that the final landform and potential for future agricultural activities is not compromised by excessive erosion, pollution or restricted availability of water.

5.9.5 Assessment of Impact

5.9.5.1 Landforms

Given the retained terminal faces of the final void would be subject to final geotechnical investigation prior to final incorporation into the final landform, the risk of geotechnical failure of the final landform is considered very minor. This notwithstanding, the Applicant has committed to an approach to rehabilitation and regular inspection such that should such failures of the landform be identified, these would be professionally inspected and remediated with additional controls implemented to prevent future occurrence. The retention of a safety bund would prevent any inadvertent or accidental movement of vehicles or pedestrians over the face.

The retention of the vegetated northern and eastern amenity bund would continue to screen views of the final landform from vantage points to the north and east. Views from the west would be obscured by the conserved native woodland vegetation to the immediate west of the extraction area and Infrastructure and Services Area. Views from the south would be obscured by the intervening Dubbo Quarry of Holcim. The overall impact of the Proposal and visual amenity is discussed in **Section 5.11**.

The proposed site stabilisation and revegetation works proposed as part of rehabilitation would minimise the potential for pollution in the form of sediment laden runoff.

On the basis of the preceding, the proposed final landform would provide a safe, stable and non-polluting landform, which minimises any impact on local visual amenity and would be suitable for the intended final land use.

5.9.5.2 Soils

With the emphasis on directly transferring soil from source to final rehabilitation destination, the potential impact on soil structure and biological activity is likely to be relatively minor. As it is the intention to isolate any soil to be stockpiled, with appropriate downstream sediment control structures, and establish vegetation on soil stockpiles maintained for 120 days or longer, the erosion risk and potential detrimental impact on soil structure would also be minimal.

Keying the respread soil would aid in the settlement of the soil layer and maximise water infiltration and subsequent growth of vegetation.

5.9.5.3 Land Capability

Excluding the retained walls of the extraction area, it is assessed that implementation of the proposed soil management and rehabilitation methods would provide for the establishment of the LSC Classes equivalent to those of the pre-quarry environment (and as identified in **Section 5.9.4.3**).

It is noted that the reduction in land and soil capability will result in a small reduction in the available BSAL. This reduction is considered unavoidable following development of the Quarry, however, this impact is considered an acceptable outcome on the basis of the following.

- It is assessed as likely that the Quarry site, if subject to further investigation in accordance with the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (OEH/OASFS, 2013), would not classify as BSAL.

- The above notwithstanding, the small reduction in mapped BSAL (<20 ha) represents <0.01% of the 2.74 million hectares of BSAL mapped within NSW (DP&I, 2014, DP&I, undated).

5.10 Land Use and Agricultural Resources

5.10.1 Introduction

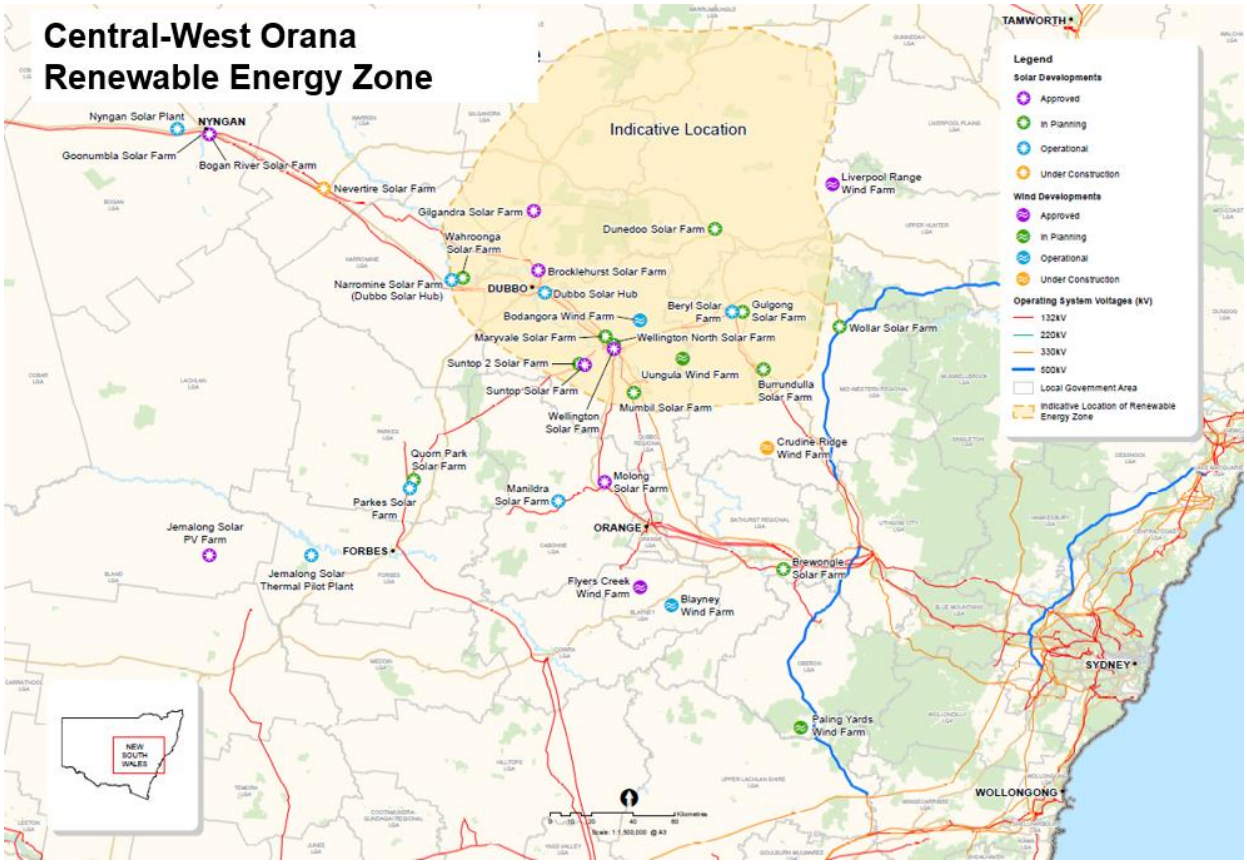
In their contribution to the SEARs, the DPI advised that the EIS must consider surrounding agricultural industries and resources and potential receptors. While noting the Project represents the continuation of an established quarry, the following sub-sections review the land uses of the local setting (both current and future), consider potential impacts on these and assess the potential land use conflicts associated with the continued and expanded Quarry operations.

5.10.2 Local Setting

The Project Site is located within the RU1 Primary Production Zone under the Gilgandra Local Environment Plan (LEP) 2011. In keeping with the objectives of this zone, land use in the local setting is a mix of medium to high intensity agriculture including cropping (principally grain crops) and grazing (principally sheep and cattle) activities with properties varying in size but generally exceeding 300 ha. As identified in **Section 2.3.4**, the land of the local setting has a moderate to high LSC of between 2 and 4 which OEH (2012) identifies as land with slight to moderate limitations which is capable of sustaining high impact land uses (with specialised management practices for LSC 4).

A significant feature of the local land use will be the Inland Rail Project. Traversing the Gilgandra Shire Council and aligned to be with 5 km of the Quarry site, this will create the need for ancillary industry in the Gilgandra LGA during the construction phase such as concrete works, manufacturing facilities and local quarries. Extractive industries (quarries), which are permissible in the RU1 Zone of Gilgandra LEP 2011 and consistent with the objective of the zone "*to allow the development of non agricultural land uses that are compatible with the character of this zone*", are likely to become a more significant feature of the Gilgandra LGA during the construction of the Inland Rail Project.

The Project Site falls within the recently identified Central-West Orana Renewable Energy Zone (refer to **Figure 5.8**). While this zone is currently in the feasibility and planning stage, it identifies the region and local setting for the construction and operation of renewable energy projects such as solar farms, wind farms and battery storage of energy.



Source: https://energy.nsw.gov.au/renewables/renewable-energy-zones

Figure 5.8 Central West Orana Renewable Energy Zone

There are already a number of solar and wind energy projects operation, under construction or in planning within this zone (refer to **Figure 5.8**) with renewable energy likely to become an increasing feature of local land use. Supply of regionally sourced and competitively priced construction materials will be important in the development of these projects into the future.

5.10.3 Management Issues and Constraints

State-wide mapping identified the Quarry site and parts of the Private Haul Road as occurring on land classified as BSAL. As noted in **Section 2.3.4**, it is noted this mapping does not account for the outcropping basalt of the Quarry site which is likely to reduce the agricultural suitability of the land, however, a return of a much of the Project site to agricultural production as possible a key management aim.

While the Quarry site is located on outcropping basalt not as amenable to local agriculture as the surrounding lands formed from quaternary alluvial geology, the Private Haul Road traverses lands with higher LSC. On the basis of the continuation of quarrying operations over the next 20 years, the following management of constraints will be required.

- Prevention of emissions from the Quarry operations (air, noise, water) which could adversely impact on surrounding agricultural activities or local amenity.
- Operation of the Private Haul Road to minimise impacts on the operations on the "Berakee" and "Wilgaroo" properties.

5.10.4 Management and Mitigation

The following management and mitigation measures would be implemented to avoid or reduce impacts on surrounding agricultural enterprises.

- No groundwater is to be intercepted by the extraction area. Only groundwater extracted under appropriate licence from groundwater bores will be used on-site.
- The Proponent will not capture any additional rainfall runoff which would otherwise be diverted to surrounding agricultural enterprises.
- The Proponent will direct all runoff to a sediment basin to prevent discharge of sediment laden water at erosive velocities from the Quarry site.
- The Proponent will update a Soil and Water Management Plan to provide for on-site erosion and sediment control plan to minimise the potential for impacts associated with siltation of waterways or dust deposition on crops or pasture (refer to **Section 5.4.4**).
- The Private Haul Road will be maintained over the life of the Project to prevent excessive dust emissions and discharges which may adversely impact on the surrounding agricultural land.
- The final landform presented in **Figure 3.3** and described in **Section 3.13.1.2** represents a sympathetic extension of the landform already nominated for the Quarry and approved. The proposed final landform does not rely on the importation of an additional materials, resources or specialist equipment.
- The Project does not propose to modify the intended final land use of the Quarry (passive biodiversity conservation and return to agricultural/grazing activities).

5.10.5 Assessment of Impact

5.10.5.1 Operations

Land Use Conflict Risk Assessment

On the basis that the Project represents a continuation of an existing extractive industry which has not impacted adversely on the surrounding agricultural lands or enterprises, a formal Land Use Conflict Risk Assessment (LUCRA) (DPI, 2011) is not deemed necessary. This notwithstanding, **Table 5.34** identifies the four key steps in the completion of a LUCRA and provides comment on each with reference to the Project.

Table 5.34 Land Use Conflict Risk Assessment – Key Steps

Step	Comment
1. Gather information about proposed land use change and associated activities	The Project does not propose any land use change
2. Evaluate the risk level of each activity	The risk of impacts on surrounding lands is low
3. Identify risk reduction management strategies	The environmental management and mitigation measures nominated to manage impacts on noise, dust, water and traffic are all relevant to reducing the potential for impacts on surrounding agricultural lands
4. Record LUCRA results	On the basis that the Project does not propose any significant change to land use or the area of impact, the potential for conflict with surrounding agricultural lands and enterprises is assessed to be minimal.

5.10.5.2 Final Land Use

The proposed final land use of the Project Site, passive biodiversity conservation and agriculture, would not have any detrimental effect on surrounding agricultural activities.

5.11 Visual Amenity

5.11.1 Scope

The SEARs require an assessment of the likely visual impacts of the development on surrounding private landowners and key vantage points in the public domain (refer to **Table 4.2**).

Section 5.11.2 provides a description of the existing visual amenity of the local setting, identifying those residential receivers and road sections which may have views of the Project Site. **Section 5.11.3** reviews the likely changes to visibility of the Quarry and potential impact of this on surrounding residential receivers and local roads. **Section 5.11.4** then provides the management measures to be implemented to reduce the visibility of the Quarry, and **Section 5.11.5** provides an assessment of residual impacts following the implementation of these.

5.11.2 Existing Environment

The local setting is dominated by cleared and regularly cultivated paddocks, with other notable features including:

- The Oxley Highway and other local roads (including the Private Haul Road)

- Local homesteads and sheds
- Windmills and other agricultural infrastructure, and
- Tree lines along roads, creek lines and remnant vegetation on lower capability land.

The Quarry site occurs over a small rise in the landscape and is surrounded by PCT 98 Poplar Box – White Cypress Pine – Wilga – Ironwood shrubby woodland (PCT98) (refer to **Section 5.6.3**). As noted in **Section 4.1.4**, the previous landowner has cleared sections of this woodland as approved clearing activities for agricultural purposes under the *Local Land Services Act 2013*. Significant stands of this vegetation is retained along the northern and western portions of the Quarry site. The Private Haul Road traverses open, cleared agricultural land.

The Quarry site would be visible to vantage points to the south and east with the closest residential receiver being 1.8km to the south. All other residential vantage points are over 3.5km away. To the north and west, the retained slopes of the small rise and remnant vegetation prevent views of the Quarry site.

The Private Haul Road would be largely unnoticeable within the local setting being constructed at ground level. Vehicles travelling on this road would be visible, as would any dust generated by moving vehicles or wind-borne.

5.11.3 Changes to Visibility

Views to the west and north of the Quarry site are unlikely to be altered with the remnant native vegetation providing sufficient screening of activities to receivers to the west and north.

The increase in disturbance will be noticeable from vantage points to the south and east. While given the reasonably shallow rise from the south and southeast on the Quarry site, the extraction area itself is unlikely to be noticeable, the expanded stockpiling operations may be visible.

The increased frequency of truck movements on the Private Haul Road will be noticeable to the owners of land adjoining this. Furthermore, the increased hours of transport operations will result in vehicle lighting on the Private Haul Road before 6.00 am and after 6.00 pm.

5.11.4 Visual Impact Management

5.11.4.1 Rehabilitation

The Proponent is cognisant of the need to manage the visual impact of the Quarry from surrounding vantage points. The proposed rehabilitation of the Quarry site has been developed with an objective to minimise the visual intrusiveness of the operations and generate a final landform which is in sympathy to the surrounding landforms and landscape (refer to **Section 3.13**).

5.11.4.2 Design Features

The exposure of Quarry site disturbance to vantage points to the north and west would continue to be minimised by retaining the screening woodland vegetation surrounding the extraction area to the northwest, west, south and southeast. As discussed in **Section 3.14** (and **Table 3.6**), the better quality basalt is located to the west and northwest of the current extraction area. The potential to extend the extraction area further in this direction was considered as an alternative but ultimately rejected in favour of the current extraction area design to maximise the retention of the woodland vegetation which provides this visual screen.

The proposed rehabilitation strategy of the Project would also provide for a final landform containing additional trees and shrubs.

5.11.4.3 Disturbance Management, Operational Controls and Safeguards

To minimise any impacts on visual amenity afforded to local landowners and residents the following operational safeguards would be implemented by the Applicant.

- The extent of land disturbance/clearing would be restricted to the extraction area extension.
- Crushing and screening activities would be relocated into the extraction area as soon as practicable (and likely within two years from approval).
- Soil stockpiles and earthen bunds (including the extraction area safety bund) would be revegetated with grass species (where to be retained for more than 120 days).
- The air quality controls as identified in **Section 5.3.5** would be implemented.
- The Private Haul Road would be regularly watered and recompacted to reduce the potential for dust lift-off.
- The Quarry and associated areas of disturbance would be maintained in a clean and tidy condition at all times.
- Night-time activities would be limited to vehicle movements on and off the Quarry site and as such no flood lighting would be required.

5.11.5 Assessment of Impacts

The Project would require a reasonably significant increase in disturbance on the Quarry site, however, the overall impact of the Quarry site on local visual amenity is likely to be mitigated by the following.

- Retained vegetation on the Quarry site would prevent views of Quarry site operations from receivers to the west and north (Receivers R1, R4, R6, R10, R11 and R12).
- The closest residence to the Quarry site (Receiver R2) is over 1.7 km from the disturbance area of the Quarry site. **Plate 5.2** illustrates the significant distance from the Quarry to Receiver R2.

Plate 5.2 View (South) to Receiver R2

- Roadside vegetation on Lewis Road (to the south of the Quarry site) will obscure views from Receivers R2 and R5.

- Rising topography (to the southwest) will obscure the sight line from Receiver R3 with all other receivers in excess of 5 km from the Quarry site.

The movement of trucks on the Private Haul Road will be noticeable to neighbouring property owners with impacts minimised as a result of:

- Effective road maintenance to reduce dust emissions, and

- Limits on traffic movements before 6.00 am and after 6.00 pm to minimise the impact of vehicle lights. Notably, the small amount of lighting generated by trucks travelling on the Private Haul Road will have no influence on the Siding Springs Observatory, located approximately 85 km to the northeast.

It is assessed that on the basis of the retention of the remnant vegetation which currently obscures views of the Quarry, adequate housekeeping, revegetation of stockpiles where practicable and effective dust suppression as described in **Section 5.3.5**, the impact of the Project on visual amenity is considered to be minor and manageable.

5.12 Hazards

5.12.1 Scope

The SEARs require an assessment of the potential impact of the Project on Hazards, with specific reference to the assessment of the likely risks to public safety, paying particular attention to potential bushfire risks and the transport, storage, handling and use of any hazardous or dangerous goods (refer to **Table 4.2**). The specific hazard-related impacts that may result as a consequence of the Project (without the implementation of the safeguards, controls and mitigation measures presented in this assessment section) and therefore require an assessment relate primarily to:

- the handling, storage and disposal of hazardous or dangerous goods (refer to **Section 5.12.2**), and

- potential for bush fire (**Section 5.12.3**).

5.12.2 Transport, Storage and Handling of Hazardous/Dangerous Goods

5.12.2.1 Potential Hazard

Site operations have the potential to contaminate land and water in and surrounding the site by the release of various chemicals used and/or stored on site. These chemicals could include:

- distillate (e.g. fuel for stationary and mobile engines),

- oils and greases (e.g. lubricants and hydraulic oils for stationary and mobile equipment), and

- miscellaneous chemicals (e.g. herbicide, paint, solvents).

A complete list of hazardous substance and dangerous goods will be contained within the Hazardous Substances and Dangerous Goods Safety Documentation maintained at the Quarry. The principal substances of concern utilised at the Quarry include:

- explosive products for blasting,

- fuels and oils for vehicles, machinery and equipment,
- chemicals for cleaning and site maintenance, and
- other chemicals such as herbicides, paints and solvents.

5.12.2.2 Operational Controls, Safeguards and Management Measures

To minimise the potential for contamination the following controls, safeguards and management measures for the transport, storage, use and disposal of hazardous materials will continue to be implemented.

- Hydrocarbons and hazardous materials would only be received by licenced suppliers for the transport of dangerous goods in accordance with *Dangerous Goods (Road Transport) Act 2009*.
- Explosive storage is located in a locked facility in accordance with the requirements of the *Explosives Regulation 2013*.
- All chemical storage facilities, including those for fuels and oils, meet the specifications of *AS 1940 – The storage and handling of flammable and combustible liquids*.
- Bunding used to contain storage of potential pollutants will be constructed of material which is impervious to the material stored and transferred therein. The bunds will be regularly inspected and kept in good condition (e.g. no cracks, gaps or leaks).
- Where vehicle access to the bunded area is required, access must be by way of a rollover bund.
- Empty hydrocarbon and chemical containers are to be stored with closures in place on a concrete hardstand or within a bunded area.
- In the event of a hydrocarbon leak or spill, the Applicant would implement a spill management procedure as described in **Section 5.9.4.2**.
- Hydrocarbon waste would be disposed of by a licenced waste contractor to a licenced waste facility.
- Hydrocarbon spill kits would be appropriately located to ensure spill response and clean up can be carried out immediately following the detection of any spills
- Safety Data Sheets (SDSs) and information relating to the storage, use and handling of chemicals will be maintained at the Quarry office.
- Spills or leaks of pollutants will be handled in accordance with the relevant SDS.

A Pollution Incident Response Management Plan (PIRMP) will be prepared for the Quarry and tested annually in accordance with POEO Act requirements.

5.12.2.3 Assessment of Impact

It is anticipated that with the proposed controls and safeguards that potential hazards as a result of hydrocarbon and hazardous materials to be used on the Project Site would be minimised.

5.12.3 Bush Fire Hazard

5.12.3.1 Local Setting

The Project Site is not located on bushfire prone land (as viewed on the NSW Sharing and Enabling Environmental Data (SEED) mapping tool). The viewed NSW Bush Fire Prone Land dataset is a map prepared in accordance with the Guide for Bush Fire Prone Land Mapping (BFPL Mapping Guide) and certified by the Commissioner of NSW RFS under purposes of Section 10.3 of the EP&A Act.

In order to confirm the bushfire hazard of the Project Site, the Rural Fire Service (RFS) guideline produced for the former Department of Planning and Infrastructure (DPI) entitled "*Planning for Bush Fire Protection*" (RFS, 2019) has been used.

5.12.3.2 Bush Fire Management Objectives

The objectives of RFS (2019), considered in this assessment of bushfire management of the Project, are to:

- afford buildings and their occupants protection from exposure to a bush fire
- provide for a defendable space to be located around buildings
- provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings
- ensure that appropriate operational access and egress for emergency service personnel and occupants is available
- provide for ongoing management and maintenance of BPMs and
- ensure that utility services are adequate to meet the needs of firefighters.

5.12.3.3 Bush Fire Hazard Classification

Vegetation Classification

The areas of the Project Site to be disturbed has been cleared of large trees and shrubs and is now dominated by exotic grassland. Remnant areas of open woodland remain to the north, west and southwest, however, the Project Site is surrounded by cleared agricultural land with these wooded areas not directly connected to other patches of remnant native woodland. Based on the description of local vegetation provided by Umwelt (2020), the vegetation has been classified into the following two formations based on the classifications provided in RFS (2019).

- Grassy and Semi-Arid Woodland – maximum fuel load of 20.2 t/ha.
- Grassland – maximum fuel load of 6 t/ha.

Slope Classification

Slopes within the Project Site are generally less than 5°.

Hazard Assessment

Notwithstanding that the risk of bush fire cannot be discounted anywhere, on basis that the Project Site is not located on bush fire prone land, is surrounded by grassland vegetation without significant connectivity to vegetation with higher fuel loads, the level of bush fire hazard is assessed to be low.

5.12.3.4 Safeguards and Controls

Various activities that may increase the risk of fire on the Project Site and transport route, and the controls proposed to limit the risk posed by these are presented in **Table 5.35**.

Table 5.35 Bushfire Hazard – Activities and Controls

Activity	Possible Ignition Source	Safeguards and/or Controls
Refuelling	Spilt fuel or dry grass ignited by spark	• Refuelling undertaken within cleared area of the Project Site. • Engines in all vehicles to be turned off during refuelling. • No smoking policy to be enforced in designated areas of the Project Site. • Fire extinguishers maintained within all site vehicles and mobile equipment.
Blasting	Heat generated by blast/ explosives management	• All blasting operations will be carried out and confined to the extraction area. • All flammable material will be removed by pre-stripping the topsoil prior to any drilling and blasting operations taking place.
General Activities	Cigarettes, Rubbish, e.g. glass, metal.	• No smoking policy to be enforced in designated areas of the Project Site. • No throwing cigarette butts from product trucks along the product delivery route. • Focus on housekeeping to be maintained by quarry management. • Water cart available. • All site vehicles and mobile equipment to carry a fire extinguisher.

More general bush fire management measures to assist in the event of a local bush fire event are as follows.

- Fuel loads immediately surrounding the operational areas of the Quarry site would be monitored and reduced as required, i.e. no re-growth of shrub or tree vegetation, other than that prescribed by rehabilitation would be allowed, grass growth would be monitored and cut back as necessary. Specialist advice would be sought, either from the NSW RFS or Gilgandra Shire Council in relation to appropriate fuel load management.
- The Private Haul Road and any internal roads would be regularly maintained to ensure safe access and egress from the open cut in the event an evacuation is called.
- Training would be provided to site personnel in relation to specific fire-fighting tasks and procedures.
- Emergency and Evacuation Management Procedures would be developed.
- In the event of a bush fire, emergency services would be given direction and access to the following infrastructure:
    - SD-1 with an approximate capacity of 3 ML, and
    - Any groundwater bore which may be located at a future time on the Quarry site.

- In the event of a local bush fire event, all personnel would be required to assemble at a designated Emergency Assembly Area. A head count would be undertaken to confirm all site personnel and visitors are accounted for. At this time, instructions as to specific procedures to be followed, i.e. site protection or evacuation, would be provided in accordance with the Emergency and Evacuation Management Procedures and advice provided by the NSW RFS.

The preparation and implementation of the above notwithstanding, the Applicant would ensure that all personnel recognise the authority of the NSW RFS and other emergency services, e.g. NSW Police, and adhere to any and all instructions provided by these authorities. Furthermore, access to all Project Site facilities and water storages would be provided to the NSW RFS and any reasonable assistance offered.

5.12.3.5 Assessment of Impacts

The proposed operations would increase the number and type of ignition sources in the local area. However, the proposed management and mitigation measures, in conjunction with general clearing activities associated with the Project would ensure that an acceptable bush fire hazard is maintained within the Quarry site.

5.13 Socio-Economic Setting

5.13.1 Introduction

The SEARs request that the EIS provide an assessment of the likely social and economic impacts of the development, including consideration of both:

- the significance of the resource, and
- and the costs and benefits of the Proposal (refer to **Table 4.2**).

The following sections review the existing socio-economic setting (refer to **Section 5.13.2**), describe the significance of the resource (refer to **Section 5.13.2**), the potential impacts of the Proposal on this setting (refer to **Section 5.13.4**), outline the contributions, commitments and safeguards to be implemented by the Applicant to minimise adverse impacts and maximise positive impacts on the socio-economic setting (refer to **Section 5.13.5**), and provide an assessment of overall impact based on the costs and benefits of the Proposal (refer to **Section 5.13.6**).

5.13.2 The Existing Socio-Economic Setting

Located at the intersection of the Newell, Oxley and Castlereagh Highways Gilgandra is located in the Orana region of New South Wales approximately halfway between Melbourne and Brisbane and 45 minutes north of the regional centre of Dubbo. Gilgandra has a population of 3,129 people with a further 1,200 people living on rural properties or small villages such as Armatree, Biddon and Tooraweenah.

Gilgandra LGA is predominantly rural and as of the 2016 census the population was 4,236 (with greater than 70 % residing in Gilgandra). Between 2011 and 2016, the population of the LGA decreased by 4.5 % (from 4,368) and median age increased (from 44 to 45) suggesting a slight decline in employment opportunities.

Gilgandra Shire is predominantly an agricultural area with sheep, beef cattle and winter cereal cropping the main enterprises. In the 2016 Census, agriculture was identified as the main industry of employment in the LGA representing over 25 % of all employment by industry. The local economy also relies on the business that the traffic on the Newell highway provides.

5.13.3 Significance of the Resource

The development applicant seeks to recover an additional 4.7 Mt of basalt from the Quarry, however it is noted that the basalt resource continues at depth with a total resource well in excess of this. The material has been proven as a hard and dense material with qualities which allow for its use in road construction and maintenance, concrete manufacture, rail infrastructure construction and maintenance and general construction and landscaping.

The Quarry is ideally placed to supply hard rock aggregates and construction material to the Inland Rail Project which will be constructed within 5 km of the Quarry site. As an established quarry with a proven quality resource, the resource is significant to supply this nation-building project.

Following from construction of the Inland Rail Project, the Quarry will provide access within the local area to a significant and quality resource for the purpose of road maintenance and construction, concrete manufacture and construction more generally. Being approximately equidistant to Gilgandra and Warren (to the northwest), the Quarry has the potential to service the needs of both shires and reduce reliance on larger quarries located further away. Over time, the Quarry may also service construction markets in Dubbo and Coonabarabran given the density and hardness of the material makes it attractive as a concrete aggregate.

5.13.4 Potential Impacts of the Project on the Socio-Economic Setting

Given the limited scale of the Proposal, the fact that extractive industry is an established feature of the local setting and very minor reliance of the proposed operations on local services and infrastructure, the potential for impact on the local socio-economic climate is limited. The main potential impact would be on local amenity, i.e. the tangible or intangible features of a setting that contribute to its appeal or desirability.

5.13.5 Commitments and Contributions

In addition to the mitigation measures and management procedures relating to amenity aspects such as noise, air quality, water, biodiversity and traffic, described previously in **Section 5.0**, the Proponent would implement the following management and mitigation measures to ensure that Project-related benefits for the community surrounding the Project Site are maximised and adverse impacts are minimised.

- Employ locally, unless no suitable local candidates for a position are available.
- Purchase goods and services locally, unless provision of the required goods and services are not available locally.
- Proactively consult throughout the life of the Quarry with those residents who could potentially be adversely impacted.
- Continue to engage the community surrounding the Project Site through the adoption of an ‘open door’ policy for any member of the community who wishes to discuss any aspect of Quarry operations.
- Maintain a community complaints response system.

As noted in **Section 3.12.2**, the Project will also contribute to the local, regional and NSW economies through contributions of between $3.3 to $4.6 million per year for wages, purchase of goods and services, payments to contractors and suppliers and payment of rates and taxes.

5.13.6 Assessments of Impacts

In order to assess the overall impact of the Project on the socio-economic environment, the various adverse and beneficial impacts are considered as follows.

Adverse Impacts

1. The previously considered impacts on local noise, air quality and traffic would each have some minor impact on the neighbouring properties of the Project Site and users of the Oxley Highway.

2. The aesthetic appeal of the local setting may be slightly reduced. It is noted, however, that the proposed design of the extraction area maximises the natural screening of activities by topography and remnant vegetation. Furthermore, the rehabilitation proposed would return the disturbed areas to a landform and vegetation sympathetic to the landforms and vegetation of the surrounding landscape.

Beneficial/Positive Impacts

1. The Project would increase the number of Full-time Equivalent (FTE) positions available for on-site personnel and truck drivers as a result of an increase in extraction and campaign crushing activities, introduction of new activities and increased movement of materials to and from the Project Site.

2. The Project would provide for an initial capital investment of approximately $3-4 million, associated with the purchase of the property, internal Quarry upgrades and mobilisation and installation of new infrastructure. An ongoing contribution of between $3.3 and $5 million per year is anticipated for Stage 1 (refer to **Section 3.12.2**) with expenditure on wages and consumables to reduce with Stage 2 due to reduce production rates.

   The Project would also contribute to the national and State economies through the payment of taxes and royalties and the purchase of goods and services from outside the local area.

3. The Project would provide for flow-on benefits to the economy through the expenditure of wages paid to employees, profits made on the sale of quarry profits and through the purchase of goods and services for the ongoing operation of the Quarry.

4. Access to the important construction materials that is critical to the construction of the Inland Rail Project.

   Notably, demand for construction materials is also likely to increase beyond that of the Inland Rail Project, with there being limited local supply. Without the increased supply from the Quarry, it is possible that local industry and construction projects would be required to important increasing volumes from outside the LGA.

5. The final landform of the Project Site would incorporate land available for future agricultural use, thereby maintaining the economic value of the site post-Quarry, as well as passive nature conservation, thereby compensating for any temporary loss in biodiversity value.

The impact of the Project on current and future land uses on, and surrounding the Project Site has been considered as part of this assessment (refer to **Section 5.10**). Importantly, as impacts would be restricted to the Project Site, the Proposal would not adversely impact on the current land use(s) of surrounding properties.

As a consequence of the Applicant's commitment to employ and utilise local resources where practicable, there would be a direct economic benefit to the Gilgandra Shire LGA. It is also assessed that as a result of the proposed design features, operational safeguards, controls and management measures, any the impacts on local amenity would not be noticeable to most residents of the local area or users of local roads.

Considering the potential direct and indirect socio-economic benefits against those deemed to be adverse, it is assessed that there would be a net socio-economic benefit resultant from the approval of the proposed quarry extension.

6.0 Summary of Commitments

This section contains a summary of all proposed environmental management commitments that will be implemented for the Project. If the development consent is granted for the Project, the proponent will commit to the management and monitoring measures provided in **Table 6.1**.

Table 6.1 Summary of Environmental Management Commitments

Environmental Feature	Management Commitments
General Operations and Limits	• The Project shall not extract more than 495,000 tpa from the Quarry • Disturbance will be restricted to the areas identified on **Figure 3.1** • Quarry operations will be restricted to between 6.00 am and 6.00 pm Monday to Saturday *(Toolbox meetings, pre-start inspections or other activities not involving mobile equipment operations may be undertaken prior to 6.00 am)* • Blasting activities will be restricted to between 9.00 am and 3.00 pm Monday to Friday. • Transportation activities will be restricted to between 5.00 am and 10.00 pm, Monday to Saturday *(Between 5.00 am to 6.00 am pre-loaded trucks exiting the Quarry only and 6.00 pm to 10.00 pm unladen trucks returning to the Quarry only)* • No operations will be undertaken on a Sunday or on public holidays.
Rehabilitation	• The Quarry site will be rehabilitated to produce a final landform generally in accordance with **Figure 3.3** (unless an alternative landform is approved by Gilgandra Shire Council) • Upon terminal benches being reached the areas of disturbance will be rehabilitated to a safe, stable and non-polluting state, suitable for the intended future use. • As far as practical, the Project Site will be progressively rehabilitated in accordance with the description of **Section 3.13**.
Traffic	• Transport of Quarry products will be by the Private Haul Road only (unless separate approval obtained from Gilgandra Shire Council) • Hourly traffic will be limited to 20 truck movements. • A Traffic Management Plan will be prepared following approval.
Quarry Site Noise	• Activities will be restricted to the approved hours of operation. • No extraction or processing prior to 6.00 am or after 6.00 pm. • Frequency modulated reversing alarms will be used preferentially on all mobile equipment. • Regular maintenance will be undertaken on all equipment. • Dialogue with neighbours will be maintained to ensure any concerns over operational noise are addressed.
Traffic Noise	• Traffic movements prior to 6.00am will be restricted to laden trucks pre-loaded the day prior and movements after 6.00pm limited to the return of unladen trucks to the Quarry site • Entry to poorly maintained vehicles, or those reported to generate excessive noise levels, will be refused. • All truck drivers must comply with a Drivers Code of Conduct outlining procedures for reducing noise impacts during transportation.

Environmental Feature	Management Commitments
Blasting	• Design and implementation of each blast by a suitably qualified blasting engineer or experienced shot-firer. • Modify blast designs, mitigation measures and operating procedures, if required, on the basis of monitoring results. • Initiate blasts between the hours of 9.00 am and 5.00 pm Monday to Friday only. No blasts would be initiated outside these hours, except for safety or emergency reasons. • Establish and maintain an environmental complaints line and register of complaints in accordance with the requirements of the Environment Protection Licence, once issued. • Respond promptly to any issue of concern or complaint raised by the community or a government agency.
Air Quality	• Water sprays will be applied prior to and following drilling (for blasting). • Water sprays will be applied during loading and unloading of materials. • Water and/or polo citrus additive will be applied at transfer points of the crushing and screening plant. • A water cart will be operated on the hardstand and frequently trafficked areas.
Surface Water	• Contain all surface runoff within the Quarry site (excepting spills from SD1 undertaken in accordance with management protocols developed with reference to the Blue Book). • Undertake hydrocarbon refuelling within a secured, sealed and bunded area of the Project Site. • Do not transfer groundwater to the surface sediment basins (unless analysis of water confirms the TDS and EC is below the WQOs for the Lachlan River catchment). • Review and update the Water Management Plan (including a Soil and Water Management Plan) of the Quarry to incorporate the various management measures and operational controls of **Section 5.4.4** .
Groundwater	• Only extract groundwater following confirmation of appropriate approvals and licences issued under the WM Act. • Groundwater is only to be extracted following obtainment of a Water Access Licence for the nominated groundwater source and volume. • Should groundwater seepage into the extraction area be observed, cease extraction below this depth until an appropriate hydrogeological investigation is completed.
Biodiversity	• Limit clearing to the areas identified in the EIS. • Implement a Vegetation Clearing Protocol. • Retain cleared vegetation for use in rehabilitation. • All ground-engaging machinery would be cleaned prior to arriving at or departing the Project Site. • Implement appropriate weed management.

Heritage	• Limit clearing to the areas identified in the EIS.
	• Establish and implement as necessary an Unanticipated Finds Protocol. This should as a minimum, require that:
	  ○ Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist.
	  ○ If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the OEH and Aboriginal stakeholders.
	• If any suspected human remains are discovered during any activity the following protocol will be followed:

Environmental Feature	Management Commitments
	○ Immediately cease all work at that location and not further move or disturb the remains. ○ Notify the NSW Police and OEH's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location. • Not recommence work at that location unless authorised in writing by OEH.
Soil Resources	• Soil Stripping to be completed (preferentially in late spring or early summer). • Topsoil and subsoil will be stripped and stockpiled separately. • Stockpiles would be constructed in accordance with Standard Drawing (SD) 4-1 of the Blue Book. • A coverage of grass of 70% will be established over the stockpile within 120 days • The stockpiles will be isolated from upslope runoff by the construction of diversion embankments (as required). • Sediment fencing will be positioned downslope of stockpiles until an adequate level of stabilisation is achieved. • Stripped soil will be immediately respread over available areas of the final landform. • Prior to respreading of the topsoil layer, the combined subsoil / imported soil profile layer would be ripped or scoured to allow keying of the topsoil.
Hazardous Materials	• Hydrocarbons and hazardous materials would only be received by licenced suppliers for the transport of dangerous goods in accordance with *Dangerous Goods (Road Transport) Act 2009*. • All chemical storage facilities, including those for fuels and oils, meet the specifications of Australian Standard (AS) 1940 – The storage and handling of flammable and combustible liquids. • Empty hydrocarbon and chemical containers are to be stored with closures in place on a concrete hardstand or within a bunded area. • Hydrocarbon spill kits would be appropriately located to ensure spill response and clean up can be carried out immediately following the detection of any spills. • A Pollution Incident Response Management Plan (PIRMP) will be reviewed and updated following approval of the development application.
Visual Amenity	• Vegetation to the north and west of the extraction area will be retained to screen views from these directions. • Crushing and screening activities would be relocated into the extraction area as soon as practicable (and likely within two years from approval). • The Private Haul Road would be regularly watered and recompacted to reduce the potential for dust lift-off. • Night-time activities would be limited to vehicle movements on and off the Quarry site and as such no flood lighting would be required.

7.0 Evaluation, Justification and Conclusion

7.1 Introduction

This EIS has been prepared by Umwelt to assist in the assessment of the likely environmental and social impacts associated with the Project. The potential impacts have been identified and carefully assessed following consideration of the design features, operational controls and management measures currently in place or proposed.

On the basis of the assessment of each potential impact, the Project can be justified as the residual impacts on the biophysical environment are either understood and determined to be acceptable, or can be predicted and appropriately managed, there would be no notable additional socio-economic impacts and the consequences of not proceeding are considered more adverse than proceeding. Each of these factors considered in the justification of the Project are presented below.

7.2 Evaluation

7.2.1 Residual Environmental Impacts

The potential environmental impacts of the Project have been identified through a process involving:

- assessment of the site characteristics
- consultation with government agencies
- consultation with surrounding landowners
- expert technical assessments.

The key issues identified were the subject of comprehensive technical assessment to identify and assess the potential impacts of the Project on the existing environment and community. The results of these assessments are detailed in **Section 5.0** and the appendices of this EIS.

The environmental and social impacts of the Project have been minimised through refining the project design and operational procedures in consideration of environmental constraints and implementation of appropriate control measures.

With the existing and proposed measures to avoid, minimise or manage impacts associated with the Project, it is anticipated that the Quarry can continue to operate within acceptable environmental standards without significantly adversely impacting the environment or local community.

7.2.2 Ecologically Sustainable Development

7.2.2.1 Principles of Ecologically Sustainable Development

The EP&A Act aims to encourage ecologically sustainable development (ESD) within NSW. As outlined in **Section 4.1.3.2**, the Project requires approval under section 4.15(1) of the EP&A Act. As such, the consent authority needs to be satisfied that the Quarry is consistent with the principles of ESD.

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

7.2.2.2 The Precautionary Principle

In making decisions about developments, the application of the precautionary principle is guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and an assessment of the risk-weighted consequences of various options.

In order to achieve a level of scientific certainty in relation to potential impacts associated with the Project, this EIS has undertaken an evaluation of all the key components. Detailed assessment of all key issues and necessary management procedures has been conducted and is documented in this EIS.

The assessment process has involved a detailed study of the existing environment and the use of engineering and scientific modelling and study to assess and determine potential impacts as a result of the Project. To this end, there has been careful evaluation to avoid, where possible, irreversible damage to the environment.

The decision-making process for the design, impact assessment and development of management processes has been transparent in the following respects:

- Relevant government authorities and community representatives were consulted during EIS preparation (refer to **Section 5.0**). This enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures.
- The approved Quarry incorporates environmental management plans, procedures and environmental monitoring that will be revised in regard to the Project. In addition, the management controls that will be implemented by Regional Hardrock as part of the Project have been clearly specified in **Section 5.0** and summarised in **Table 6.1**.
- This EIS has been undertaken on the basis of the best available scientific information about the Project area. Where uncertainty in the data used in the assessment has been identified, a conservative worst-case analysis has been undertaken and contingency measures have been identified to manage that uncertainty.

7.2.2.3 Intergenerational Equity

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 would provide ongoing high-quality supply of hard rock materials to the Inland Rail Project and local markets. As an expansion to existing quarrying operations, reliance is placed on the extension to the rehabilitation strategies and final land use objectives of the Quarry Rural Landscape Management Plan. As discussed in **Section 3.13**, the Project does not propose any significant variation from the approved final landform and land use strategy of the approved Quarry and therefore will not have any significant additional impact on the local environment or community. The environmental management measures discussed in **Section 5.0** and summarised in **Table 6.1** have been developed to minimise the impact of the Project on the environment and community to the extent reasonably practicable.

The management of environmental issues as outlined in this EIS will assist to maintain the health, diversity and productivity of the environment for future generations whilst also realising the benefits of the quarrying operations.

7.2.2.4 Conservation of Biological Diversity

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. As discussed in **Section 5.6**, the Project is unlikely to have any additional impact on biodiversity of conservation significance.

7.2.2.5 Valuation and Pricing of Resources

The principle of improved valuation and pricing of resources refers to the need to determine proper values of services provided by the natural environment. The objective is to apply economic terms and values to the elements of the natural environment. This is a difficult task largely due to the intangible comparisons that need to be drawn in order to apply the values.

The Project optimises the valuation and pricing of the basalt resource with minimal impact by maximising its efficient extraction at the existing Quarry through expansion of the extraction area and increasing extraction rates.

Feasibility considerations during the design process for the Project have included the costs of integration of effective management measures to minimise potential environmental and social impacts.

7.2.3 Environmental Planning & Assessment Act 1979 Considerations

7.2.3.1 Objects of the EP&A Act

Table 7.1 provides a short description of how the Project and this EIS have addressed and satisfy the objects of the EP&A Act.

Table 7.1 Objects of the EP&A Act

Object	EIS Coverage
to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,	Socio-economic effects are assessed in **Section 5.13**, with the Project likely to provide for an ongoing socioeconomic benefit to Gilgandra LGA. The Project would incorporate measures to avoid or mitigate impacts to the natural environment arising from potential impacts on water resources (refer to **Sections 5.4** and **5.5**) and biodiversity (refer to **Section 5.6**). Operational controls would also be implemented to manage potential impacts from noise (**Section 5.2**) and air emissions (refer to **Section 5.3**).

Object	EIS Coverage
to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,	The principles of ecologically sustainable development have been considered in **Section 7.2.2**.
to promote the orderly and economic use and development of land,	The Project would involve the continued operation and extension of the Quarry and would maintain the supply of construction materials to the region. The Project would be a significant contributor to the local and regional economy and community.
to promote the delivery and maintenance of affordable housing,	The Project would not limit the provision of affordable housing in Gilgandra LGA.
to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,	Ecological surveys and assessment have determined that the Project would be unlikely to have a significant impact on any threatened population, species or community (refer to **Section 5.6**). It is concluded that the Project would not increase the risk of local extinction of any species.
to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),	The Project would not result in disturbance to any identified Aboriginal heritage site.
to promote good design and amenity of the built environment,	The Project would have no impact on the built environment.
to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,	The Project does not require construction of buildings.
to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,	The EIS includes a review of the relevant State, regional and local environmental planning regulations, plans and strategies including how these have been addressed (refer to **Section 4.1.3**).
to provide increased opportunity for community participation in environmental planning and assessment.	Gilgandra Shire Council, various government agencies and local landholders were consulted during the planning of the Project and preparation of the EIS.

7.3 Justification

7.3.1 Economic Contributions

The Proponent proposes a capital investment, in the form of haul road upgrade, hardstand and carpark preparation, building purchase and installation, and mobilisation and establishment of crushing and screening infrastructure and mobile plant on the Quarry site, to the value of $1.1 million.

The Proponent anticipates an ongoing contribution of approximately $3.3 to $4.6 million per annum to the local and regional economy as follows:

- Wages (including truck drivers): $1,200,000 to $2,000,000 per annum.
- Consumables, goods and services: approximately $1,500,000 to $2,000,000 per annum.

- Contractors and suppliers: up to $200,000 per annum.
- Rates and taxes: approximately up to $400,000 per annum.

7.3.2 Suitability of the Site

The Quarry is located within a rural environment in an area dominated by rural based industries, as discussed in **Section 2.0**. The site is considered suitable for the Project for the following reasons:

- The site contains extensive basalt resources and is located within proximity to markets for these resources.
- The site has been used for basalt extraction since original approval was granted in 2017.
- The site is located within a Primary Production zone and the development is consistent with the objectives of the zone.
- The proposed extraction area extension consists of cleared land not used for any other purpose, limiting the potential ecological impacts of further disturbance.
- The Project is compatible with surrounding land uses and can co-exist with these existing uses.
- The site includes suitable buffers to environmentally sensitive areas.
- Topography and vegetation provide some visual shielding from the surrounding area.
- Suitable safe access to the Oxley Highway is provided from the site without impacting adversely on the local road network.

7.3.3 Consideration of Alternatives

As identified in **Section 3.14**, a number of alternatives were considered when planning the Project, namely:

- A modified extraction area
- A modified stockpile area, and
- A reduced production rate.

Crucially, the proposed disturbance footprint (combining the extraction area and stockpile area) and production rate has been confirmed as providing for the resource and production objectives of the Project whilst avoiding or minimising impacts on biodiversity, heritage and groundwater.

7.3.4 Benefits of the Project

The key benefits of the Project include:

- Maximising the efficient extraction of the resource at the existing quarry, thereby delaying or eliminating the need for further quarry development on another less suitable greenfield site.
- The environmental impact of the Project can be managed within acceptable environmental standards.
- The Project will provide continued employment for existing staff and significant additional employment for ongoing quarry operations.

- The Project will result in ongoing operational expenditure that will have flow-on economic benefits for the region.

7.3.5 Consequences of Not Proceeding

The proposed extension of the Quarry is essential to allow it to play a role in supplying construction materials for major infrastructure works associated with the Inland Rail Project. The consequences of not proceeding with the Project are considered more adverse than proceeding, and include the following:

- The 'do nothing' option (refer to **Section 1.4**) was considered undesirable as it does not allow Regional Hardrock to maximise the efficient use of an existing high-quality resource to meet the needs of major infrastructure projects in the region while providing economic benefits to the local community.
- If demand is not able to be met by existing approved resources, a greenfield development may be required, including environmental impacts greater than those associated with expanding the existing Quarry and operations.

7.4 Conclusion

The Berakee Quarry Extension Project has, to the extent feasible, been designed to address the issues of concern identified by the relevant levels of government and legislation.

- The Project provides for the extraction, processing and transportation of important construction material whilst minimising the residual impacts on the biophysical environment.
- The Quarry products would facilitate infrastructure construction (including the federally significant Inland Rail Project), and the efficient operation of businesses and projects in the wider area surrounding the Quarry, including road building and maintenance.
- The contribution of the Project to the local and regional economy would be increased by virtue of the increased employment and expenditure.

The post-quarry landform would integrate the re-establishment of vegetation conducive to a land use consistent with the surrounding land uses. In light of the conclusions included throughout this EIS, it is assessed that the Project could be undertaken in a manner that would satisfy all relevant statutory goals and criteria, environmental objectives and reasonable community expectations.

8.0 References

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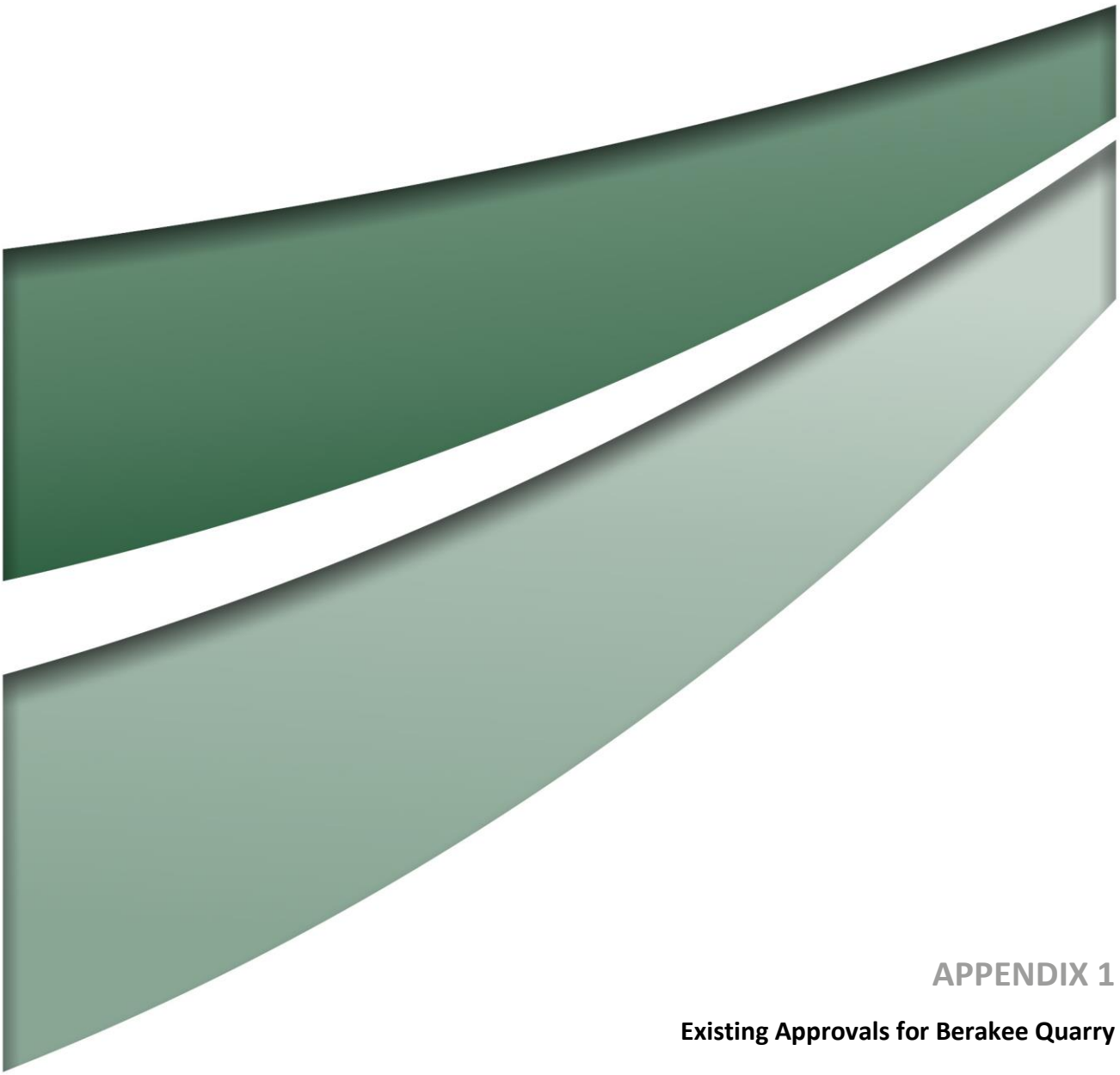


APPENDIX 1

Existing Approvals for Berakee Quarry

GILGANDRA SHIRE COUNCIL
Live > Enjoy > Grow

> 15 Warren Road, Gilgandra 2827
> PO Box 23, Gilgandra NSW 2827

> P 02 6817 8800
> council@gilgandra.nsw.gov.au
www.gilgandra.nsw.gov.au

A381; 2017/218-Revision A

Contact: Lindsay Mathieson

25 June 2019

Sandy Creek Family Trust
557 Berida Innisfail Road
GILGANDRA NSW 2827

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979
SECTION 4.18(1A)
NOTICE TO APPLICANT OF DETERMINATION OF APPLICATION FOR MODIFIED DEVELOPMENT CONSENT

Development Application No:	2017/218A
Applicant Name:	Sandy Creek Family Trust C/-Colin and Leslie Kilby
Land to be Developed:	144 Ostlers Lane Collie NSW Lot 45 DP752563
Proposed Development:	Development & Operation Of A Basalt Quarry To Produce Up To 30,000 Cubic Metres Of Material From An Area <2 Hectares.
Determination - Date:	29 January 2018
Determination:	Consent subject to following listed Conditions
Modified Determination Date:	25 June 2019
Consent to Operate from - Date:	29 January 2018
Consent to Lapse on - Date: (where not commenced)	29 January 2023

The application for the modification of the development consent granted 29 January 2017 for the above development has been determined by Council pursuant to section 4.55 (1A) of the Environmental Planning and Assessment Act 1979 by the issue of a modified consent, subject to the changes noted below.

NATURE OF MODIFIED CONSENT

- Private haulage road for access and egress to the quarry site.

The following is a complete set of current conditions which combines any amended and/or deleted conditions from the previous development consent. This revised development consent, with revised conditions, is to be read as a single document without the need to reference the previous conditions issued with DA2017/218, dated 29 January 2018.

DETAILS OF CONDITIONS

1. Development of the site shall be carried out generally in accordance with the approved plans, specifications and documentation submitted with the application in the Statement of Environmental Effects prepared by R W Corkery, Ref 971/01 dated August 2017 and Statement of Environmental Effects prepared by UMWELT Environmental & Social Consultants dated March 2019 subject to any notations in red or modification required as a consequence of any condition. The relevant plans are:
   Project Site Layout – Figure 2.1

   Extraction Area Layout – Figure 2.3

   Conceptual Final Landform – Figure 2.5

   Erosion and Sediment Controls – Figure 4.1

   Certificate of Title nominating right of carriageway 22m wide – ref VTZW-99-5ZDP

   Reason: To ensure compliance with this consent.

2. The Applicant shall comply with the General Terms of Approval Notice No. 1557997 dated 30 October 2017 from the NSW EPA (copy attached).

   Reason: To ensure compliance with Section 91 of the Environmental Planning and Assessment Act, 1979 and NSW EPA requirements.

3. A sign must be erected on the development site from the right of carriageway on the boundary of Lot 45 DP 752563 showing:

a) Name of the Principal Contractor (if any) for any building work and a telephone number on which that person may be contacted outside working hours.
b) Stating that unauthorised entry to the work site is prohibited.
Reason: To ensure compliance with the Environmental Planning and Assessment Act, 1979.

4. The maximum extraction rate for the quarry shall be limited to 30,000 cubic metres per calendar year of basalt (equivalent to 80,000 tonnes per calendar year). The active quarry shall not exceed 1.5 hectares in area. Material storage, crushing and roads shall not exceed 0.5 hectares in area.

   Reason: To ensure compliance with the Environmental Planning and Assessment Act, 1979.

5. Subject to condition 6 trucks hauling quarry materials or accessing the site to obtain quarry materials will only use the Private Haulage Route marked "Berakee Quarry Nominated Haulage Route" dated June 2019 (see attachment A). No truck movements from the quarry operations are permitted outside the nominated haulage route.

   Reason: To ensure compliance with the Environmental Planning and Assessment Act, 1979 and limit quarry road maintenance impacts.

6. For a period of up to 12 months to 30 June 2020, the use of the temporary haulage route (see attachment B) is permitted on the following road sections:
   a) The section of Berida Innisfail Road from Ostlers Lane to the Leeches Creek Road intersection.
   b) The section of road from Berida Innisfail and Leeches Creek Road intersection to the intersection of Leeches Creek Road and Yungundi Road intersection.

   A maximum of 30,000 tonnes of quarry material is allowed to be transported on the temporary haulage route period.

   A security Bond (Bank guarantee) in the amount of $100,000 shall be supplied by the applicant to Gilgandra Shire Council for the temporary haulage route nominated above. Gilgandra Shire Council can access this money to undertake road maintenance at any time during the temporary haulage route period if the applicant does not undertake the work.

   At the conclusion of the temporary haulage route period, the applicant is to undertake maintenance of the above nominated road sections (or pay Gilgandra Shire Council to undertake it) to ensure the roads are at or above the following standards in accordance with the Gilgandra Local Hierarchy Plan as adopted by Council – Resolution Number-235/13

   - Berida–Innisfail Road and Leeches Creek Road – *unsealed secondary through road condition 3*

   Following completion of the road maintenance at the end of the temporary haulage route period. Council will inspect the maintenance

works to ensure the sections of road are returned to condition 3 as nominated above. At this point Council will release the security bond (or balance of it).

Reason: To ensure compliance with the Environmental Planning and Assessment Act, 1979 and ensure quarry related road maintenance is paid for by the Applicant

7. Deleted
8. Deleted

9. Pursuant to section 138(2) of the roads Act 1993 and within a 12 month period from the date of this approval , the intersection at the right of carriageway on lot 52 DP43558 and the Oxley Highway shall be upgraded by the Applicant to include the following:
   - Safe Intersection Sight Distance (SISD) requirements outlined in Part 4A of the Austroads Guide to Road Design is to be provided and maintained at the newly constructed access onto the Oxley Highway via "Wilgaroo". The Oxley Highway has a 110km/h speed limit and SISD at the intersection is to be 300metres in each direction.

   - The vehicular access from the Oxley Highway servicing "Wilgaroo" haulage road at the agreed new access point is to be upgraded in accordance with Austroads Guide to Road Design and any relevant Roads and maritime supplements, including:

     - Part 4A Figure 7.4 The Vehicular access is to be sealed a minimum of forty (40) metres from the edge of the Oxley Highway, match existing road levels and not interfere with existing road drainage.

     - Prior to construction the applicant is to contact Roads and Maritime's Area Maintenance Manager, Holly Davies holly.davies@rms.nsw.gov.au or 02 68414 774 to ascertain details for the provision of appropriate culverts to be installed in the access road to "Wilgaroo" at the intersection with the Oxley Highway.

     - To provide suitable storage capacity for the largest class of vehicle accessing the subject land, any gate, grid or similar structure installed in the access is to be set back a minimum of 40 metres from the edge of the Oxley Highway.

     - A sealed Basic Left (BAL) turn treatment as shown in Part 4A Figure 8.2 of the Austroads Guide to Road Design 2017 is to be provided in the Oxley Highway at its intersection with the newly constructed access to "Wilgaroo"

     - A sealed Basic Right (BAR) turn treatment as shown in Part 4 Figure A.28 of the Austroads Guide to Road

Design 2017 is to be provided in the Oxley Highway at its intersection with the newly constructed access to "Wilgaroo"

- A copy of the heavy vehicles swept turning paths is to be provided and approved by Roads and Maritime demonstrating the largest vehicle accessing the Oxley Highway (being a 36.5m) can be safely accommodated within the required BAR/BAL intersection treatment prior to the commencement of construction works.

- A copy of construction plans for any road work on and adjoining the Oxley Highway are to be submitted to Roads and Maritime for approval. As the Oxley Highway is a state road, the developer will be required to enter into a Works Authorisation Deed (WAD) with Roads and Maritime for approval of and construction of the intersection.

- Prior to the commencement of construction works, the proponent is to contact Roads and Maritime's Field Traffic Manager to determine if a Road Occupancy Licence (ROL) is required. In the event that an ROL is required, the proponent will obtain the ROL prior to works commencing within three (3) metres of the travel lanes in the Oxley Highway.

- All required road works are to be completed to the satisfaction of Council prior to operation of the proposed development.

Reason: To ensure compliance with the Environmental Planning and Assessment Act, 1979 and Roads and Maritime Services requirements.

10. Within a 12 month period from the date of this approval, a 200m section of the right of carriageway (starting from the edge of the 40 metre sealed section from the intersection of the Oxley Highway) shall provided with a suitable road base material to a depth of 100mm at full cost to the Developer to minimise dust impacts on the Oxley Highway.

    Reason: To ensure that the impact of the proposed development upon public roads is adequately addressed

11. Deleted
12. Deleted
13. Deleted
14. Deleted
15. Deleted
16. Deleted

17. Trucks are not permitted to use the nominated haulage route during wet weather for the life of the quarry unless the developer provides for an adequate all weather road surface so as to prevent the tracking of mud from haulage vehicles onto the Oxley Highway.

Reason: To maintain safe road conditions at the intersection of Oxley Highway and the nominated haulage route

18. A Code of Conduct for the transportation of materials on public roads shall be submitted to and approved by Council. The Code of Conduct as approved shall be implemented for the life of the development.

    Reason: Compliance with 16(1) of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.

19. Prior to any work commencing within any road reserve an application shall be lodged and approval received for road works pursuant to Section 138 of the Roads Act 1993.

    Reason: To ensure compliance with the Environmental Planning and Assessment Act, 1979 and the Roads Act 1993.

20. The applicant shall prepare Traffic Management Plans(TMP) and Pavement Management Plans (PMP) for approval by Warren Shire Council detailing probable impacts on Warren Shire Council roads and bridges. The applicant shall provide full funding for the works issuing from the approved plans.

    Reason: The roads in the Warren Shire Council areas have not been designed to carry continuous heavy loads and Councils should not suffer additional costs due to this development

21. The site shall be protected from erosion and sediment loss during the construction works. This work must be carried out and maintained in accordance with erosion and sediment control guidelines for building sites.
    NOTE: All erosion and sediment control measures must be in place prior to earthworks commencing.

    Reason: To protect the environment.

22. Any water discharged from the site shall ensure that water quality is maintained in accordance with all quality standards being chemical, physical and microbiological for primary recreational water contact as stated ANZECC Guidelines and water quality objectives in NSW 2000.

    Reason: To prevent pollution of waterways and the environment

23. No chemicals, explosives or fuel are to be stored at or near the quarry site.

    Reason: To prevent pollution of waterways and the environment

24. A site office must be erected at the entrance to the quarry site to control access to the site and provide shelter for staff. It must include toilet facilities, hand washing facilities and drinking water. A rain water tank of at least 10,000 litres shall be installed at the site office and a 20,000 litre

tank for firefighting purposes. A 65mm Storz fitting and ball or gate valve shall be installed on the tank.
Any proposed building or structure shall be designed and constructed in conformity with the applicable design criteria applicable under the NCC (building Code of Australia) and Disability (Access to Premises-Buildings) Standards 2010 of the Disability Discrimination Act 19

Reason: To provide a safe work site and sanitary facilities for workers and Council requirement to ensure compliance with the applicable Premises Standards under the DDA is demonstrated.

25. The sanitary wastewater disposal and water plumbing installations shall comply with the provisions of the Local Government (General) Regulation, 2005 and the requirements of Council as the delegated plumbing/drainage regulator. The applicant shall obtain appropriate approvals pursuant to S.68 of the Local Government Act 1993.

Reason: Statutory and Council requirement to protect the environment and ensure sanitary facilities for workers

26. Construction works and operation of the quarry are to be limited as follows:

a) Monday to Friday - 7.00 am to 6.00 pm.
b) Saturday 7.00 am to 4.00 pm.
c) No construction work or quarry activity which will adversely impact on the amenity of the area is to take place on Sundays or Public Holidays.

Reason: To preserve the amenity of the area

27. Blasting at the quarry will only be carried out between 9 am and 3 pm Monday to Friday and all neighbours will be given not less than 24 hours' notice.

Reason: To preserve the amenity of the area

28. No external lighting shall be located on the quarry site.

Reason: To ensure compliance with Gilgandra Local Environmental Plan 2011.

29. The quarry operator shall provide annual production data for the subject site to the NSW Division of Resources and Geoscience and Gilgandra Shire Council on a date agreed with that authority or on the anniversary of the commencement of the quarry.

Reason: To assist in the collection of construction material production data for the estate of NSW

30. All waste generated on site is to be disposed at an approved waste management facility regulated or licensed to receive such waste.

Reason: To protect public health, safety and the environment.

31. In the event that any Aboriginal archaeological material is discovered during earthmoving/construction works, all work in that area shall cease immediately and the Office of Environment and Heritage (OEH) notified of the discovery as soon as practicable.
Work shall only recommence upon the authorisation of the OEH.

Reason: To protect Aboriginal heritage

32. A copy of this development consent and the EPA GTA requirements must be kept at the quarry site office. The development consent must be produced to any authorised officer of Council or the EPA who asks to see it. The development consent must be available for inspection by any employee or subcontractor working at the premises or operating the vehicle or mobile plant.

Reason: To ensure compliance with the Environmental Planning and Assessment Act, 1979.

33. Within 12 months of commencing the quarry operation the applicant will prepare a site rehabilitation plan based on the information in section 2.l0 and Figure 2.5 of the SEE and submit this for Council's approval.

Reason: To protect the environment and rehabilitate the site post extraction

34. The proposed development is located in a Bushfire Prone Area. The owner shall ensure that any proposed building or structure is designed and constructed in accordance with the requirements of the "Planning for Bushfire Protection" guidelines.

Reason: Requirement of the Environmental Planning and assessment Act 1979.

35. Deleted

36. The right of Carriageway easement is to remain on the certificate of title (Lot 52 DP 43558) for the life of the quarry

Reason: To provide safe and legal access to the quarry.

37. That, upon completion of the intersection upgrade, condition 5 shall forthwith come into effect and the temporary haulage route as per condition 6 shall forthwith cease.

Reason: As adopted by Council Resolution number 117/19

NOTES

(1) A separate application is required to be submitted to either Council or an accredited certifier to obtain a Construction Certificate to permit the erection of any proposed buildings or structures.

(2) Any proposed building or structure is required by the Deemed-to-satisfy BCA and the Premises Standards to provide disabled access. However, notwithstanding this, the applicant's attention is drawn to the owners' and employers' obligations under the NSW Anti-Discrimination Act whereby the design of the premises and workplace should not discriminate against a disabled persons visiting and obtaining access to such premises. It should be noted that compliance with the BCA and the Premises Standards is not a defence against prosecution, or the issue of a rectification order under the subjects Act in respect of all disability access issues. Accordingly, Council recommends that the applicant and owner investigate their liability under such Acts.

(3) Any proposed building or structure is to provide a list of Fire Safety Measures which must be submitted with the Construction Certificate application pursuant to clause 139 of the Environmental Planning and Assessment Regulation 2000. The Regulation prescribes that the information to be submitted must include:

- A list of any existing fire safety measures provided in relation to the land or any existing building on the land; and
- A list of the proposed fire safety measures to be provided in relation to the land and any building on the land as a consequence of the building work.

(4) Details of the disabled facilities (including access paths, toilets, signage and location of any tactile ground surface indicators) need to be adequately detailed on the Construction Certificate application plans to permit assessment and compliance evaluation with the provisions of the Council's Development Control Plan (where applicable), the Premises Standards and the BCA. In particular, the submitted details for the proposed disabled and ambulant toilets should include elevations and floor plans of the facilities drawn to scale of 1:20. Reference should be made to AS 1428.1, the Access Code under the Premises Standards and AS/NZS 2890.6 regarding specific design parameters.

(5) It is a statutory requirement that an Approval to Operate a System of Sewerage Management must be obtained from the Council prior to occupation of the building and/or commissioning of the sewerage management facility (eg septic tank, AWTS etc). This approval to operate the sewerage management system is time limited and must therefore, be renewed on a regular basis by the owner of the premises. Accordingly, the applicant to this consent should ensure that the owner of the subject premises is made aware of the following:

(a) That an approval to Operate a System of Sewerage Management must be obtained from the Council prior to occupation of the

building and/or commissioning of the sewerage management facility; and

(b) That such approval once obtained must be renewed on a regular basis.

(6) Any proposed building or structure requires the owner of the building to submit to the Principal Certifying Authority (PCA) a Fire Safety Certificate(s) with respect to each *essential fire safety measure* installed in association with the building – as listed on the Fire Safety Schedule attached to the Construction Certificate. Such certificate(s) must also be forwarded by the owner to the PCA prior to occupation or use of the subject building.
Copies of the subject Fire Safety Certificate(s) must also be forwarded by the owner to Council (if not the appointed PCA) and the Commissioner of Fire and rescue NSW and displayed within the subject building in a prominent position.

(7) Any proposed building or structure requires the owner of the building to submit to Council at least once in each period of 12 months following the completion of the building and Annual Fire Safety Statement(s) with respect to each essential fire safety measure associated with the building.

Copies of the subject Annual Fire Safety Statement(s) must also be forwarded by the owner to the Commissioner of Fire and Rescue NSW and displayed within the subject building in a prominent position. In this regard Fire and Rescue NSW has requested that only electronic copies of the statement be forwarded, with their dedicated email address for such Statements being afss@fire.nsw.gov.au

(8) Approvals that will be required to be obtained under Section 68 of the Local Government Act include:

- Install and construct a human waste storage facility and drain connected to such facility: and
- Operate a system of sewerage management (within the meaning of section 68A).

(9) Offensive noise as defined under the Protection of the Environment Operations Act 1997 shall not be emitted from the proposed development.
Air impurities as defined under the Protection of the Environment Operations Act 1997 shall not be released or emitted into the atmosphere in a manner which is prejudicial to the health and safety of occupants, the surrounding inhabitants or the environment.

(10) The Development shall be carried out in accordance with Roads and Maritime Services correspondence dated 10 January 2017 (copy attached).

(11) It is recommend that Haulage operations coinciding with local student school bus pick up/drop off times are to be avoided.

Other Approvals
List Local Government Act 1993
Approvals Granted under S.68(5)

General terms of other Approvals integrated as part of the Consent (list Approvals)

- *Nil.*

RIGHT OF REVIEW

Section 8.2 and 8.3 of the Environmental Planning and Assessment Act,1979 confers the right for an applicant to make request to the Council for it to review its determination, within six (6) months after the date on which the applicant received this notice. Any requests for a review are required to be accompanied by a fee as set in Council's revenue policy.

RIGHT OF APPEAL

Section 8.7 and 8.10 of the Environmental Planning and Assessment Act, 1979 confers the right for an applicant who is dissatisfied with Council's determination to appeal to the Land and Environment Court within six (6) months after the date on which you receive this Notice.

Signed on behalf of the General Manager,
GILGANDRA SHIRE COUNCIL

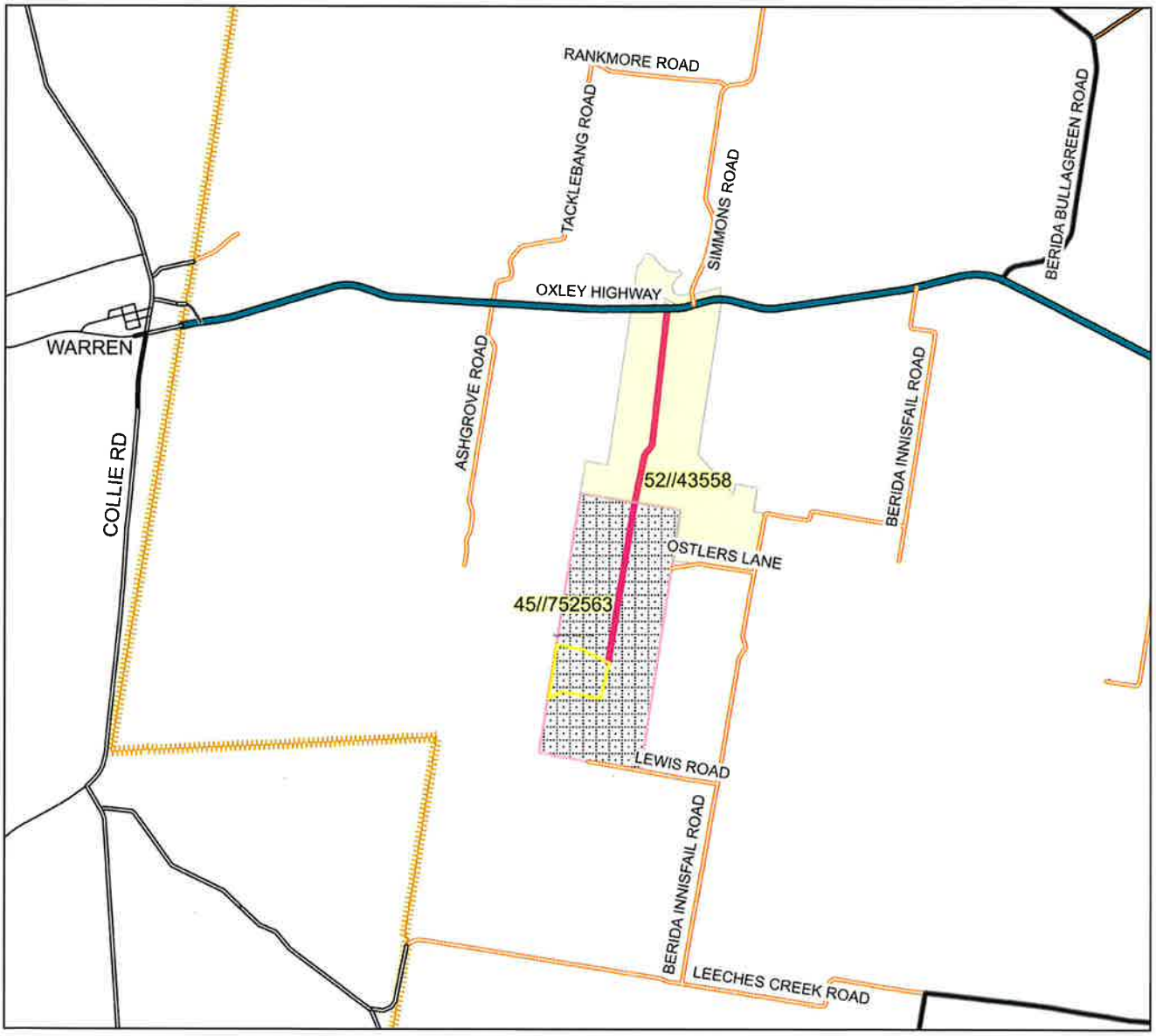
Signature L Mathieson

For David Neeves
General Manager

GILGANDRA SHIRE COUNCIL
Live > Enjoy > Grow

Attachment A

Berakee Quarry Nominated Haulage Route June 2019

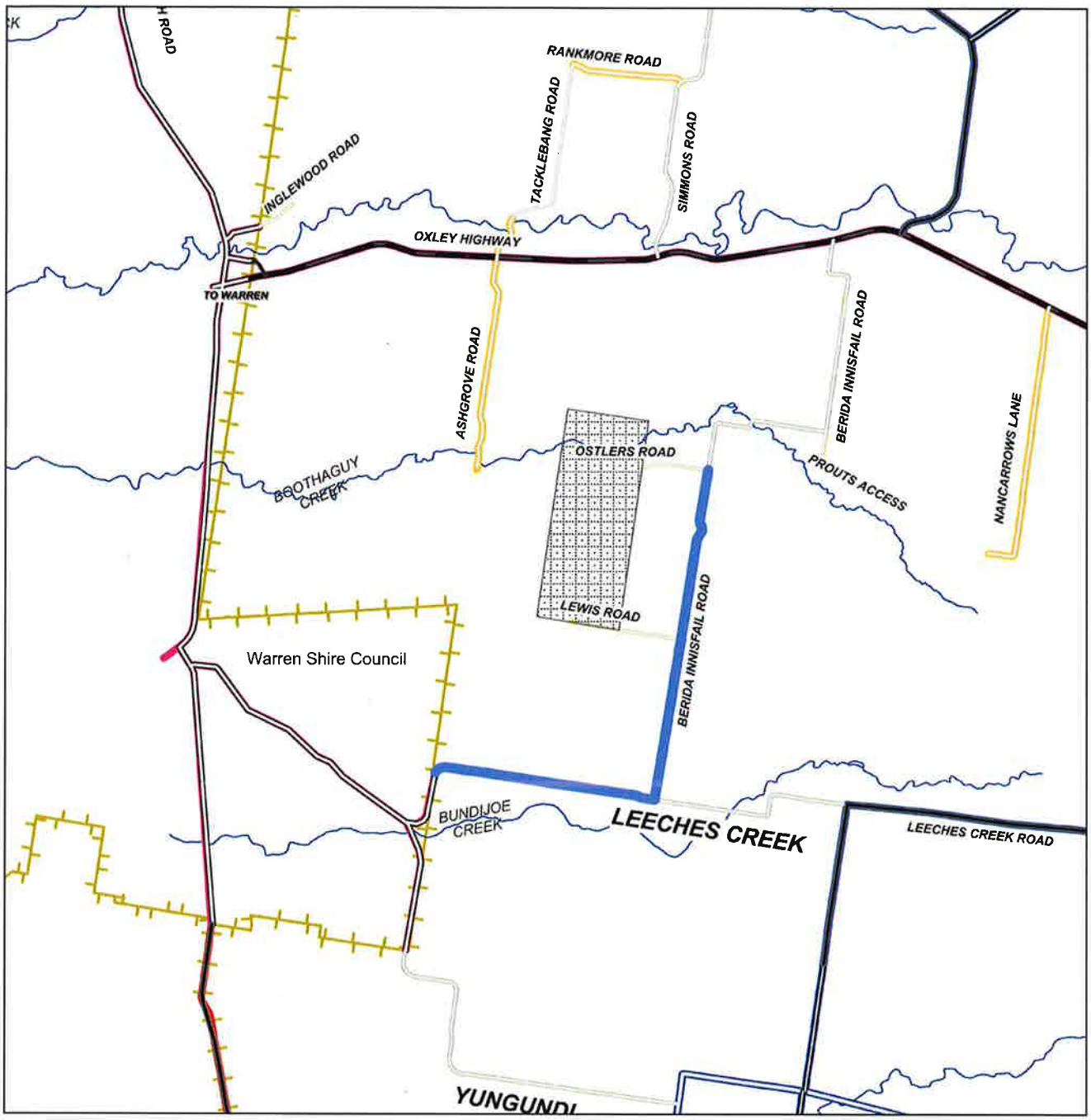


Lot benefited by Easement
Lot Burdened by Easement
Private Right of Carriage Easement

Attachment B

Copyright 2018 Gilgandra Shire Council

Porposed temporary Berakee Quarry Haulage Route January 2018



Temporary Route Legend

Temporary Haulage Route

Protection of the Environment Operations Act 1997

General Terms of Approval - Issued

Notice No: 1557997

The General Manager
Gilgandra Shire Council
PO Box 23
GILGANDRA NSW 2827

Attention: Brian Irvin

Notice Number	1557997
Date	30-Oct-2017

Re: DA2017/218 - Berakee Quarry - Lot 45 DP 752563 - 144 Ostlers Lane Collie NSW 2827

Issued pursuant to Section 91A(2) Environmental Planning and Assessment Act 1979

I refer to the development application and accompanying information provided for the Extractive Industry (Quarry) at Lot 45 DP 752563 144 Ostlers Lane, Collie NSW 2837 received by the Environment Protection Authority (EPA) on 5 September 2017.

The EPA has reviewed the information provided and has determined that it is able to issue a licence for the proposal, subject to a number of conditions. The applicant will need to make a separate application to the EPA to obtain this licence prior to commencement of scheduled development (construction) or schedule activities.

The general terms of approval for this proposal are provided at **Attachment A**. If Gilgandra Shire Council (Council) grants development consent for this proposal these conditions should be incorporated into the consent.

These general terms relate to the development as proposed in the documents and information currently provided to EPA. In the event that the development is modified either by the applicant prior to the granting of consent or as a result of the conditions proposed to be attached to the consent, it will be necessary to consult with EPA about the changes before the consent is issued. This will enable the EPA to determine whether its general terms need to be modified in light of the changes.

The EPA would like to advise Council that every Protection of the Environment Operations Act 1997 (POEO) licence will contain a number of mandatory conditions. A copy of the mandatory conditions has been included as a separate attachment to the General Terms of Approval and is provided in **Attachment B**.

General Terms of Approval - Issued

Notice No: 1557997

The proponent should be aware of their obligation to prepare a Pollution Incident Response Management Plan (PIRMP) for the premises as required by the Protection of the Environment Legislation Amendment Act 2011. Guidelines on the preparation of the PIRMP can be found at http://environment.nsw.gov.au/legislation/20120027egprepirmp.pdf.

If you have any questions, or wish to discuss this matter further please contact Joshua Loxley on 02 6883 5326.

Yours sincerely

Bradley Tanswell

Unit Head

Central West

(by Delegation)

General Terms of Approval - Issued

Notice No: 1557997

Administrative conditions

A1. Information supplied to the EPA

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

- the development application DA2017/218 submitted to Gilgandra Shire Council on 30 August 2017;
- *Statement of Environment Effects for Sandy Creek Family Trust for the Berakee Quarry Via Gilgandra August 2017* at Lot 45 DP 752563 144 Ostlers Lane Collie NSW 2827.

A2. Fit and Proper Person

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

Discharges to Air and Water and Application to Land

P1.1 The following points referred to in the table are identified in this licence for the purpose of the monitoring and/or setting of limits for discharges of pollutant to water from the point

EPA identification No.	Types of Monitoring Point	Type of discharge point	Location Description
Sediment Basin 1 overflow (Location TBA)	Surface water Quality	Surface water discharge	TBC in site specific Water management Plan
Blast monitoring point	Blast monitoring		TBC in consultation with the EPA
Weather Station	On site weather Station		TBC in specific Air Quality Management Plan

Notes:

1) The monitoring requirements may be modified by the EPA subject to ongoing review of the licence conditions and monitoring results

2) A licence application will need to define the sediment basins and other monitoring and discharge points on the premises.

3) Discharge of pollutants to water from the sediment basins is only permitted when the discharge occurs soley as a result of rainfall that exceeds the minimum design criteria for sediment control measures in *Managing Urban Stormwater: Soils and Construction - Volume 2E Moines and Quarries.*

General Terms of Approval - Issued

Notice No: 1557997

Limit conditions

L1. Pollution of waters

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

L2. Concentration limits

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

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

L2.3 To avoid any doubt, this condition does not authorise the discharge or emission of any other pollutants.

Water and Land

Monitoring point 1

Pollutant	Units of measure	50% concentration limit	90% concentration limit	3DGM concentration limit	100% concentration limit
TSS	mg/L				<50
Oil and Grease	mg/L				<10
pH					6.5-8.5

L5. Waste

L5.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997.

L5.2 This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if it requires an environment protection licence under the Protection of the Environment Operations Act 1997.

L6. Noise limits

L6.1 Noise from the premises must not exceed:

(a) an LAeq (15 minute) noise emission criterion of 35 dB(A) (7am to 6pm) Monday to Friday and 7am to 4pm

Saturday; and

(b) an LAeq (15 minute) noise emission criterion of 35 dB(A) during the evening (6pm to 10pm) Monday to Friday; and

(c) an LAeq (1 minute) of 45dB(A) at night (10pm to 7am) Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

Note:

1) LAeq(15 minute) is defined as the continuous 'A' weighted sound pressure level-the energy average of the noise measured over a 15 minute period.

2) LA1(1 minute) is defined as the sound pressure level exceeded for one percent of a 1 minute measurement period.

L6.2 The noise limits set out in condition L6.1 apply under all meteorological conditions except for any one of the following:

a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or

b) Stability category G conditions and wind speeds greater than 2 metres/second at 10 metres above ground level;

L6.3 For the purposes of condition L6.2:

a) The meteorological data to be used for determining meteorological conditions is the data recorded by the on-site meteorological weather station.

b) Temperature inversion will be assessed by use of the sigma-theta process as outlined in Appendix E4 of the NSW Industrial Noise Policy (INP).

L6.4 For the purposes of determining the noise generated at the premises Class 1 or 2 noise monitoring equipment as defined by AS IEC61672.1-2004 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing, must be used.

L6.5 To determine compliance:

a) With the LAeq(15 minute) noise limits in condition L6.1, the noise monitoring equipment must be located:

- within 30 metres of a dwelling façade but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary that is closest to the premises;
- approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises;
- within approximately 50 metres of the boundary of a National Park or a Nature Reserve.

b) With the LA1(1minute) noise limit in Condition L6.1;the noise monitoring equipment must be located within 1 metre of the dwelling facade.

c) The noise monitoring equipment must be located in a position that is:

- at the most affected point at a location where there is no dwelling at the location; or
- at the most affected point within an area at a location prescribed by conditions L6.5(a)or 6.5(b).

L6.6 A breach of this Environment Protection Licence will still occur where noise generated from the premises in excess of the appropriate limit specified in the condition L6.1 is detected:

- at a location other than an area prescribed by Conditions L6.5(a) or L6.5(b);and/or
- at a point other than the most affected point at a location.

L6.7 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

Hours of operation

L6.8 All construction work at the premises must only be conducted between 7am to 6pm Monday to Friday and 7am to 4pm Saturday.

L6.9 Activities at the premises, other than construction work, may only be carried on between 7am to 6pm Monday to Friday and 7am to 4pm Saturday.

L6.10 Activities are not permitted to be undertaken on Sundays or Public holidays.

L6.11 This condition does not apply to the delivery of material outside the hours of operation permitted by condition L6.8 or L6.9, if that delivery is required by police or other authorities for safety reasons; and/or the operation or personnel or equipment are endangered. In such circumstances, prior notification is to be provided to the EPA and affected residents as soon as possible, or within a reasonable period in the case of emergency.

L6.12 The hours of operation specified in conditions L6.8 and L6.9 may be varied with written consent if the EPA is satisfied that the amenity of the residents in the locality will not be adversely affected.

L6.13 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L7. Blasting

Airblast Overpressure level

L7.1 The airblast overpressure level from blasting operations at the premises must not exceed 120dB (Lin Peak) at any time at the blast monitoring location on Lewis Lane or any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L7.2 The airblast overpressure level from blasting operations at the premises must not exceed 115dB (Lin Peak) at the blast monitoring location on Lewis Lane or any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded

Ground vibration (ppv)

L7.3 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10mm/sec at the blast monitoring location on Lewis Lane or any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L7.4 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5mm/sec at the blast monitoring location on Lewis Lane or any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

Note:

"Noise sensitive locations" includes buildings used as a residence, hospital, school, child care centre, places of public worship and nursing homes. A noise sensitive location includes the land within 30 metres of the building.

Time of blasting

L7.5 Blasting at the premises may only take place between 9:00am-5:00pm Monday to Friday. Blasting is not permitted on saturday, Sunday or public holidays.

L7.6 Blasting outside of the hours specified in L7.5 can only take place with the written approval of the EPA.

Blast monitoring

L7.7 To determine compliance with conditions L7.1 to L7.4:

a) Airblast overpressure and ground vibration levels experienced at the blast monitoring location on Lewis Lane must be measured and recorded for all blasts carried out on the premises;

b) Instrumentation used to measure and record the airblast overpressure and ground vibration levels must meet the requirements of Australian Standard AS 2187.2-2006.

NOTE: A breach of the licence will still occur where airblast overpressure or ground vibration levels from the blasting operations at the premises exceeds the limit specified in conditions L7.1 to L7.4 at any "noise sensitive locations" other than the locations identified in the above condition.

Frequency of blasting

L7.8 Blasting at the premises is limited to 1 blast each day on which blasting is permitted.

Operating conditions

O1. Odour

O1.1 The licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.

Note: The POEO Act states that no offensive odour may be emitted from particular premises unless potentially offensive odours are identified in the licence and the odours are emitted in accordance with conditions specifically directed at minimising the odours are permitted.

O1.2 No condition of this licence identifies a potentially offense odour for the purposes of Section 129 of the Protection of the Environment Operations Act 1997.

O2. Dust

O2.1 Activities occurring at the premises must be carried out in a manner that will minimise emissions of dust from the premises.

O2.2 Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading.

O2.3 All dust control equipment must be operable at all times with exception of shutdowns required for maintenance.

O3. Stormwater/sediment control

03.1 The licensee must prepare and implement a Water Management Plan (WMP). The WMP for the project must be prepared to the satisfaction of the EPA and must be submitted with the Environment protection licence application. This plan must:

a. be prepared by a suitably qualified and experiences person(s);

b. address construction, operation and post closure monitoring, management and response arrangements;

c. include a commitment to meet discharge limits outlined in condition L2; and

d. include:

   i. a Site Water Balance; and

   ii. a Soil and Water Management Plan

O3.1 The Proponent must prepare and implement a Soil Erosion and Sediment Control Plan. This Plan must as a minimum:

a) describe how soil erosion and sediment pollution will be managed following the guidelines, principles and minimum design standards in Managing Urban Stormwater: Soils and Construction - Volume 1 (the blue book) during the construction/commencement stages;

b) describe how long-term soil erosion and sediment pollution measures such as dirty water diversion drains, sediment basins and soil stockpile areas will be designed and managed consistent with the guidelines, principles and minimum design standards in Managing Urban Stormwater: Soils and Construction - Volume 2E Mines and Quarries (DECC 2008)

c) describe how the haul roads and access roads will be designed and managed consistent with the guidelines, principles and minimum design standards in Managing Urban Stormwater: Soils and Construction - Volume 2C Unsealed Roads (DECC 2008)

d) provide plan drawings showing the locations of best management practices for the site during all construction/commencement and operational stages

e) include written text detailing the installation, monitoring and maintenance requirements for each of the recommended best management practices for erosion and sediment control

f) include drawings of any engineering structures such as sediment basins and dirty water diversion structures, including design standards and management regimes to return the erosion and sediment control system to design capacity following rainfall events.

g) include design calculations and sizing for all dirty water diversion bunds and sediment basin on site:

h) consider the potential for increasing the size of sediment basins to maximise water reuse and reduce the need for managed overflows or discharge;

i) ensure that unsealed roads are maintained consistent with practices and principles in 'Managing Urban Stormwater - Soils and Construction Volume 2C unsealed roads;

j) ensure that any service installation will be managed consistent with the guidelines, principles and minimum design standards in 'Managing Urban Stormwater - Soils and Construction Volume 2A installation of Services.

O4 Emergency response

O4.1 The licensee must prepare, maintain and implement as necessary a Pollution Incident Response Management Plan ("PIRMP") for the premises. The licensee must keep the PRIMP on the premises at all times. The PIRMP must document systems and procedures to deal with all types of incidents (e.g. spills, explosions or fires) that may occur at the premises, or may be associated with activities that occur at the premises, and which are likely to cause material harm to the environment.

O4.2 The PIRMP must be tested annually at a minimum, or following a pollution incident. If a current emergency response plan does not exist at the date of issue of this licence, the licensee must develop an emergency response plan within 3 months of that date.

Note: The licensee must develop the PIRMP in accordance with the requirements in Part 5.7A of the Protection of the Environment Operations Act 1997 and the Protection of the Environment Operations (General) Regulation 2009.

O5. Bunding Requirements

O5.1 All above ground storages containing flammable and combustible liquids must be bunded in accordance with Australian Standard AS 1940-200.

O7. Noise and Blasting

Blast management protocol

O7.1 A Blasting/Vibration Management Protocol must be prepared in relation to the development and implemented. The protocol must include, but need not be limited to, the following matters:

- compliance standards;
- mitigation measures;
- remedial action;
- monitoring methods and program;
- monitoring program for flyrock distribution;
- measures to protect underground utilities (eg: rising mains, subsurface telecommunication and electric cables) and livestock nearby;
- notification of procedures for neighbours prior to detonation of each blast;
- measures to ensure no damage by flyrock to people, property, livestock and powerlines.

O8. Air

Air Quality Management Plan

O8.1 The proponent must develop and implement an Air Quality Management Plan (AQMP) prior to the commencement of scheduled activities. The AQMP must include the following but not be limited to;

- The AQMP must have key performance indicators, monitoring methods that includes location, frequency and duration of monitoring, record keeping, response mechanisms and compliance reporting.
- The AQMP must provide further evidence to support the conclusion that adverse air quality impacts will not result for the construction and operation of the proposed quarry.
- The AQMP must provide addition information to characterise the existing background air quality near to the proposed Berakee Quarry site.
- The AQMP must provide information regarding the mitigation measures proposed to control dust emissions from all aspects of operations.

The AQMP must be submitted to the EPA prior to the commencement of Scheduled Activities.

O8.2 All operations and activities occurring at the premises must be carried out in manner that will minimise the emission of air pollutants from the premise.

O8.3 The premises must be maintained in such a manner as to prevent and/or minimise the emissions of air pollutants from the premises at all times.

Monitoring and recording conditions

M1 Monitoring records

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

M1.2 All records required to be kept by the licence must be:

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

M1.3 The following records must be kept in respect of any samples required to be collected: the date(s) on which the sample was taken;

- the time(s) at which the sample was collected;
- the point at which the sample was taken; and
- the name of the person who collected the sample.

M2. Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/ discharge point or utilisation area specified below (by a point number), the applicant must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The applicant must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

Water and Land

Monitoring point 1

Pollutant	Units of measure	Frequency	Sampling Method
Total Suspend Solids (TSS)	mg/L	Daily during discharge	Grab sample
Oil and Grease	mg/L	Daily during discharge	Grab sample
pH	mg/L	Daily during discharge	Insitu

M4. Testing methods - concentration limits

M4.1 Monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area required by condition **M2.1** must be done in accordance with:

- the Approved Methods Publication; or
- if there is no methodology required by the Approved Methods Publication or by the general terms of approval or in the licence under the Protection of the Environment Operations Act 1997 in relation to the development or the relevant load calculation protocol, a method approved by the EPA in writing before any tests are conducted,
- unless otherwise expressly provided in the licence.

Meteorological Monitoring

M5.1 The meteorological weather station must be maintained so as to be capable of continuously monitoring the parameters specified in condition M5.2

M5.2 For each monitoring point specified in the table below the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The licensee must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns.

Point 3 - Location to be confirmed in consultation with EPA

Parameter	Units of measure	Frequency	Averaging period	Sampling Method
Air Temperature	°C	Continuous	1 hour	AM-4
Wind Direction	o	Continuous	15 minute	AM-2 & AM-4
Wind speed	m/s	Continuous	15 minute	AM-2 & AM-4
Sigma Theta	o	Continuous	15 minute	AM2 & AM-4
Rainfall	mm	Continuous	15 minute	AM-4
Siting				AM-1

Relative humidity	%	Continuous	1 hour	AM-4

M6 Requirement to Monitor Blasting

M6.1 To determine compliance with blast limits;

a. Air blast overpressure and ground vibration levels must be measured and electronically recorded at the nearest residence or noise sensitive location or for all the parameters in the first column of the table below.

b. The licensee must use the units of measure, sampling method, and sampling frequency specified in the other columns.

Parameter	Units of Measures	Frequency	Sampling Method
Airblast Overpressure	Decibels (linear peak)	Continuous during all blasts	Australian Standards AS2187.2-2002
Ground vibration peak particle velocity	Millimetres/second	Continuous during all blasts	Australian Standard AS2187.2-2006

M7 Telephone complaints line

M7.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M7.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

Reporting conditions

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

Attachment B – Mandatory Conditions for all EPA licences

Administrative conditions

Other activities

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

- Extractive Activities; and
- Crushing Grinding and Separating.

Operating conditions

Activities must be carried out in a competent manner

Licensed activities must be carried out in a competent manner.

This includes:

a. the processing, handling, movement and storage of materials and substances used to carry out the activity; and

b. the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

Maintenance of plant and equipment

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

e. must be maintained in a proper and efficient condition; and

f. must be operated in a proper and efficient manner.

Monitoring and recording conditions

Recording of pollution complaints

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

The record must include details of the following:

- the date and time of the complaint;
- the method by which the complaint was made;
- any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- the nature of the complaint;

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

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

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

Telephone complaints line

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

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

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

Reporting conditions

Annual Return documents

What documents must an Annual Return contain?

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

a. Statement of Compliance; and

b. Monitoring and Complaints Summary.

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

Period covered by Annual Return

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

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

Where this licence is transferred from the licensee to a new licensee,

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

b. the new licensee must prepare an annual return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

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

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

a. in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or

b. in relation to the revocation of the licence – the date from which notice revoking the licence operates.

Deadline for Annual Return

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

Notification where actual load can not be calculated

(Licences with assessable pollutants)
Where the licensee is unable to complete a part of the Annual Return by the due date because the licensee was unable to calculate the actual load of a pollutant due to circumstances beyond the licensee's control, the licensee must notify the EPA in writing as soon as practicable, and in any event not later than the due date.

The notification must specify:

a. the assessable pollutants for which the actual load could not be calculated; and

b. the relevant circumstances that were beyond the control of the licensee.

Licensee must retain copy of Annual Return

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

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

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

a. the licence holder; or

b. by a person approved in writing by the EPA to sign on behalf of the licence holder.

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

Notification of environmental harm

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

Notifications must be made by telephoning the EPA's Pollution Line service on 131 555.

The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Written report

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

a. where this licence applies to premises, an event has occurred at the premises; or

b. where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,

and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

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

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

a. the cause, time and duration of the event;

b. the type, volume and concentration of every pollutant discharged as a result of the event;

c. the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event; and

d. the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;

e. action taken by the licensee in relation to the event, including any follow-up contact with any complainants;

f. details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event;

g. any other relevant matters.

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

General conditions

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

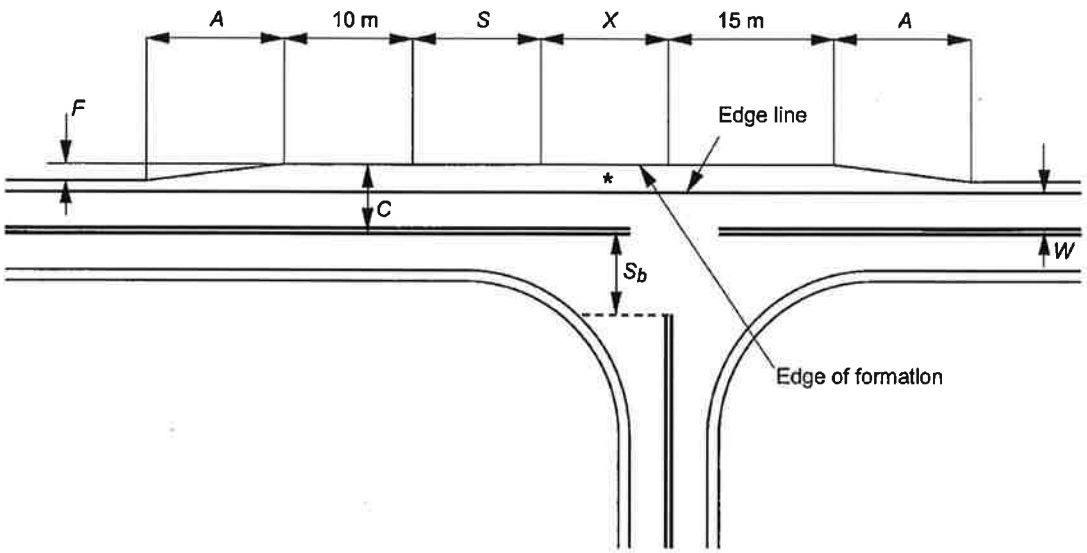
A copy of this licence must be kept at the premises or on the vehicle or mobile plant to which the licence applies.

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

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

Figure A 28: Basic right (BAR) turn treatment on a two-lane rural road

* It is preferred that the widened shoulder is sealed, unless the shoulder can be maintained with a sound and even surface



Notes:

This treatment applies to the right turn from a major road to a minor road.

The dimensions of the treatment are:

W = Nominal through lane width (m) (including widening for curves). Width to be continuous through the intersection.

C = On straights –6.5 m minimum
7.0 m minimum for Type 1 & Type 2 road trains
On curves – widths as above + curve widening (based on widening for the design turning vehicle plus widening for the design through vehicle)

$A = \frac{0.5VF}{3.6}$
Increase length A on tighter curves (e.g. those with a side friction demand greater than the maximum desirable). Where the design through vehicle is larger than or equal to a 19 m semi-trailer the minimum speed used to calculate A is 80 km/h

V = Design speed of major road approach (km/h)

F = Formation/carriageway widening (m)

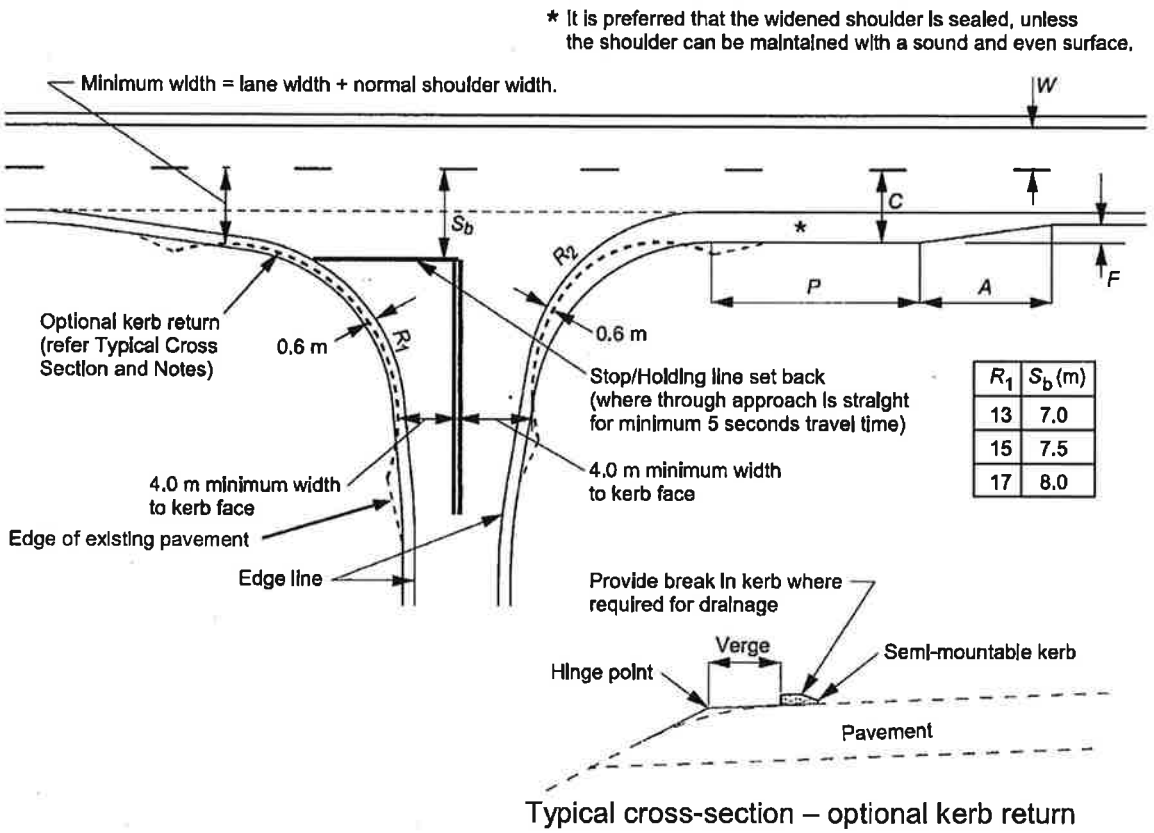
S = Storage length to cater for one design turning vehicle (m) (minimum length 12.5 m)

X = Distance based on design vehicle turning path, typically 10–15 m

Source: Department of Main Roads (2006)[25].

25 Department of Main Roads (2006) has been superseded and Figure A 28 has not been carried forward into Queensland Department of Transport and Main Roads (2016).

Figure 8.2: Rural basic left-turn treatment (BAL)



R_1	S_b (m)
13	7.0
15	7.5
17	8.0

Notes:

- *R_1 and R_2 are determined by the swept path of the design vehicle.*
- *The dimensions of the treatment are defined thus:*

  W = *Nominal through lane width (m) (including widening for curves).*

  C = *On straights – 6.0 m minimum.*

  On curves – 6.0 m plus curve widening (based on widening for the design turning vehicle plus widening for the design through vehicle).

  $A = \frac{0.5VF}{3.6}$

  V = *Design speed of major road approach (km/h).*

  F = *Formation/carriageway widening (m).*

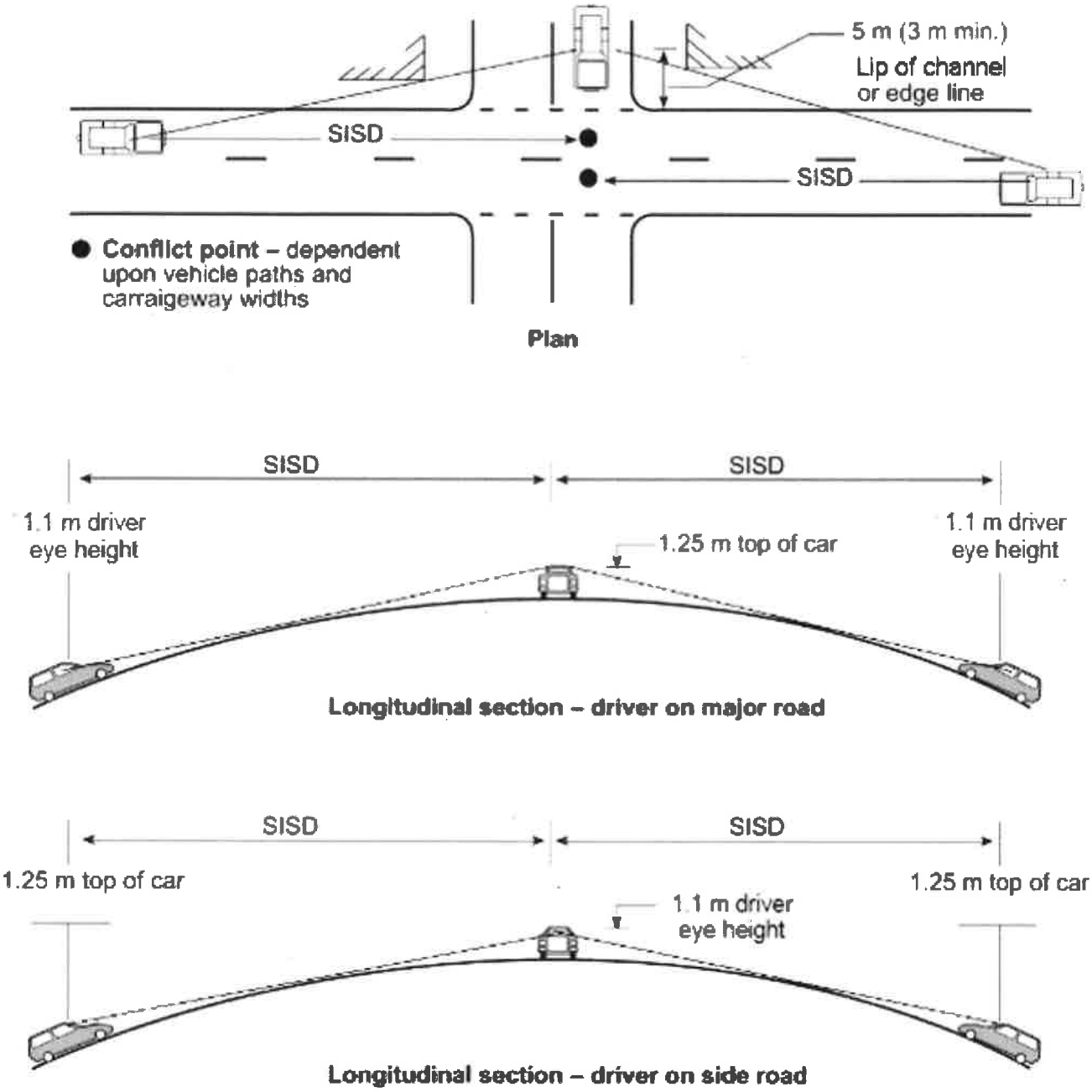
  P = *Minimum length of parallel widened shoulder (Table 8.1).*

  S_b = *Setback distance between the centre of the major road and the give way or stop line in the minor road.*

Source: Department of Main Roads (2006)[35].

35 Department of Main Roads (2006) has been superseded and Figure 8.2 has not been carried forward into Queensland Department of Transport and Main Roads (2016).

Figure 3.2: Safe intersection sight distance (SISD)



Source: Based on Department of Main Roads (2006[6]).

6 Department of Main Roads (2006) has been superseded and Figure 3.2 has not been carried forward into Queensland Department of Transport and Main Roads (2016)

Environment Protection Licence

Licence - 21093

Licence Details	
Number:	21093
Anniversary Date:	13-June

Licensee
REGIONAL HARDROCK (GILGANDRA) PTY LIMITED
PO BOX 4921
DUBBO NSW 2830

Premises
BERAKEE QUARRY
144 OSTLERS LANE
COLLIE NSW 2827

Scheduled Activity
Crushing, grinding or separating
Extractive activities

Fee Based Activity	Scale
Crushing, grinding or separating	> 30000-100000 T annual processing capacity
Land-based extractive activity	> 30000-50000 T annual capacity to extract, process or store

Region
Regional West - Dubbo
Level 1, 48-52 Wingewarra Street DUBBO NSW 2830
Phone: (02) 6883 5333
Fax: (02) 6884 8675
PO Box 2111
DUBBO NSW 2830

Environment Protection Licence

Licence - 21093

INFORMATION ABOUT THIS LICENCE ---- 4

Dictionary ---- 4

Responsibilities of licensee ---- 4

Variation of licence conditions ---- 4

Duration of licence ---- 4

Licence review ---- 4

Fees and annual return to be sent to the EPA ---- 4

Transfer of licence ---- 5

Public register and access to monitoring data ---- 5

1 ADMINISTRATIVE CONDITIONS ---- 6

A1 What the licence authorises and regulates ---- 6

A2 Premises or plant to which this licence applies ---- 6

A3 Information supplied to the EPA ---- 7

A4 Other administrative conditions ---- 7

2 DISCHARGES TO AIR AND WATER AND APPLICATIONS TO LAND ---- 7

P1 Location of monitoring/discharge points and areas ---- 7

3 LIMIT CONDITIONS ---- 8

L1 Pollution of waters ---- 8

L2 Concentration limits ---- 8

L3 Waste ---- 9

L4 Noise limits ---- 9

L5 Blasting ---- 11

L6 Hours of operation ---- 12

4 OPERATING CONDITIONS ---- 12

O1 Activities must be carried out in a competent manner ---- 12

O2 Maintenance of plant and equipment ---- 12

O3 Dust ---- 13

O4 Other operating conditions ---- 13

5 MONITORING AND RECORDING CONDITIONS ---- 14

M1 Monitoring records ---- 14

M2 Requirement to monitor concentration of pollutants discharged ---- 14

M3 Testing methods - concentration limits ---- 14

M4 Recording of pollution complaints ---- 15

M5 Telephone complaints line ---- 15

Environment Protection Licence

Licence - 21093

M6 Blasting ---------- 15
6 REPORTING CONDITIONS ---------- 16
R1 Annual return documents ---------- 16
R2 Notification of environmental harm ---------- 17
R3 Written report ---------- 17
7 GENERAL CONDITIONS ---------- 18
G1 Copy of licence kept at the premises or plant ---------- 18
DICTIONARY ---------- 19
General Dictionary ---------- 19

Environment Protection Licence

Licence - 21093

Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

Environment Protection Licence

Licence - 21093

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

REGIONAL HARDROCK (GILGANDRA) PTY LIMITED
PO BOX 4921
DUBBO NSW 2830

subject to the conditions which follow.

Environment Protection Licence

Licence - 21093

1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled development work listed below at the premises listed in A2:
Initial site works includes on-site earthworks and construction in preparation for the commencement of scheduled activities as approved by Gilgandra Shire Council on 29 January 2018 (DA2017/218).

A1.2 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Crushing, grinding or separating	Crushing, grinding or separating	> 30000 - 100000 T annual processing capacity
Extractive activities	Land-based extractive activity	> 30000 - 50000 T annual capacity to extract, process or store

A1.3 Not with standing A1.2, the scale of the land-based extractive activity authorised under this licence must not exceed 80000 tonnes per annum, being the amount equivalent to the extraction limit approved by the development consent granted under the *Environmental Planning and Assessment Act 1979* for the premises specified in A2.

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
BERAKEE QUARRY
144 OSTLERS LANE
COLLIE
NSW 2827
LOT 45 DP 752563

Environment Protection Licence

A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

A4 Other administrative conditions

A4.1 The applicant must, in the opinion of the EPA, be fit and proper person to hold a licence under the Protection of the Environment Operations Act 1997, having regard to the matters in s.83 of that Act.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

P1.2 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Sediment basin	Sediment basin	Sediment basin 1 discharge point ("SB-1") as depicted in Figure 5. Surface water monitoring point submitted to the EPA on 3 April 2018 (EPA Reference: DOC18/233198).

Note: The monitoring requirements may be modified by the EPA subject to ongoing review of the licence conditions and monitoring results.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

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

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

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

L2.4 Water and/or Land Concentration Limits

POINT 1

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Oil and Grease	milligrams per litre				<10
pH	pH				6.5-8.5
TSS	milligrams per litre				<50

L2.5 The limits specified under Condition L2.4 for the sediment pond identified as EPA licence discharge point 1 do not apply when the discharge occurs solely as a result of a rainfall event measured at the premises which exceeds;

- a total of 50 millimetres of rainfall over any consecutive 5 day period.

Note: A 50 mm rainfall depth is defined by the publication Managing Urban Stormwater: Soils and Construction (Landcom, 4th Edition, July 2006) as the rainfall depth in millimetres for a 95th percentile 5 day rainfall event for the 'Central Tablelands and Central Western Slopes' (Dubbo) consistent with the storage capacity (recommended minimum design criteria) for Type D sediment retention basins as described in Managing Urban Stormwater Volume 2E: Mines and Quarries (DECC 2008).

L2.6 The concentration limit for total suspended solids stipulated by condition L2.4 for EPA identification point 1 is deemed not to have been breached where:

a) the water discharged is covered by condition L2.5; or

b) when not covered by condition L2.5, the water discharged (in accordance with licence conditions O4.4 and O4.5) is within the pH range 6.5-8.5 and has a turbidity of no more than 40 NTU at the time of the discharge; and

c) the EPA is advised within 3 working days of the completion of the sample testing and analysis as required by condition M2.2 of any results above the licence limit.

Note: The purpose of condition L2.6 is to expediate the assessment and subsequent discharge of the clarified water from the stormwater control structures (sediment ponds).

L3 Waste

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

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

L4 Noise limits

L4.1 Noise generated from the premises must not exceed the noise limits in the table below:

Locality or location	Day LAeq(15 min)	Evening LAeq(15min)	Night LA1(1min)
Any residence, school or public building not associated with the premises	35 dB(A)	35 dB(A)	45 dB(A)

Note: For the purposes of the table above:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays:
b) Evening is defined as the period from 6pm to 10pm;
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 1pm to 8am Sunday and Public Holidays.
d) LAeq(15 minute) is defined as the continuous 'A' weighted sound pressure level-the energy average of the noise measured over a 15 minute period.

e) LA1(1 minute) is defined as the sound pressure level exceeded for one percent of a 1 minute measurement period.

L4.2 The noise limits set out in condition L4.1 apply under all meteorological conditions except for any one of the following:
a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
b) Stability category G conditions and wind speeds greater than 2 metres/second at 10 metres above ground level;

L4.3 For the purposes of condition L4.2:
a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather stations identified in the Air Quality Management Plan dated March 2018.
b) Temperature inversion must be assessed by use of the sigma-theta process as outlined in Appendix E4 of the NSW Industrial Noise Policy (INP).

L4.4 For the purposes of determining the noise generated at the premises Class 1 or 2 noise monitoring equipment as defined by AS IEC61672.1-2004 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing, must be used.

L4.5 To determine compliance:
a) With the LAeq (15 minute) noise limits in condition L4.1, the noise monitoring equipment must be located:

- within 30 meters of a dwelling façade but not closer that 3 meters where any dwelling on the property is situated more than 30 meters from the property boundary that is closest to the premises;
- approximately on the boundary where any dwelling is situated 30 meters or less from the property boundary that is closest to the premises;
- within approximately 50 meters of the boundary of a National Park or a Nature Reserve.

b) With the LA1 (1 minute) noise limit in Condition L4.1; the noise monitoring equipment must be located within 1 meter of the dwelling façade.

c) The noise monitoring equipment must be located in a position that is;

- at the most affected point at a location where there is no dwelling at the location; or
- at the most affected point within an area at a location prescribed by conditions L4.5(a) or 4.5(b).

L4.6 A breach of this Environment Protection Licence will still occur where noise generated from the premises in excess of the appropriate limit specified in the condition L4.1 is detected:

- at a location other than an area prescribed by Conditions L4.5(a) or L4.5(b); and/or
- at a point other than the most affected point at a location.

L4.7 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L5 Blasting

Airblast Overpressure Level

L5.1 The airblast overpressure level from blasting operations at the premises must not exceed 120dB (Lin Peak) at any time at the blast monitoring location on Lewis Lane or any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining wether or not the limit has been exceeded.

L5.2 The airblast overpressure level from blasting operations at the premises must not exceed 115dB (Lin Peak) at the blast monitoring location on Lewis Lane or any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining wether or not the limit has been exceeded.

Ground Vibration (ppv)

L5.3 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10mm/sec at the blast monitoring location on Lewis Lane or any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L5.4 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5mm/sec at the blast monitoring location on Lewis Lane or any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

Note: "Noise sensitive locations" includes buildings used as residence, hospital, school, child care centre, places of public worship and nursing homes. A noise sensitive location includes the land within 30 meters of the building.

Time of blasting

L5.5 Blasting at the premises may only take place between 9:00am-5:00pm Monday to Friday. Blasting is not permitted on Saturday, Sunday or public holidays.

L5.6 Blasting outside of the hours specified in L5.5 can only take place with the written approval of the EPA.

Frequency of blasting

L5.7 Blasting at the premises is limited to 1 blast each day on which blasting is permitted.

Blast monitoring

L5.8 To determine compliance with conditions L5.1 to L5.4:
a) Airblast overpressure and ground vibration levels experienced at the blast monitoring on Lewis Lane

must be measured and recorded for all blasts carried out on the premises;
b) Instrumentation used to measure and record the airblast overpressure and ground vibration levels must meet the requirements of Australian Standard AS 2187.2-2006.

Note: A breach of the licence will still occur where airblast overpressure or ground vibration levels from the blasting operations at the premises exceeds the limit specified in conditions L5.1 to L5.4 at any "noise sensitive locations" other than the locations identified in the above condition

L6 Hours of operation

L6.1 All construction work at the premises must only be conducted between 7am to 6pm Monday to Friday and 7am to 4pm Saturday.

L6.2 Activities at the premises, other than construction work, may only be carried on between 7am to 6pm Monday to Friday and 7am to 4pm Saturday.

L6.3 Activities are not permitted to be undertaken on Sundays or Public holidays.

L6.4 This condition does not apply to the delivery of material outside the hours of operation permitted by condition L6.1 or L6.2, if that delivery is required by police or other authorities for safety reasons; and/or the operation or personnel or equipment are endangered. In such circumstances, prior notification is to be provided to the EPA and affected residents as soon as possible, or within a reasonable period in the case of emergency.

L6.5 The hours of operation specified in conditions L6.1 and L6.2 may be varied with written consent if the EPA is satisfied that the amenity of the residents in the locality will not be adversely affected.

L6.6 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:

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

O3 Dust

O3.1 Activities occurring at the premises must be carried out in a manner that will minimise emissions of dust from the premises.

O3.2 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

O3.3 Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading.

O3.4 All dust control equipment must be operable at all times with exception of shutdowns required for maintenance.

O4 Other operating conditions

Odour

O4.1 The licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.

Note: The POEO Act states that no offensive odour may be emitted from particular premises unless potentially offensive odours are identified in the licence and the odours are emitted in accordance with conditions specifically directed at minimising the odours are permitted.

O4.2 No condition of this licence identifies a potentially offensive odour for the purposes of Section 129 of the Protection of the Environment Operations Act 1997.

Bunding Requirements

O4.3 All above ground storages containing flammable and combustible liquids must be bunded in accordance with Australian Standard AS 1940-200.

Management of sediment ponds

O4.4 The sediment pond identified as EPA identification number 1 (licence discharge point 1) under condition P1.2 must be drained or pumped out within five (5) days following rainfall in order to maintain the design storage capacity of the basin.

O4.5 Water discharged to comply with condition O4.4 may only be discharged from sediment ponds via licence discharge point 1 where the water complies with the discharge limits specified under condition L2.4 for licence discharge point 1.

O4.6 The licensee must undertake maintenance to desilt all sediment ponds to retain their design storage

capacities.

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Water and/ or Land Monitoring Requirements

POINT 1

Pollutant	Units of measure	Frequency	Sampling Method
Oil and Grease	milligrams per litre	Daily during any discharge	Grab sample
pH	pH	Daily during any discharge	In situ
Total suspended solids	milligrams per litre	Daily during any discharge	Grab sample

M3 Testing methods - concentration limits

Environment Protection Licence

M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Recording of pollution complaints

M4.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M4.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M4.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M4.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M5 Telephone complaints line

M5.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M5.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M5.3 The preceding two conditions do not apply until - the date of the issue of this licence.

M6 Blasting

M6.1 To determine compliance with blast limits Air blast overpressure and ground vibration levels must be measured and electronically recorded at the nearest residence or noise sensitive location or for all the parameters in the first column of the table below.

Parameter	Units of Measures	Frequency	Sampling Method

Airblast Overpressure	Decibels (linear peak)	Continuous during all blasts	Australian Standards AS2187.2-2002
Ground vibration peak particle velocity	Millimeters/second	Continuous during all blasts	Australian Standard AS2187.2-2006

6 Reporting Conditions

R1 Annual return documents

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

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

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

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

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

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

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

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

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

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

R1.7 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not

satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

7 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

Environment Protection Licence

Licence - 21093

Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 21093

flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.

Environment Protection Licence

Licence - 21093

TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non-putrescible), special waste or hazardous waste

Mr Bradley Tanswell

Environment Protection Authority

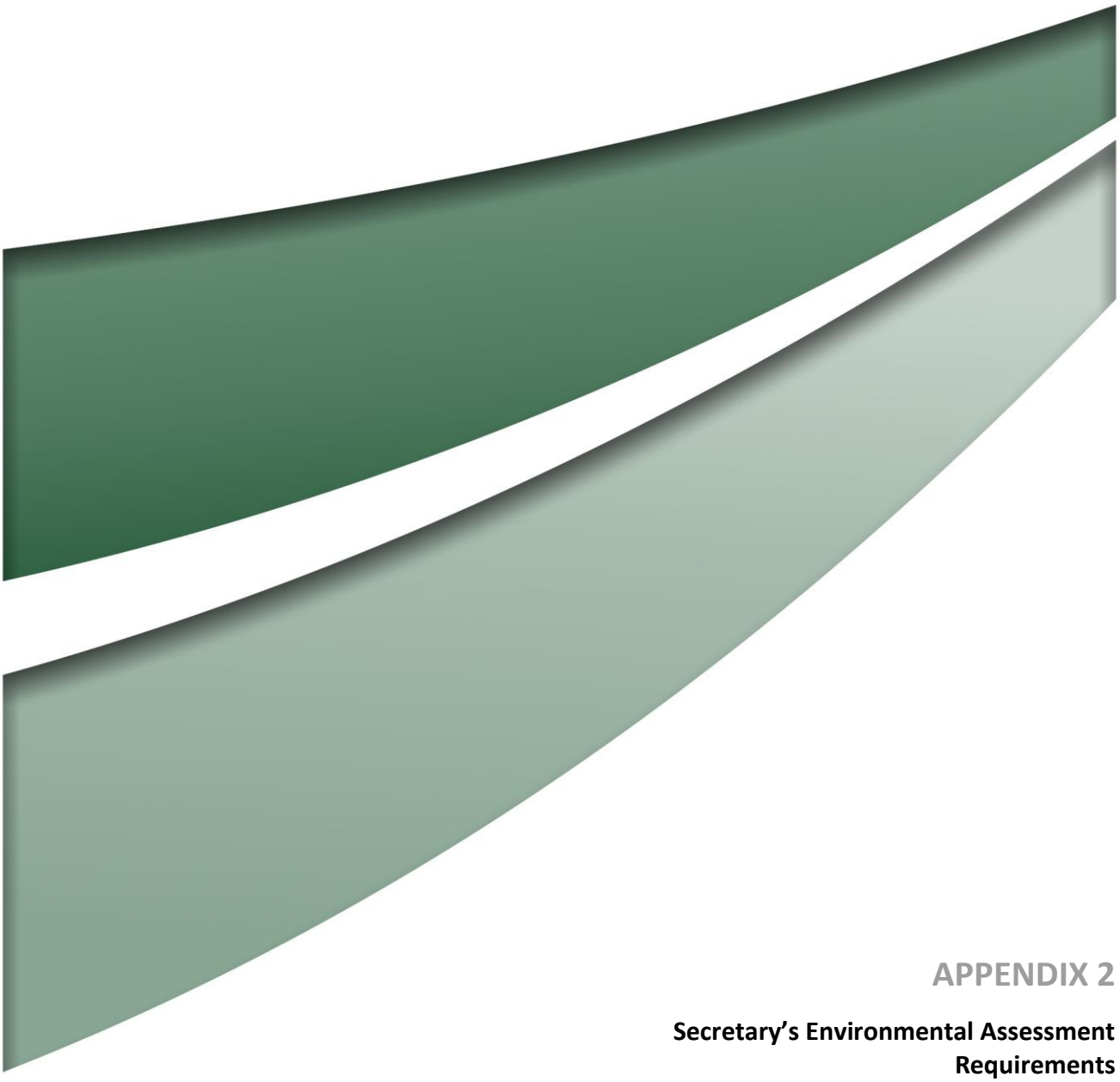
(By Delegation)

Date of this edition: 13-June-2018

End Notes

2 Licence format updated on 07-May-2019

3 Licence transferred through application 1599290 approved on 17-Nov-2020 , which came into effect on 07-Nov-2020



APPENDIX 2

Secretary's Environmental Assessment Requirements

Planning and Assessments
Energy and Resource Assessments
Contact: Melissa Anderson
Phone: 8275 1392
Email: Melissa.Anderson@planning.nsw.gov.au

Mr Jon Novoselac
Environmental Consultant
Umwelt (Australia) Pty Ltd
Office 1, 3 Hampden Avenue
ORANGE NSW 2830
By Email: jnovoselac@umwelt.com.au

Dear Mr Novoselac

Planning Secretary's Environmental Assessment Requirements
Berakee Quarry (EAR 1488)

I refer to your request for the Planning Secretary's Environmental Assessment Requirements (EARs) for the above development, which is designated local development under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Please find attached a copy of the EARs for the Environmental Impact Statement (EIS) for the proposed development. These requirements have been prepared in consultation with relevant government agencies based on the information your company has provided to date. The agencies' comments are attached for your information (see Attachment 2). You must have regard to these comments in the preparation of the EIS.

In your request for EARs, you have also indicated that the proposal is classified as integrated development under section 4.46 of the EP&A Act as it requires additional statutory authorisations. You are encouraged to consult with the relevant agencies with respect to licence/approval requirements. If further integrated approvals are required, you must undertake your own consultation with the relevant public authorities and address their requirements in the EIS.

The Department wishes to emphasise the importance of effective and genuine community consultation during the preparation of the EIS. This process should provide the community with a clear understanding of the proposal and its potential impacts and include active engagement with the community regarding key issues of concern. The development application (DA) for the proposed development must be accompanied by clear evidence of the consent to the lodgement of the DA of all owners of land directly subject to the DA.

Please contact the consent authority at least two weeks before you propose to submit your DA. This will enable the consent authority to:

- confirm the applicable fees; and
- determine the number of copies (hard-copy and digital) of the EIS that will be required for reviewing purposes.

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will also require separate approval under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Commonwealth Department of Agriculture, Water and the Environment to determine if an approval under the EPBC Act is required (http://www.environment.gov.au or 6274 111).

You should contact the Mine Safety branch of the NSW Resources Regulator in regard to this and other matters relating to compliance with the *Work Health and Safety (Mines and Petroleum Sites) Act 2013.*

If you have any enquiries about these requirements, please contact Melissa Anderson on the details above.

Yours sincerely

Matthew Sprott
Director
Resource Assessments
as delegate for the Planning Secretary

Planning Secretary's Environmental Assessment Requirements

Section 4.12(8) of the *Environmental Planning and Assessment Act 1979* and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.*

Designated Development

EAR Number	EAR 1488
Proposal	Extraction and processing of up to 4.7 million tonnes of hard rock, up to a maximum of 120,000 tonnes per annum over a 30 year period.
Location	"Berakee", Oxley Highway, Collie NSW 2827 (Lot 1 DP 1265657)
Applicant	Regional Hardrock Gilgandra Unit Trust
Date of Issue	24 December 2020
Date of Expiry	24 December 2022
General Requirements	The Environmental Impact Statement (EIS) for the development must comply with the requirements in Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* In particular, the EIS must include: • an executive summary; • a comprehensive description of the development, including: - a detailed site description and history of any previous quarrying on the site, including a current survey plan; - identification of the resource, including the amount, type, composition; - the layout of the proposed works and components (including any existing infrastructure that would be used for the development); - an assessment of the potential impacts of the development, as well as any cumulative impacts, including the measures that would be used to minimise, manage or offset these impacts; - a detailed rehabilitation plan for the site; - any likely interactions between the development and any existing/approved developments and land uses in the area, paying particular attention to potential land use conflicts with nearby residential development; - a list of any other approvals that must be obtained before the development may commence; - the permissibility of the development, including identification of the land use zoning of the site; - identification of sensitive receivers likely to be affected by the development using clear maps/plans, including key landform areas, such as conservation areas and waterways; • a suitable monitoring and reporting procedure to ensure that the total resource extracted by the development does not exceed 5 million tonnes; • a conclusion justifying why the development should be approved, taking into consideration: - alternatives; - the suitability of the site; - the biophysical, economic and social impacts of the project, having regard to the principles of ecologically sustainable development; and - whether the project is consistent with the objects of the *Environmental Planning and Assessment Act 1979*; and • a signed declaration from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.
Consultation	In preparing the EIS for the development, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers and any surrounding landowners that may be impacted by the development. The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.
Key Issues	The EIS must assess the potential impacts of the proposal at all stages of the development, including the establishment, operation and decommissioning of the development.

The EIS must address the following specific issues:

- **Noise** – including a quantitative assessment of potential:
  - construction and operational noise and off-site transport noise impacts of the development in accordance with the *Interim Construction Noise Guideline, NSW Noise Policy for Industry and NSW Road Noise Policy* respectively;
  - reasonable and feasible mitigation measures to minimise noise emissions; and
  - monitoring and management measures;
- **Blasting & Vibration** –
  - proposed hours, frequency, methods and impacts; and
  - an assessment of the likely blasting and vibration impacts of the development, having regard to the relevant ANZEC guidelines and paying particular attention to impacts on people, buildings, livestock, infrastructure and significant natural features;
- **Air** – including an assessment of the likely air quality impacts of the development in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*. The assessment is to give particular attention to potential dust impacts on any nearby private receivers due to construction activities, the operation of the quarry and/or road haulage;
- **Water** – including:
  - a detailed site water balance and an assessment of any volumetric water licensing requirements, 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 required 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 Water Sharing Plan or water source embargo;
  - an assessment of activities that could cause erosion or sedimentation issues, and the proposed measures to prevent or control these impacts;
  - an assessment of any likely flooding impacts of the development;
  - an assessment of potential 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; and
  - a detailed description of the proposed water management system, water monitoring program and other measures to mitigate surface and groundwater impacts;
- **Biodiversity** – including:
  - accurate predictions of any vegetation clearing on site;
  - a detailed assessment of the potential biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems undertaken in accordance with Sections 7.2 and 7.7 of the *Biodiversity Conservation Act 2016*; and
  - a detailed description of the proposed measures to maintain or improve the biodiversity values of the site in the medium to long term, as relevant.
- **Heritage** – including:
  - an assessment of the potential impacts on Aboriginal heritage (cultural and archaeological), including evidence of appropriate consultation with relevant Aboriginal communities/parties and documentation of the views of these stakeholders regarding the likely impact of the development on their cultural heritage; and
  - identification of Historic heritage in the vicinity of the development and an assessment of the likelihood and significance of impacts on heritage items, having regard to the relevant policies and guidelines listed in Attachment 1;
- **Traffic &Transport** – including:
  - accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for transportation of quarry products;
  - an assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road networks, detailing the nature of the traffic generated, transport routes, traffic volumes and potential impacts on local and regional roads;
  - an assessment of cumulative traffic impacts on local and State road networks;
  - a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network (particularly the proposed transport routes) over the life of the development;
  - evidence of any consultation with relevant roads authorities, regarding the establishment of agreed contributions towards road upgrades or maintenance; and
  - a description of access roads, specifically in relation to nearby Crown roads and fire trails;

	• **Land Resources**– including an assessment of: - potential impacts on soils and land capability (including potential erosion and land contamination) and the proposed mitigation, management and remedial measures (as appropriate); - potential impacts on landforms (topography), paying particular attention to the long-term geotechnical stability of any new landforms (such as overburden dumps, bunds etc); and - the compatibility of the development with other land uses in the vicinity of the development, in accordance with the requirements of Clause 12 of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*; • **Waste** – including estimates of the quantity and nature of the waste streams that would be generated or received by the development and any measures that would be implemented to minimise, manage or dispose of these waste streams; • **Hazards** – including an assessment of the likely risks to public safety, paying particular attention to potential bushfire risks and the transport, storage, handling and use of any hazardous or dangerous goods; • **Visual** – including an assessment of the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, including with respect to any new landforms; • **Social & Economic** – an assessment of the likely social and economic impacts of the development, including consideration of both the significance of the resource and the costs and benefits of the project; and • **Rehabilitation** – including: - 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; and - the measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy, recognising that a rehabilitation bond will likely be required as a condition of any future development consent.
Environmental Planning Instruments	The EIS must take into account all relevant State Government environmental planning instruments, guidelines, policies, and plans. While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies and plans that may be relevant to the environmental assessment of this development. During the preparation of the EIS you must also consult the Department's EIS Guideline – Extractive Industries – Quarries. This guideline is available at http://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/extractive-industries-quarries-eis-guideline-1996-10.ashx. In addition, the EIS must assess the development against the Gilgandra Local Environmental Plan and any relevant development control plans/strategies.

ATTACHMENT 1

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:
http://www.planning.nsw.gov.au
http://www.bookshop.nsw.gov.au
http://www.publications.gov.au

Environmental Planning Instruments, Policies, Guidelines & Plans

Environmental Planning Instruments - General	
	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
	State Environmental Planning Policy (State and Regional Development) 2011
	State Environmental Planning Policy (Infrastructure) 2007
	Gilgandra Local Environmental Plan 2011
Risk Assessment	
	AS/NZS 4360:2004 Risk Management (Standards Australia)
	HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)
Land	
	State Environmental Planning Policy No. 55 – Remediation of Land
	Agricultural Land Classification (DPI)
	Rural Land Capability Mapping (OEH)
	Soil and Landscape Issues in Environmental Impact Assessment (NOW)
	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC)
	Guidelines for Consultants Reporting on Contaminated Sites (EPA)
	Agricultural Issues for Extractive Industry Development (DPI)
Water	
Groundwater	NSW Aquifer Interference Policy 2012 (NOW)
	NSW State Groundwater Policy Framework Document (NOW)
	NSW State Groundwater Quality Protection Policy (NOW)
	NSW State Groundwater Quantity Management Policy (NOW)
	Australian Groundwater Modelling Guidelines 2012 (Commonwealth)
	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	Guidelines for the Assessment & Management of Groundwater Contamination (EPA)
Surface Water	NSW State Rivers and Estuary Policy (NOW)
	NSW Government Water Quality and River Flow Objectives (EPA)
	Using the ANZECC Guideline and Water Quality Objectives in NSW (EPA)
	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (EPA)
	Managing Urban Stormwater: Soils & Construction (Landcom) and associated Volume 2E: Mines and Quarries (DECC)
	Managing Urban Stormwater: Treatment Techniques (EPA)
	Managing Urban Stormwater: Source Control (EPA)
	Technical Guidelines: Bunding & Spill Management (EPA)
	A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)
	NSW Guidelines for Controlled Activities (NOW)
	Guidelines for Controlled Activities on Waterfront Land 2018 (NRAR)**(Waterfront land only)**
Flooding	Floodplain Development Manual (OEH)
	Floodplain Risk Management Guideline (OEH)
Biodiversity	

	Biodiversity Assessment Method (OEH 2017)
	Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH 2017)
	Ancillary rules: Biodiversity conservation actions
	Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying variation rules
	NSW Guide to Surveying Threatened Plants (OEH 2016)
	Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECC 2009)
	Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004)
	Threatened Species Assessment Guideline – The Assessment of Significance (DECC 2007)
	OEH principles for the use of biodiversity offsets in NSW
	NSW State Groundwater Dependent Ecosystem Policy (NOW)
Heritage	
	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
	Guide to investigation, assessing and reporting on Aboriginal cultural heritage in NSW (OEH) 2011
	Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH)
	Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (OEH)
	Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (OEH)
	NSW Heritage Manual (OEH)
	Statements of Heritage Impact (OEH)
Noise & Blasting	
	NSW Noise Policy for Industry (EPA)
	Interim Construction Noise Guideline (EPA)
	NSW Road Noise Policy (EPA)
	Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC)
Air	
	Protection of the Environment Operations (Clean Air) Regulation 2002
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA)
	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (EPA)
	Assessment and Management of Odour from Stationary Sources in NSW (DEC)
	National Greenhouse Accounts Factors (Commonwealth)
Transport	
	Guide to Traffic Generating Development (RTA)
	Road Design Guide (RMS) & relevant Austroads Standards
Hazards	
	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
	Hazardous and Offensive Development Application Guidelines – Applying SEPP 33
	Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis
	Planning for Bushfire Protection 2019 (RFS)
Resource	
	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (JORC)
Waste	
	Waste Classification Guidelines (EPA)
	Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes 1999 (EPA)
Rehabilitation	
	Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth)
	Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth)
	Strategic Framework for Mine Closure (ANZMEC-MCA)

ATTACHMENT 2

AGENCIES' CORRESPONDENCE

GILGANDRA SHIRE COUNCIL
Live > Enjoy > Grow

> 15 Warren Road, Gilgandra 2827
> PO Box 23, Gilgandra NSW 2827
> P 02 6817 8800
> council@gilgandra.nsw.gov.au
www.gilgandra.nsw.gov.au

A3255: LM

Contact: Lindsay Mathieson

14 September 2020

Melissa Anderson
Environmental Assessment Officer
Energy, Resources & Compliance | Planning and Assessment
4 Parramatta Square, 12 Darcy St, Parramatta, NSW 2150

Dear Ms Anderson

Basalt Quarry - Lot 1 DP 1265657, Oxley Hwy, Collie

Thank you for your email of 3 September 2020 consulting with Council pursuant to Schedule 2 of the Environmental Planning and Assessment Regulation 2000, in relation to Council requirements for the EIS for this development. Council offers the following comments:

The existing approval for a quarry on this site is limited to a maximum disturbance area of 2 hectares including only 1.5 hectares at the quarry site itself and the balance in roads, etc. In the Preliminary Environmental Assessment (PEA) a scaled air photo shows a disturbance area that appears to exceed this approved area. Any assessment of the site now proposed for a larger quarry should not assume that any disturbance (including land clearing) beyond 2 hectares is approved. Land disturbed by quarry activities beyond 2 ha should be assessed in the EIS as not being currently disturbed unless lawful disturbance can be demonstrated.

Traffic and its impacts around the site and on local and regional networks is a key issue with a quarry of this size. Council has invested considerable time and resources into assisting the previous quarry owner achieve a private haulage route to the Oxley Highway that allows heavy vehicles to avoid Ostlers Lane and the Berrida-Innisfail Road. The Preliminary Environmental Assessment (PEA) states that there will be *"No change to Quarry access arrangements proposed, i.e. principal access via the private haulage route to the Oxley Highway with the potential to use Ostlers Lane and Berida-Innisfail Road subject to road upgrades"*. Council disputes this statement as the ability to use Ostlers Lane and Berida- Innisfail Road has expired and was restricted to trucks carrying less than 32 tonnes of material in any case.

It should not be assumed that Council will support vehicles greater than 36.5m accessing the Oxley Highway. Council will expect that the private haulage road will be made all weather to avoid tracking mud onto the Oxley Highway and to ensure public roads are not used in wet weather. A Traffic Management Plan should be included in the EIS.

A sediment and erosion plan for the quarry, material storage areas and the private haulage route should be included in the EIS.

The subject land is substantially mapped in Gilgandra LEP 2011 as an area of "Biodiversity Sensitivity" on the Sensitivity Biodiversity Map.

The EIS will need to provide sufficient information to allow Council to address the following LEP clause:

7.1 Biodiversity protection

(1) The objective of this clause is to maintain terrestrial and aquatic biodiversity, including the following—

(a) protecting native fauna and flora,

(b) protecting the ecological processes necessary for their continued existence,

(c) encouraging the recovery of native fauna and flora and their habitats.

(2) This clause applies to land identified as "Biodiversity Sensitivity" on the Sensitivity Biodiversity Map.

(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider any adverse impact of the proposed development on the following—

(a) native ecological communities,

(b) the habitat of any threatened species, populations or ecological community,

(c) regionally significant species of fauna and flora or habitat,

(d) habitat elements providing connectivity.

(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—

(a) the development is designed, sited and will be managed to avoid any adverse environmental impact, or

(b) if that impact cannot be avoided—the development is designed, sited and will be managed to minimise that impact, or

(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

It is noted that page 11 of the PEA states that *"the vegetation on site is unlikely to be consistent with Poplar Box Grassy Woodland on Alluvial Plains EEC as the native perennial ground layer present does not constitute 50% or greater of the total ground layer, as specified in the Environment Protection and Biodiversity Conservation Act 1999 listing criteria (DoEE 2019)."* The work undertaken in 2017 stated that:

Native flora

The ground cover of the study area was generally high (more than 90 percent density on any given one metre square area) (**Plate 3-1**), except for where agricultural blasting has occurred (**Plate 3-2**). Ground stratum species consisted mainly of two native grasses, Knotty Spear Grass (*Austrostipa nodosa*) and Rough Spear Grass (*Austrostipa scabra*), with small patches of weeds consisting mainly of White Horehound (*Marrubium vulgare*) and Paterson's Curse (*Echium plantagineum*). There were no mid-stratum species. Poplar Box and White Cypress Pine were the only upper stratum species present.

Threatened species

No threatened flora species were recorded or deemed likely to be present and not recorded.

Priority weeds

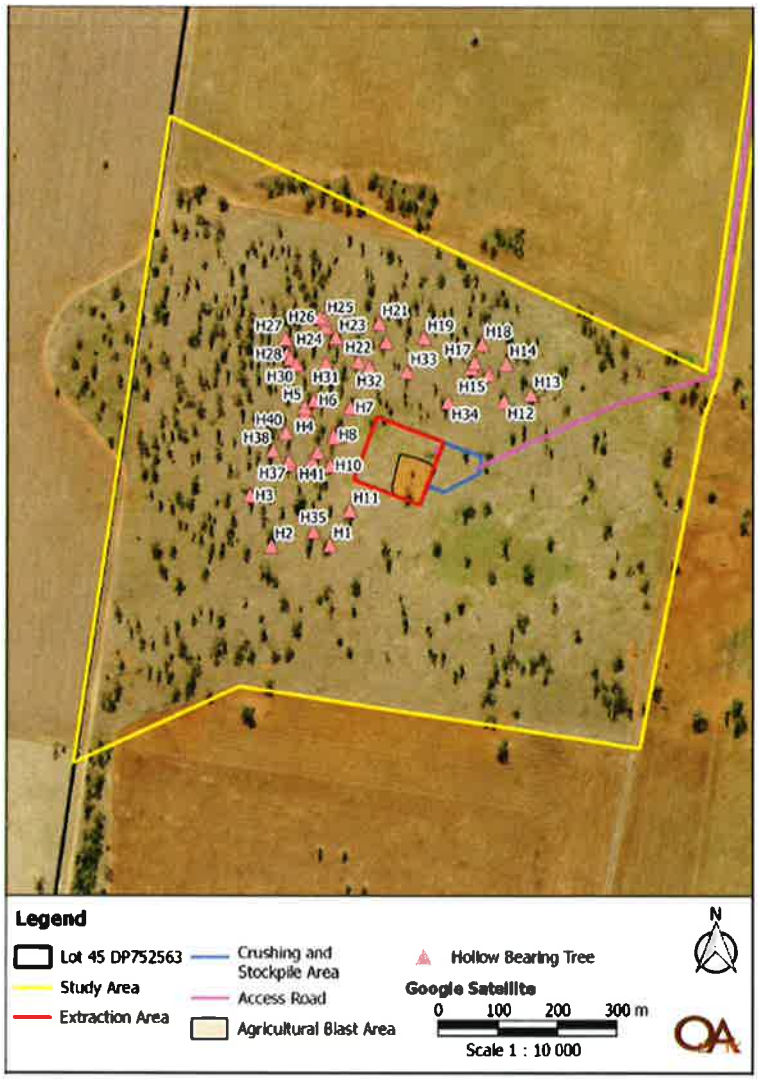
No priority weeds or Weeds of National Significance were recorded in the subject site.

The EIS will need to explain these differences in native vegetation assessment and clearly describe the current vegetation communities and the impact of the proposed quarry on them.

It is also noted that in 2017 the woodland on the site was assessed and the report concluded that *"it contained an abundance of hollows with 80% of inspected Poplar*

Box trees containing a hollow". The ecological impact of losing tree hollows and what can be done to offset any impact needs to be addressed in the EIS.

Figure 3-6: Location of hollow bearing trees within adjacent to the subject site



In relation to NSW *Biodiversity Conservation Act 2016* (BC Act), it is noted that a 25ha estimated disturbance area and 8.5ha extraction area exceeds the 1ha Biodiversity Offset Scheme (BOS) threshold and triggers the Biodiversity Assessment Method (BAM) and Biodiversity Assessment Requirements (BAR). Council will expect biodiversity to be addressed comprehensively with appropriate offsets to unavoidable impacts addressed in the EIS. This assessment will need to include work on the private haulage route.

Although this site has a limited number of private dwellings in close proximity the impacts of dust, noise, vibration and blasting will need to be assessed specifically to this site and not solely by reference to other similar sites. Data collected from blasting and crushing operations conducted on this site in relation to the existing quarry approval should be included.

The EIS should address site facilities including toilets, drinking and hand washing water and wastewater disposal at the site that meets Council requirements.

An assessment of bushfire hazard and risk is expected and storage of water for

firefighting should also be addressed in the EIS.

The applicant should also be aware that the land is subject to the Siding Spring Observatory—maintaining dark sky provisions in Gilgandra LEP 2011. This will need to be addressed in the EIS.

Council will expect a comprehensive Aboriginal archaeological assessment of the subject land by a suitably qualified person including consultation with the relevant LALC.

Council will expect a clear plan and timetable for site rehabilitation including milestones for rehabilitation within the first five years and then over the life of the quarry to avoid problems in the long term once the resource has been exhausted.

A community and stakeholder engagement report including direct consultation with property owners within 1km of the quarry site and wider community views and feedback.

This response is not intended to be exhaustive and Council assumes that the EIS will address the form and content requirements of all relevant legislation and the requirements of other agencies.

Should you require any further information, please do not hesitate me at Council during business hours on 02 68178800.

Yours faithfully

L M Mathieson

Lindsay Mathieson
Director Planning & Environment

Our ref: DOC20/752538-3
Senders ref: EAR 1488

Ms Melissa Anderson
Environmental Assessment Officer
Planning and Assessment Group
Melissa.anderson@planning.nsw.gov.au

Dear Melissa,

Subject: Environmental Assessment Requirements (EAR) 1488 – Berakee Quarry Expansion Project

I refer to your email dated 3 September 2020 to the Biodiversity and Conservation Division (BCD) seeking input into the Department of Planning, Industry and Environment's Environmental Assessment Requirements (EARs) for the preparation of an Environmental Impact Assessment (EIS) for Berakee Quarry Expansion – Collie project.

BCD understands that the proposal involves the expansion of the current quarry. The quarry is currently limited to a disturbance footprint of 2ha and an annual production of up to 80,000 tonnes per annum. The expansion proposal indicates that the footprint of the quarry will be up to 25ha, and that the annual production in the first five years of production will be up to 490,000 tonnes per annum. The life of the quarry will also be extended from 8-12 years to 30 years.

BCD has considered your request and provides standard EARs for the proposed development in **Attachments A** and **B**.

BCD recommends the EIS needs to appropriately address the following:

1. Biodiversity and offsetting
2. Water and soils
3. Flooding

Please note that as of 1 July 2020 Aboriginal cultural heritage responsibilities previously performed by BCD have been transferred to the Heritage Division of the Department of Premier and Cabinet. Any questions or requests for formal Aboriginal cultural heritage assessment requirements should be directed to heritagemailbox@environment.nsw.gov.au , phone 02 9873 8500 or mail Heritage NSW, Department of Premier and Cabinet, Locked Bag 5020 Parramatta NSW 2124.

If you have any questions about this advice, please do not hesitate to contact Helen Knight, Conservation Assessment Data Officer, via helen.knight@environment.nsw.gov.au or (02) 6883 5327

Yours sincerely,

Samantha Wynn
Senior Team Leader Planning North West
Biodiversity and Conservation Division

17 September 2020

Attachment A - Environmental Assessment Requirements

Attachment B - Guidance Material

ATTACHMENT A

BCD's Recommended Environmental Assessment Requirements (EARs) for Berakee Quarry Expansion proposal

OEH	Office of Environment and Heritage (now Biodiversity and Conservation Division)
BCD	Biodiversity and Conservation Division of the NSW Department of Planning, Industry and Environment, formerly OEH
The Department	NSW Department of Planning, Industry and Environment
NPWS	National Parks and Wildlife Service

1. The Proposal

All components of the proposed development must be clearly described, including:

- the location of the proposed development and its context in the locality
- the rationale for the project
- the size, scale and type of the proposed development
- the pre-construction, construction, operational, and, where relevant, decommissioning phases of the proposed development, and the methods proposed to implement these phases
- plans and maps of the proposed development showing the locations of relevant phases and infrastructure
- the staging and timing of the proposed development
- the proposed development's relationship to any other proposals and developments

2. Environmental Impacts of the Proposal

The proponent must consider, assess, quantify and report on the likely environmental impacts of the proposal if applicable, particularly:

- Biodiversity
- National Park estate: land reserved or acquired under the *National Parks and Wildlife Act 1974*
- Flooding and, floodplain issues
- Cumulative impacts

The Secretary's Environmental Assessment Requirements should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines mentioned. A full list of guidelines and reference material is presented in **Attachment 2**. Appropriate justification should be provided in instances where the matters below are not addressed.

3. Biodiversity

Biodiversity Assessment Methodology for the Biodiversity Offsets Scheme (BOS)

The EIS should include an assessment of the following:

a. The EIS must assess the impact of the proposed development on biodiversity values to determine if the proposed development is "likely to significantly affect threatened species" for the purposes of Section 7.2 of the Biodiversity Conservation Act 2016 (BC Act), as follows:

   a. The EIS must demonstrate and document how the proposed development exceeds, or does not exceed, the biodiversity offsets scheme threshold as set out in Section 7.4 of the BC Act 2016 and Clause 7.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation) by determining whether the proposed development involves:

      i. **The clearing of native vegetation exceeds the thresholds** listed under Clause 7.23 of the BC Regulation, **or**

      ii. The clearing of native vegetation, or other action, **on land included on the Biodiversity Values Map** published under Clause 7.23 of the BC Regulation (this map includes areas of outstanding biodiversity value, as declared under Section 3.1 of the BC Act).

   b. If the proposal does not trigger any of the criteria in (a) above, then the EIS must determine whether the proposed development is likely to have a significant impact based on '*the test for determining whether proposed development likely to significant affect threatened species or ecological communities'* in Section 7.3 of the BC Act.

   c. Where there is reasonable doubt regarding potential impacts, or where information is not available, then a significant impact upon biodiversity should be considered likely when applying the test in Section 7.3 of the BC Act. Where it is concluded that there is no significant impact, the EIS must justify how the conclusion has been reached.

   d. If the development exceeds the thresholds in (a) or (b), then the EIS must be accompanied by a biodiversity development assessment report (BDAR) prepared in accordance with Part 6 of the BC Act. That is, the Biodiversity Assessment Methodology applies.

Required Information

Where development is considered "likely to significantly impact on threatened species" and a Biodiversity Development Assessment Report is required, the following requirements apply:

- Biodiversity impacts related to the proposal are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method.
- The BDAR must document the application of the avoid, minimise and offset hierarchy including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.
- The BDAR must include details of the measures proposed to address the offset obligation as follows:
  - The total number and classes of biodiversity credits required to be retired for the proposal.
  - The number and classes of like-for-like biodiversity credits proposed to be retired.
  - The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules.
  - Any proposal to fund a biodiversity conservation action.
  - Any proposal to make a payment to the Biodiversity Conservation Fund.

- If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.

The BDAR must be prepared by a person accredited to apply the Biodiversity Assessment Method under s6.10 of the *Biodiversity Conservation Act 2016*.

Where a BDAR is not required and a threatened species assessment is prepared to support a conclusion of "no significant impact", the EIS must include a field survey of the site, conducted and documented in accordance with the relevant guidelines including the Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW, 2009), Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft (DEC, 2004) and Guidelines for Threatened Species Assessment (Dept Planning, July 2005). The approach should also reference the field survey methods and assessment information on the Department of Planning, Industry and Environment website including the Bionet Atlas, Threatened Species Profile and Bionet Vegetation Classification (see Attachment 2).

4. NPWS Managed Estate

Land reserved or acquired under the *National Parks and Wildlife Act 1974* (NPW Act)

If the proposed development is within, adjacent to, or in close proximity to, NPWS managed conservation estate (e.g. a national park, nature reserve, state conservation area, land which is declared wilderness under the *Wilderness Act 1987*), or is within, adjacent to, or in close proximity to, a watercourse that flows directly into NPWS managed conservation estate, then the EIS must address impacts upon such area/s.

Where NPWS managed estate is likely to be impacted, the EIS should include:

- The following (as appropriate):
    - Evidence that the proponent has consulted with BCD on the legal permissibility of the proposal under the NPW Act.
    - In the case of proposals on land declared as wilderness under the *Wilderness Act 1987*, evidence that the proponent has consulted with BCD on the appropriateness of the proposal. That is, whether it is consistent with the objects of the *Wilderness Act 1987* (section 3) and the management principles for wilderness areas (section 9).
    - Alternative options that have been explored to avoid impacts on the NPWS managed estate (on-park) and a clear justification of any on-park components of the proposal.
    - If on-park impacts are considered unavoidable, consideration of the issues, including details of any compensation proposal, consistent with the Department's *Revocation, Recategorisation and Road Adjustment Policy* (2012) for proposals that are located wholly or partly in a National Park or other land acquired or reserved under the *National Parks and Wildlife Act 1974*.
- Consideration of the matters identified in the *Guidelines for developments adjoining land managed by the Office of Environment & Heritage* (OEH 2013) where a proposal adjoins or is immediate vicinity of NPWS managed estate, or is upstream of NPWS managed estate, which include:
    - The nature of the impacts, including direct and indirect impacts
    - The extent of the direct and indirect impacts
    - The duration of the direct and indirect impacts
    - The objectives of the reservation of the land
- A description of the mitigation and management options that will be used to prevent, control, abate or minimise identified direct and indirect impacts associated with the proposal. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

5. Water

- The EIS must map features relevant to water, including:
  - Rivers, streams, estuaries (as described in s4.2 of the Biodiversity Assessment Method)
  - Wetlands (as described in s4.2 of the Biodiversity Assessment Method)
  - Groundwater
  - Groundwater dependent ecosystems
- The EIS must describe background conditions for any water resource likely to be affected by the proposal, including:
  - Existing surface and groundwater
  - Hydrology
  - Water Quality Objectives (as endorsed by the NSW Government) including groundwater as appropriate that represent the community's uses and values for the receiving waters. Indicators and trigger values/criteria for the identified environmental values in accordance with the ANZECC (2000) *Guidelines for Fresh and Marine Water Quality* and / or local objectives, criteria or targets endorsed by the NSW Government
  - *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions* (OEH/EPA, 2017).
- The EIS must assess the impacts of the proposal on water quality, including:
  - The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the proposal protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction.
  - Identification of proposed monitoring of water quality.
- The EIS must assess the impact of the proposal on hydrology, including:
  - Water balance including quantity, quality and source.
  - Effects upon rivers, wetlands, estuaries, marine waters and floodplain areas.
  - Effects upon water-dependent fauna and flora including groundwater dependent ecosystems.
  - Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches).
  - Changes to environmental water availability, both regulated / licensed and unregulated / rules-based sources of such water.

6. Flooding

- The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including:
  - Flood prone land (ie land susceptible to the probable maximum flood event).
  - Flood planning area, the area below the flood planning level.
  - Hydraulic categorisation (floodway and flood storage areas).
  - Flood hazard.
- The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 10% Annual Exceedance Probability (AEP), 1% AEP flood levels and the probable maximum flood, or an equivalent extreme event.
- The EIS must model the effect of the proposal (including fill) on the current flood behaviour for a range of design events as identified above, and the 0.5% AEP and 0.2% AEP year flood events

as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.

- All site drainage, stormwater quality devices and erosion / sedimentation control measures should be identified in the EIS and the onsite treatment of stormwater and effluent runoff and predicted stormwater discharge quality from the proposal should be detailed.
- Modelling in the EIS must consider and document:
  - Existing council flood studies in the area and examine consistency to the flood behaviour documented in these studies.
  - The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood (PMF), or an equivalent extreme flood.
  - Impacts of the proposal on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazard categories and hydraulic categories.
  - Impacts of earthworks and stockpiles within the flood prone land up to the PMF level. The assessment should be based on understanding of cumulative flood impacts of construction and operational phases.
  - Relevant provisions of the NSW Floodplain Development Manual 2005.
- The EIS must assess the impacts on the proposal on flood behaviour, including:
  - Whether there will be detrimental increases in the potential flood affectation of other properties, assets and infrastructure.
  - Consistency with Council floodplain risk management plans.
  - Consistency with any Rural Floodplain Management Plans.
  - Compatibility with the flood hazard of the land.
  - Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land.
  - Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site.
  - Whether there will be a direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.
  - Appropriate mitigation measures to offset potential flood risk arising from the proposal. Any proposed mitigation work should be modelled and assessed on the overall catchment basis in order to ensure it fits its purpose and meets the criteria of the Council where it is located, and to ensure it has no adverse impact to surrounding areas.
  - Any impacts the proposal may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the NSW SES and Council.
  - Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the NSW SES and Council.
  - Emergency management, evacuation and access, and contingency measures for the proposal during both construction and operational phases considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the NSW SES.
  - Any impacts the proposal may have on the social and economic costs to the community as a consequence of flooding.

ATTACHMENT B

Guidance Material

Title	Web address
Relevant Legislation	
Biodiversity Conservation Act 2016	https://www.legislation.nsw.gov.au/#/view/act/2016/63/full
Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Fisheries Management Act 1994	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
National Parks and Wildlife Act 1974	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Protection of the Environment Operations Act 1997	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
Water Management Act 2000	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
Wilderness Act 1987	http://www.legislation.nsw.gov.au/viewtop/inforce/act+196+1987+FIRST+0+N
Biodiversity	
Biodiversity Values Map	https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap
Biodiversity Assessment Method (OEH, 2017)	http://www.environment.nsw.gov.au/resources/bcact/biodiversity-assessment-method-170206.pdf
Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH, 2017)	http://www.environment.nsw.gov.au/resources/bcact/guidance-decision-makers-determine-serious-irreversible-impact-170204.pdf
Ancillary rules: Biodiversity conservation actions	http://www.environment.nsw.gov.au/resources/bcact/ancillary-rules-biodiversity-actions-170496.pdf
Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules	http://www.environment.nsw.gov.au/resources/bcact/ancillary-rules-reasonable-steps-170498.pdf
Ancillary rules: Impacts on threatened species excluded from application of the variation rules	http://www.environment.nsw.gov.au/resources/bcact/ancillary-rules-impacts-on-threatened-entities-excluded-from-variation-170497.pdf
The Departments Threatened Species Profiles	http://www.environment.nsw.gov.au/threatenedspeciesapp/
BioNet Atlas	http://www.environment.nsw.gov.au/wildlifeatlas/about.htm
BioNet Vegetation Classification	http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx

Title	Web address
NSW Guide to Surveying Threatened Plants (OEH, 2016)	http://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-guide-to-surveying-threatened-plants
Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna - Amphibians (DECC, 2009)	www.environment.nsw.gov.au/resources/Threatenedspecies/09213amphibians.pdf
Threatened Species Assessment Guideline - The Assessment of Significance (DECC 2007)	www.environment.nsw.gov.au/resources/Threatenedspecies/tsaguide07393.pdf
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004)	http://www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf
Fisheries NSW policies and guidelines	http://www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals/fish-habitat-conservation
National Park Estate	
Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water (DECCW, 2010)	http://www.environment.nsw.gov.au/protectedareas/developmntadjoiningdecc.htm
List of national parks	http://www.environment.nsw.gov.au/NationalParks/parksearchatoz.aspx
Revocation, recategorisation and road adjustment policy (OEH, 2012)	http://www.environment.nsw.gov.au/policies/RevocationOfLandPolicy.htm
List of aquatic reserves	www.dpi.nsw.gov.au/fisheries/habitat/protecting-habitats/mpa
List of marine parks	www.mpa.nsw.gov.au/contact.html
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	www.environment.gov.au/water/publications/quality/australian-and-new-zealand-guidelines-fresh-marine-water-quality-volume-1
Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions	http://www.environment.nsw.gov.au/research-and-publications/publications-search/risk-based-framework-for-considering-waterway-health-outcomes-in-strategic-land-use-planning
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	http://deccnet/water/resources/AWQGuidance7.pdf
Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales (DEC 2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf

Title	Web address
Flooding	
Floodplain Development Manual	http://www.environment.nsw.gov.au/floodplains/manual.htm
Floodplain Risk Management Guidelines	http://www.environment.nsw.gov.au/topics/water/coasts-and-floodplains/floodplains/floodplain-guidelines
NSW Climate Impact Profile	http://climatechange.environment.nsw.gov.au/
Climate Change Impacts and Risk Management	Climate Change Impacts and Risk Management: A Guide for Business and Government, AGIC Guidelines for Climate Change Adaptation

DOCXX/XXXX

Department of Planning, Industry and Environment
By email at: melissa.anderson@planning.nsw.gov.au

Attention: Ms Melissa Anderson

15 September 2020

Dear Ms Anderson

Environmental Assessment Requirements
Berakee Quarry Expansion Project (EAR 1488)

I refer to the email from the Department of Planning, Industry and Environment (DPIE) to the Environment Protection Authority (EPA) dated 3 September 2020 seeking the EPA's Environmental Assessment Requirements (EARs) to assist with the preparation of an Environmental Impact Statement for the Berakee Quarry Expansion Project (EAR 1488) off the Oxley Highway, near Collie.

Based on the information provided, the EPA understands that the Proponent, Regional Quarries Australia Pty Ltd, is seeking approval for the expansion of the Berakee Quarry. The EPA has considered the proposal and provides at **Attachment A** the information it requires to properly assess the Proposal. The EPA's key information requirements for the Proposal must include an adequate description and assessment of:

1. Confirmation of the entity that would be the holder of any environment protection licence issued by the EPA.
2. Noise and vibration – proximity to any sensitive receivers and identification of noise sources and mitigation measures.
3. Air quality – proximity to any sensitive receivers and identification of dust and other air emissions and mitigation measures during both construction and operational activities.
4. Erosion and sediment control and site wide water management.

The EPA has also provided the appropriate guidance material to be considered (but not limited too) at **Attachment B**.

By virtue of Clauses 19 and 16 of Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act), the Proponent would also require an environment protection licence issued from the EPA, should approval be granted. The Proponent would need to apply separately to the EPA for such a licence.

It is important that all assumptions and conclusions made in the Environmental Impact Statement are supported by adequate and appropriate data. The Proponent should also be aware that any commitments made in the environmental assessment may be formalised as approval conditions and/or environment protection licence conditions.

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If you have any questions about this matter, please contact Sam Preston-Stanley on 02 6883 5333 or by email to central.west@epa.nsw.gov.au.

Yours sincerely

MATTHEW CORRADIN
A/Unit Head – Regulatory Operations
Regulatory Operations Regional

Encl: **Attachment A** – EPA's Recommended Environmental Assessment Requirements
Attachment B – Guidance Material

ATTACHMENT A – EPA's Recommended Environmental Assessment Requirements – Berakee Quarry Expansion Project (EAR 1488)

How to use these requirements

The EPA requirements have been structured in accordance with relevant guidelines, as follows. It is suggested that the EIS follow the same structure:

A. Executive summary

B. The proposal

C. The location

D. List of required approvals and licences

E. Identification and prioritisation of all issues

F. The environmental issues

G. The mitigation measures

H. Justification for the proposal and conclusion

The EIS should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines/standards at **Attachment B**.

A Executive summary

The document's executive summary should include a discussion of the proposed development, the key environmental risks, the identified mitigation measures, and an overall conclusion and justification for the proposal.

B The proposal

The proposed development must be adequately described and should clearly state and refer to:

a) the type, the nature and size of the proposed development, including proposed average and maximum annual production rates that are expected to occur;

b) the type, the nature and amount of the processes and the products to be used, including the plant and equipment proposed for use, fuel and chemicals required and proposed methods for their transportation, storage, use and their emergency management provisions, including relevant process flow diagrams;

c) the by-products produced and/or wastes produced, including the fate of such products;

d) the staging and timing of the proposal, including any construction works and any plans for potential future expansion plans and the proposed construction and operational hours, including and heavy vehicle movements;

e) the anticipated benefits to relevant industry, community, etc; and

f) the proposal's relationship to any other facility or industry both locally and abroad.

C The location

Provide an overview of the setting in which the proposed development is to take place in its local and regional environmental context including:

a) the location of the proposed facility, its layout, including plant and equipment, and details of the surrounding environment, including land use zoning with appropriate maps/diagrams;

b) the topography;

c) meteorological data (e.g. temperature, wind (prevailing wind direction and strength), rainfall, evaporation, etc);

d) surrounding land uses, including ownership details of any residence and/or land likely to be affected by the proposed facility with appropriate maps/diagrams;

e) ecological information (vegetation, fauna, waters) with appropriate maps/diagrams; and

f) availability of services and the accessibility of the site for passenger and freight transport.

D List of approvals and licences

Identify all approvals, licences or permits required to undertake the proposed development as well as those already obtained and those to be obtained.

Based on the information provided and should the proposed development be approved; the proponent will need to make a separate application to EPA for an environment protection licence for the scheduled activity of Extractive Activities under Clause 19 of Schedule 1 of the POEO Act and also potentially the scheduled activity of Crushing, Grinding or Separating under Clause 16 of Schedule 1 the POEO Act. Additional information is available through EPA's *Guide to Licensing* document. General information on license requirements can also be obtained from EPA's Environment Line on 131 555 during office hours or can be found on the EPA web site (click here).

The EIS must clear identify who the holder of any issued environment protection licence would be.

The EIS must also address the considerations listed under Section 45 of the POEO Act where they are appropriate to this Proposal.

E Identification and prioritisation of issues / scoping of impact assessment

Identify a scoping risk assessment methodology, undertake a risk assessment, and identify and prioritise key issues.

F The environmental issues

1. Noise

- Identify the existing noise environment (including any relevant noise assessment groupings) and identify applicable noise goals in line with relevant guidance/standards;
- Identify potential noise and vibration sources and impacts during both construction and operational stages and identify best practice mitigation measures (pollution control) and strategies to be incorporated for both stages to minimise noise and vibration emissions/impacts (with proposed timing), including validation monitoring, in line with relevant guidance/standards; and
- Propose representative noise monitoring locations for determining compliance with applicable noise goals and where relevant noise goals would be set as representative limits.

Note: this will require a detailed Noise Impact Assessment to be completed.

2. Air

- Identify the existing air quality environment and identify applicable air quality goals (i.e. ground level concentrations for pollutants and odour assessment criteria) in line with relevant guidance/standards; and
- Identify potential air quality and odour sources and impacts (including point source emissions from any site-based plant and equipment and/or fugitive dust or other emissions) during both construction and operational stages and identify best practice mitigation measures (pollution control) and strategies to minimise point and/or fugitive and/or odour emissions/impacts (with proposed timing), including monitoring, in line with relevant guidance/standards; and
- Include an emission inventory of all sources of air emissions.

Note: this will require a detailed Air Quality Impact Assessment to be completed.

3. Water

- Identify the condition of the local catchment and those immediate areas on and around the proposed development e.g. soils, erosion potential, vegetation cover, etc; and
- Identify nearby water resources, the background water conditions (including river flow data, water flow/direction and quality data, the depth to groundwater, groundwater flow/gradient and quality data, reliance on water resources by surrounding users and by the environment) and relevant water quality objectives in line with relevant guidance/standards; and
- Identify existing impacts to water resources (including other industrial discharges); and
- Identify any water intakes, intake frequency and volumes related to the proposed development; and
- Identify any expected discharges (including stormwater), discharge quality, discharge frequency and volumes related to the proposed development; and
- Identify all practical measures that can be taken to prevent any expected discharges or an explanation of why any specific discharges cannot be prevented; and
- Identify potential impacts to surface and groundwater during both construction and operational stages and identify best practice mitigation measures (pollution control) and strategies to

protect surface and groundwater resources, particularly erosion and sediment controls during the construction stage and the rehabilitation stage and the inclusion of permanent erosion and sediment controls where required and applicable; and
- Include a detailed water balance and discharge inventory; and
- Include an assessment of any mixing zones; and
- Include any proposed discharge limits.

Note: this will require a detailed Water Assessment to be completed.

4. Land

- Identify if the soils in the area of the Proposal are contaminated or are acid forming (i.e. acid sulphate soils) and if so, identify best practice mitigation measures (pollution control) and strategies or remedial and/or disposal actions that will be required/undertaken if applicable in accordance with relevant guidance/standards; and
- Identify potential impacts to soils/land resources as a result of the proposed development and identify best practice mitigation measures (pollution control) and strategies that will be required/undertaken if applicable in accordance with relevant guidance/standards.

5. Waste

- Identify all waste types that will be generated as a result of the proposed development during both construction and operation, their classification and the ways in which they will be legally handled, stored, transported, reused, recycled or disposed of, including sampling/monitoring, record keeping, waste tracking, contingency measures and any other verification practices, in accordance with relevant guidance/standards; and
- Identify options and strategies for waste minimisation; reuse and recycling across all activities and processes during both construction and operational stages.

6. Storage and use of fuels / chemicals etc

- Identify all fuels/chemicals/products/dangerous goods to be stored/used onsite; and
- Identify adequate handling, storage, control and usage requirements for any fuels/chemicals/products/dangerous to be stored/used onsite.

7. Incident Management

Identify adequate incident management procedures to be established including notification requirements to the Appropriate Regulatory Authority and other relevant authorities for incidents that cause or have the potential to cause material harm to the environment (Part 5.7 of the POEO Act).

8. Cumulative impacts

- Identify the extent that the receiving environment is already stressed by existing development and background levels of emissions to which this proposal will contribute; and
- Identify the cumulative impacts of the proposed development in a local context.

9. Monitoring Programs

Include a detailed proposal of any noise, air, water, land, waste, meteorological etc monitoring during construction and operation to ensure and assumptions, predictions, goals, criteria etc are achieved. The proposal should include a detailed description of the monitoring locations, sample analysis methods and the level of reporting proposed.

G. Compilation of mitigation measures

- Outline how the proposal and its environmental protection measures would be implemented and managed in an integrated manner so as to demonstrate that the proposal is capable of complying with statutory obligations under EPA licences or approvals (e.g. outline of an

environmental management plan).

- Include any Statement of Commitments to be made by the Proponent.

H. Justification for the proposed development and conclusion

Reasons should be included which justify undertaking the proposal in the manner proposed, having regard to the potential environmental impacts.

ATTACHMENT B – EPA's Guidance Material (not exhaustive)

Legislation	
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Protection of the Environment Operations Act 1997	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
Protection of the Environment Operations (General) Regulation 2017	https://legislation.nsw.gov.au/view/html/inforce/current/sl-2009-0211
Protection of the Environment Operations (Noise Control) Regulation 2017	https://legislation.nsw.gov.au/#/view/regulation/2017/449
Protection of the Environment Operations (Clean Air) Regulation 2010	https://legislation.nsw.gov.au/#/view/regulation/2010/428
Protection of the Environment Operations (Waste) Regulation 2014	https://legislation.nsw.gov.au/#/view/regulation/2014/666
Waste Avoidance and Resource Recovery Act 2001	https://legislation.nsw.gov.au/#/view/act/2001/58
Contaminated Land Management Act 1997	http://www.legislation.nsw.gov.au/#/view/act/1997/140
Licensing	
Licensing Requirements	https://www.epa.nsw.gov.au/licensing-and-regulation/licensing
Noise/Vibration	
Interim Construction Noise Guideline (DECC, 2009)	https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/interim-construction-noise-guideline
Noise Policy for Industry (2017) and Implementation and Transitional arrangements for the Noise Policy for Industry (2017)	https://www.epa.nsw.gov.au/publications/noise/17p0524-noise-policy-for-industry https://www.epa.nsw.gov.au/publications/noise/17p0293-implement-transition-arrange-noise-pol-industry
Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC, 1990)	https://www.epa.nsw.gov.au/~/media/EPA/Corporate%20Site/resources/noise/ANZECBlasting.ashx
Assessing Vibration: a technical guideline (DEC, 2006) and	https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/assessing-vibration
NSW Road Noise Policy (DECCW, 2011)	http://www.epa.nsw.gov.au/resources/noise/2011236nswroadnoisepolicy.pdf
NSW Rail Infrastructure Noise Guideline (EPA, 2013)	https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/20130018eparing.pdf
Air/Odour	
Approved methods for the Modelling and Assessment of Air Pollutants in NSW (2016)	http://www.epa.nsw.gov.au/resources/epa/approved-methods-for-modelling-and-assessment-of-air-pollutants-in-NSW-160666.pdf
Approved methods for the Sampling and Analysis of Air Pollutants in NSW (2007)	http://www.epa.nsw.gov.au/resources/air/07001amsaap.pdf
National Environment Protection (Ambient Air Quality) Measure	http://www.nepc.gov.au/nepms/ambient-air-quality
No EPA specific guidance material exists for the control of dust from construction sites. Consideration should be given to	http://www.epa.nsw.gov.au/air/lgaqt.htm

the POEO Act and the Local Government Air Quality Toolkit (DECC, 2007)	
Technical Framework - Assessment and Management of Odour from Stationary Sources in NSW (DEC, 2006) and Technical Notes - Assessment and Management of Odour from Stationary Sources in NSW (DEC, 2006)	http://www.epa.nsw.gov.au/air/odour.htm http://www.epa.nsw.gov.au/air/odour.htm
Ground-level ozone impact assessment framework (EPA, 2015)	https://www.epa.nsw.gov.au/~/media/EPA/Corporate%20Site/resources/air/150305-ozone-impact-assessment-summary.ashx
Water/Soils	
ANZECC Guidelines for Fresh and Marine Water Quality (2018)	https://www.waterquality.gov.au/guidelines/anz-fresh-marine
NSW Water Quality and River Flow Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	http://deccnet/water/resources/AWQGuidance7.pdf
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/water/approvedmethods-water.pdf
Soil and Landscape Issues in Environmental Impact Assessment (DLWC 2000)	https://www.shop.nsw.gov.au/publication/soil-and-landscape-issues-in-environmental-impact-assessment-technical-report-no-34-1324-6860-839
Managing urban stormwater: soils and construction, vol. 1 (Landcom, 2004) and Addendum Publications (Various)	http://www.environment.nsw.gov.au/stormwater/publications.htm
Landslide Risk Management (2007)	http://www.australiangeomechanics.org/resources/downloads/
Site Investigations for Urban Salinity (DLWC, 2002)	http://www.environment.nsw.gov.au/resources/salinity/booklet3siteinvestigationsforurbansalinity.pdf
Dryland Salinity Resources (Various)	http://www.environment.nsw.gov.au/salinity/solutions/urban.htm
Contaminated Sites Assessment and Remediation	
Contaminated Land – EPA website	https://www.epa.nsw.gov.au/your-environment/contaminated-land
Managing land contamination: Planning Guidelines – SEPP 55 Remediation of Land	http://www.epa.nsw.gov.au/clm/planning.htm
Contaminated Land Management Compliance Statement (EPA, 2018)	https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/clm/180997-contaminated-sites-compliance-statement.pdf?la=en&hash=2B42D6FCE54664A660606D67C321389B9A724ED44
Sampling Design Guidelines (EPA, 1995)	http://www.epa.nsw.gov.au/resources/clm/95059sampgdlne.pdf
Guidelines for the Assessment and Management of Groundwater Contamination (DEC, 2007)	https://www.epa.nsw.gov.au/~/media/EPA/Corporate%20Site/resources/clm/groundwaterguidelines07144.ashx
Guidelines on the Duty to Report Contamination under the *Contaminated Land Management Act 1997* (EPA, 2015)	https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/clm/150164-report-land-contamination-guidelines.pdf
Guidelines for the NSW Site Auditor Scheme – 3rd Edition (EPA, 2017)	https://www.epa.nsw.gov.au/publications/contaminatedland/17p0269-guidelines-for-the-nsw-site-auditor-scheme-third-edition

Guidelines for Consultants Reporting on Contaminated Sites (EPA, 2000)	http://www.epa.nsw.gov.au/resources/clm/20110650consultantsglines.pdf
National Environment Protection (Assessment of Site Contamination) Measure	http://www.nepc.gov.au/nepms/assessment-site-contamination
Waste	
NSW Waste Avoidance and Resource Recovery Strategy 2014-2021	http://www.epa.nsw.gov.au/wastestrategy/warr.htm
Waste Classification Guidelines – 4 Parts (EPA, 2014)	http://www.epa.nsw.gov.au/wasteregulation/classify-waste.htm
Chemical and Fuel Storage	
Storage and Handling of Dangerous Goods – Code of Practice (WorkCover, 2005)	http://www.safework.nsw.gov.au/__data/assets/pdf_file/0005/50729/storage-handling-dangerous-goods-1354.pdf

Melissa Anderson

Environmental Assessment Officer
Resource Assessments | Planning Services

NSW Planning, Industry & Environment

Our ref: DOC20/737001

Your ref: EAR 1488

Emailed: via planning portal

14 September 2020

Dear Ms Anderson

Subject: Request for Secretary's Environmental Assessment Requirements – Berakee Quarry Expansion project – EAR 1488.

Thank you for the opportunity to provide advice on the above matter. This is a response from the Regional NSW, Mining, Exploration & Geoscience (MEG).

Basalt is not a prescribed mineral under the *Mining Act 1992*. Therefore, MEG has no statutory role in authorising or regulating the extraction of this commodity. However, MEG is the principal government authority responsible for assessing the State's resources of construction materials and for advising State and local government on their planning and management.

All environmental reports (EIS or similar) accompanying Development Applications for extractive industry lodged under the *Environmental Planning & Assessment Act 1979* should include a resource assessment which:

- Documents the size and quality of the resource and demonstrates that both have been adequately assessed; and
- Documents the methods used to assess the resource and its suitability for the intended applications.

If deemed commercial-in-confidence, the resource assessment summary included in the EIS should commit to providing MEG with full resource assessment documentation separately.

MEG collects data on the quantity of construction materials produced annually throughout the State. Forms are sent to all operating quarries at the end of each financial year for this purpose. The statistical data collected is of great value to Government and industry in planning and resource management, particularly as a basis for analysing trends in production and for estimating future demand for particular commodities or in particular regions. Production data may be published in aggregated form, however production data for individual operations is kept strictly confidential.

In order to assist in the collection of construction material production data, the proponent should be required to provide annual production data for the subject site to MEG as a condition of any new or amended development consent.

MEG would appreciate the opportunity for early consultation in relation to the proposed location of any biodiversity offset areas (both on and off site) or any supplementary biodiversity measures to ensure there is no consequent reduction in access to prospective land for mineral exploration, or potential for sterilisation of mineral or extractive resources.

Queries regarding the above information should be directed to the MEG - Land Use team at landuse.minerals@geoscience.nsw.gov.au.

Yours sincerely,

Steven Palmer

Manager, Land Use Assessment

Geological Survey of NSW, Mining, Exploration & Geoscience

NSW GOVERNMENT | Department of Primary Industries

OUT20/11105

16 September 2020

Melissa Anderson
Environmental Assessment Officer
Energy, Resources and Compliance
Planning and Assessment
4 Parramatta Square 2150

E: melissa.anderson@planning.nsw.gov.au

Dear Melissa

SEAR's Request –EAR 1488 Berakee Quarry Expansion Project

Thank you for the opportunity to provide Environmental Assessment Requirements (EARs) for the above proposal as per your correspondence dated 3 September 2020.

The NSW Department of Primary Industries (NSW DPI) Agriculture is committed to the protection and growth of agricultural industries, and the land and resources upon which these industries depend. Important issues for extractive industries are the potential impact on limited agricultural resources and the ability to rehabilitate the land to enable continued agricultural investment.

NSW DPI Agriculture provides SEARs (Attachment 1) and a range of publications to assist consent authorities, community and proponents in addressing the recommended SEARs (Attachment 2). These have been refined in response to the Preliminary Environmental Assessment supplied to support this request.

Should you require clarification on any of the information contained in this response, please contact myself on (02) 68811250.

Yours sincerely

Mary Kovac
Agricultural Landuse Planning Officer
Central and Far West
Agricultural Land Use Planning

Attachment 1: SEARs Recommendations

Issue and desired outcome	Detail / Requirement
Site Suitable for development	• Complete a Landuse Conflict Risk Assessment (LUCRA) to identify potential landuse conflict, in particular relating to separation distances and management practices to minimise odour, dust and noise from sensitive receptors. A LUCRA is described in the DPI Land Use Conflict Risk Assessment Guide. • Include a map to scale showing the above operational and infrastructure details including separation distances from sensitive receptors.
Consideration for impacts to agricultural resources and land	• Describe the current and potential *Important Agriculture Land* on the proposed development site and surrounding locality including the land capability and agricultural productivity. • Demonstrate that all significant impacts on current and potential agricultural developments and resources can be reasonably avoided or adequately mitigated. • Consider possible cumulative effects to agricultural enterprises and landholders.
Suitable and secure water supply	• Estimated water demand and water availability should be clearly outlined in the proposal. The source of water and any sanitisation methods to be detailed in the application. • Outline any impacts to water use from agriculture and mitigation measures if required.
Surface & Groundwater protected	• Proposed development design, operation and by-product management should be undertaken to avoid nutrient and sediment build up and minimise erosion, off site surface water movement and groundwater accession that impacts on agricultural resources.
Biosecurity Standards met	• Include a biosecurity (pests and weeds) risk assessment outlining the likely plant, animal and community risks. • Develop a biosecurity response plan to deal with identified risks as well as contingency plans for any failures. Including monitoring and mitigation measures in weed and pest management plans.
Suitable traffic movements	• Consideration of the route for movements needs to be taken into account so that impacts on sensitive receptors are minimised (e.g. noise, dust, volume of traffic). This should include consideration of Travelling Stock Reserves (TSR) and the movement of livestock or farm vehicles along / across the affected roads.
Land stewardship met	• Develop Rehabilitation and Decommissioning/Closure Plans that describes the design criteria of the final landuse and landform along with the expected timeline for the rehabilitation program. • Outline monitoring and mitigation measures to be adopted for rehabilitation remedial actions.
Adequate consultation with community	• Consult with relevant agencies such as on the design, construction and operation of the proposed infrastructure. • Consult with the owners / managers of affected and adjoining neighbours and agricultural operations in a timely and appropriate manner about; the proposal, the likely impacts and suitable mitigation measures or compensation.

	• Establish a complaints register that includes reporting and investigating procedures and timelines, and liaison with Council in relation to complaint issues.
Contingency and Environmental Management Plan developed	• Contingency plans should be developed to enable the operation to deal with emergency situations. Commitment to the preparation of an Emergency Management plan that outlines procedures and responsibilities for responding to emergency events that impact on surrounding agricultural uses.

Attachment 2: Guidelines for assessment

Title	Location
Land Use Conflict Risk Assessment Guide	https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment2/lucra
Agricultural Issues for Extractive industry Development	https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment2/extractive-industries

Melissa Anderson

From: Lands Ministerials Mailbox
Sent: Monday, 21 September 2020 9:04 AM
To: Melissa Anderson
Subject: Re: Request for EARs - EAR 1488 - Berakee Quarry Expansion Project

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Melissa

Apologies for the delay in responding.

Crown Lands has no comments for this proposal.

Thanks
Kirstyn

Lands Stakeholder Relations

Team telephone numbers: Rebecca Johnson, Principal Project Officer, 4920 5040; Kirstyn Goulding, Administration Officer - Customer Liaison, 4920 5058; Kim Fitzpatrick, Senior Project Officer, 4920 5015, Deb Alterator, Project Support Officer 4920 5172

Crown Lands | Department of Planning, Industry and Environment
E lands.ministerials@dpie.nsw.gov.au
Level 4, 437 Hunter Street Newcastle NSW 2295
www.dpie.nsw.gov.au

Our Vision: Together, we create thriving environments, communities and economies.

The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

From: Melissa Anderson <Melissa.Anderson@planning.nsw.gov.au>
Sent: Thursday, 3 September 2020 3:13 PM
To: OLG - Gilgandra Shire Council <council@gilgandra.nsw.gov.au>; DPI Landuse Enquiries Mailbox <landuse.enquiries@dpi.nsw.gov.au>; DPI Landuse Ag Mailbox <landuse.ag@dpi.nsw.gov.au>; EPA Planning Matters Mailbox <planning.matters@epa.nsw.gov.au>; OEH Planning Matters Mailbox <PlanningMatters@environment.nsw.gov.au>; nswresourcesregulator@service-now.com <nswresourcesregulator@service-now.com>; Angela Stewart <development.western@rms.nsw.gov.au>; records@rfs.nsw.gov.au <records@rfs.nsw.gov.au>; DRG RO Assessment Coordination Mailbox <assessment.coordination@planning.nsw.gov.au>; Lands Ministerials Mailbox <lands.ministerials@dpie.nsw.gov.au>
Cc: DPE PSVC Western Region Mailbox <westernregion@planning.nsw.gov.au>
Subject: Request for EARs - EAR 1488 - Berakee Quarry Expansion Project

Good Afternoon,

Environmental Assessment Requirements (EAR) 1488 – Berakee Quarry Expansion Project

Umwelt (Australia) Pty Limited on behalf of *Regional Hardrock Gilandra Unit Trust* (the Applicant) has requested the requirements of the Planning Secretary of the Department of Planning, Industry and Environment for the preparation of an Environmental Impact Statement (EIS) for the above local designated development located in the Gilgandra local government area. I have attached a copy of the Applicant's request and Preliminary Environmental Assessment Report (PEA) for your reference.

Under Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, the Planning Secretary is requesting your requirements for the EIS.

It would be greatly appreciated if we could receive your advice by **Friday the 18th of September 2020**.

If you have any queries please contact me on the details below.

Kind regards
Melissa

Melissa Anderson
Environmental Assessment Officer
Energy, Resources & Compliance | Planning and Assessment
4 Parramatta Square, 12 Darcy St, Parramatta, NSW 2150
T 02 8275 1392 | E melissa.anderson@planning.nsw.gov.au
www.dpie.nsw.gov.au

NSW GOVERNMENT | Planning, Industry & Environment

The Department of Planning, Industry and Environment acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

Melissa Anderson

From: David Ward
Sent: Wednesday, 9 September 2020 2:15 PM
To: Melissa Anderson
Cc: Jane Gordois
Subject: FW: Request for EARs - EAR 1488 - Berakee Quarry Expansion Project
Attachments: form-a-request-for-planning-secretarys-requirements-2018-07-27.pdf; 20112_R01_Regional Quarries_PEA_Final V2.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Melissa

Thank you for your request for EARs. Fisheries don't have any environmental assessment requirements for this project.

Cheers
David

David Ward | Fisheries Manager
DPI Fisheries - Aquatic Environment
Department of Primary Industries
4 Marsden Park Road | Calala NSW 2340
T: +61 2 6763 1255 | M: +61 (0) 0429 908 856
E: david.ward@dpi.nsw.gov.au
W: www.dpi.nsw.gov.au

15 October 2020

SF2020/16837; WST20/000313/01

The Manager
Resource Assessments
Department of Planning, Industry & Environment
GPO Box 39
SYDNEY NSW 2001

Attn: Melissa Anderson

Dear Ms Anderson

SEARs 1488 Berakee Quarry Expansion Project

Thank you for the request for input into Secretary Environmental Assessment Requirements (SEARs) for the Berakee Quarry expansion project referred via the Major Projects Portal dated inviting input from Transport for NSW (TfNSW).

TfNSW notes that the expansion of Berakee Quarry will involve the following changes to the existing project:

- Expansion of the resource size from 750,000tpa to 4.7Mt. The first stage of the expansion will occur over a five year period extracting 2.3Mt of basalt with an average extraction of 490,000tpa. Stage two will occur over a 20 year period extracting 2.4 Mt with an expected extraction rate of 80,000 to 120,000 tpa,
- Continued use of the private haulage route to the Oxley Highway with the potential to use Ostlers Lane and Berida-Innisfail Road subject to upgrade requirements to upgrade intersections,
- The increased size of the haulage vehicle from a B-double heavy vehicle to a B-triple heavy vehicle,
- Increase in the daily vehicle movements from 14vmpd to 70 vmpd equating to a weekly increase from 100 to 496 vehicle movements,
- Increase in contract trucks during campaigns from 2-3 to 24,and

TfNSW requests that the Environmental Impact Statement be supported by an Transport Impact Assessment (TIA) prepared by a suitably qualified person in accordance with the *Austroads Guide to Traffic Management Part 12*, the Roads and Maritime *Supplements to Austroads* and the *RTA Guide to Traffic Generating Developments*. The TIA will need to address the following:

- Project schedule:
    - Hours and days of work, number of shifts and start and end times,
    - Phases and stages of the project, including construction, operation and decommissioning,

Transport for NSW
51-55 Currajong Street PARKES NSW 2870 | PO Box 334 PARKES NSW 2870 DX20256
P 6861 1449 | **W** development.western@rms.nsw.gov.au | ABN 18 804 239 602

- Traffic volumes:
    - Existing background traffic,
    - Project-related traffic for each phase or stage of the project,
    - Projected cumulative traffic at commencement of operation, and a 10-year horizon post-commencement,
- Traffic characteristics:
    - Number and ratio of heavy vehicles to light vehicles,
    - Peak times for existing traffic,
    - Peak times for project-related traffic including commuter periods,
    - Proposed hours for transportation and haulage,
    - Interactions between existing and project-related traffic,
- A description of all over size and over mass vehicles and the materials to be transported
- The origins, destinations and routes for:
    - Commuter (employee and contractor) light vehicles and pool vehicles,
    - Heavy (haulage) vehicles,
    - Over size and over mass vehicles,
- Road safety assessment of key haulage route/s,
- The proposed haulage routes as noted within the request for SEARs is the primary haulage route being the private haulage road (with a registered easement “right of carriage way” on DP 1250038), “Wilgaroo” onto the Oxley Highway and alternative route being Ostler’s Lane Berida-Innisfail Road. As a part of the development application you will be required to:
    - Obtain owner’s consent for the use of the private haulage route via the registered right of carriage way from the owner of the land burdened by the land on DP 1250038,
    - The alternative haulage route Ostler’s Lane Berida-Innisfail Road approved as a temporary haulage route within the previous modification to the development (DA2017/218A) permitted the temporary use of this route till the 30 of June 2020. This was on the basis of limited haulage to a maximum of 30,000tpa. The proposed expansion of the Berakee Quarry will increase the haulage and therefore a reassessment of the appropriate treatments along the haulage routes as a part of the TIA will be required to determine the level of intersection treatment required for the alternative haulage route.
- The impact of traffic generation on the public road network and measures employed to ensure traffic efficiency and road safety during construction, operation and decommissioning of the project,
- The need for improvements to the road network, and the improvements proposed such as road widening and intersection treatments, to cater for and mitigate the impact of project related traffic,

- Proposed road facilities, access and intersection treatments are to be identified and be in accordance with *Austroads Guide to Road Design* including provision of Safe Intersection Sight Distance (SISD),
- Local climate conditions that may affect road safety during the life of the project (e.g. fog, wet and dry weather, icy road conditions),
- The layout of the internal road network, parking facilities and infrastructure,
- Impact on rail corridors and level crossings detailing any proposed interface treatments,
- Impact on public transport (public and school bus routes) and consideration for alternative transport modes such as walking and cycling,
- Identification and assessment of potential impacts of the project, such as blasting, lighting, visual, noise, dust and drainage on the function and integrity of all affected public roads,
- Controls for transport and use of any dangerous goods in accordance with *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*, the *Australian Dangerous Goods Code* and *Australian Standard 4452 Storage and Handling of Toxic Substances,*
- Propose a Traffic Management Plan (TMP) to be developed following approval of the EIS, in consultation with relevant Councils and TfNSW. The TMP would need to identify strategies to manage the impacts of project related traffic, including any community consultation measures for peak haulage periods.
- Propose a Driver Code of Conduct for haulage operations which could include, but not be limited to:
    - Safety initiatives for haulage through residential areas and/or school zones.
    - An induction process for vehicle operators and regular toolbox meetings.
    - A public complaint resolution and disciplinary procedure.

Please forward a copy of the SEARs to TfNSW at development.western@rms.nsw.gov.au when sent to the applicant. If you wish to discuss this matter further, please contact Alexandra Power, Development Assessment Officer on (02) 6861 1449.

Yours faithfully

Ainsley Bruem
A/Manager Land Use Assessment
Western Region

Transport for NSW
51-55 Currajong Street PARKES NSW 2870 | PO Box 334 PARKES NSW 2870 DX20256
P 6861 1449 | **W** development.western@rms.nsw.gov.au | ABN 18 804 239 602

Melissa Anderson

Subject: Request for EARs - EAR 1488 - Berakee Quarry Expansion Project

From: Alan Bawden <Alan.Bawden@rfs.nsw.gov.au>
Sent: Wednesday, 28 October 2020 5:50 PM
To: Melissa Anderson <Melissa.Anderson@planning.nsw.gov.au>
Subject: FW: Request for EARs - EAR 1488 - Berakee Quarry Expansion Project

Good afternoon Melissa

The NSW RFS ha reviewed the attached documents and your request below.

The subject land is not mapped bush fire prone land by council.

Further the current and continuing agricultural activities minimise the grass fire risk to the development.

As such the NSW RFS has no requirements for bush fire within the EIS.

Further, the consent authority can considered this response, consultation under S4.14 of the EP&A Act 1979, with respect to any subsequent development application.

Regards

Alan Bawden
Team Leader - Development Assessment and Planning
Planning and Environment Services (North)
NSW RURAL FIRE SERVICE
51 Moonee Street Coffs Harbour
Locked Bag 17 GRANVILLE NSW 2142
p 02 66910400 e pes@rfs.nsw.gov.au
www.rfs.nsw.gov.au **www.facebook.com/nswrfs** **www.twitter.com/nswrfs**
PREPARE.ACT.SURVIVE

Natural Resources Access Regulator
Locked Bag 5022,
Parramatta NSW 2124
T 1800 633 362
E nrar.servicedesk@industry.nsw.gov.au
www.industry.nsw.gov.au/nrar

Contact: Tim Baker
Phone: 0428 162097
Email : Tim.Baker@nrar.nsw.gov.au

Our ref: V15/2812-5#11
Your Ref: SEAR 1488

Melissa Anderson
Environmental Assessment Officer
Energy, Resources & Compliance | Planning and Assessment
4 Parramatta Square, 12 Darcy St
PARRAMATTA NSW 2150

5 November 2020

email: melissa.anderson@planning.nsw.gov.au

Dear Melissa,

Re: Berakee Quarry Expansion Project – Environmental Assessment Requirements ID No. 1488 – Designated Development

Thank you for your email of 9 August 2020 seeking input to Secretary Environmental Assessment Requirements (SEARs) for the above development. In relation to this matter that has been referred to NRAR for comment, I've reviewed the proposal and can confirm this is not a matter for NRAR to advise on. This is because it does not require a licence/lease under the Mining Act, the proponent is not a public authority (such as Council), and a Controlled Activity Approval under the Water Management Act is not required.

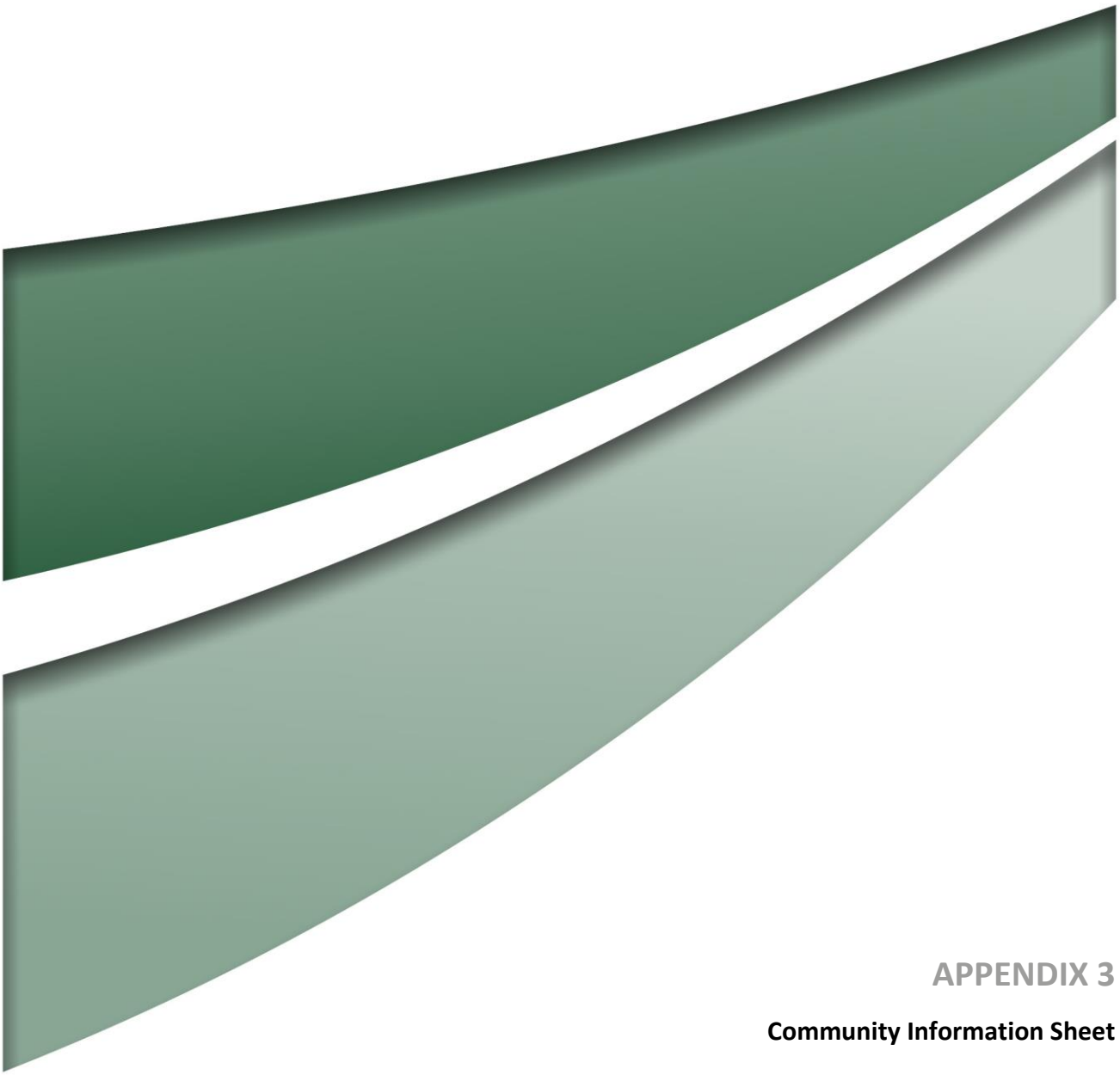
WaterNSW is the relevant agency to consider any potential approval and licensing requirements and relevant assessment considerations for surface water or groundwater impacts from the development. This would include consideration of the groundwater assessment for potential aquifer interference, associated licensing/approval requirements, and submission of any relevant General Terms of Approval if the matter has been referred as integrated development.

NRAR is aware that the private haul road crosses over a 3rd order waterway (Calf Pen / Boothaguy Creek) via an existing bed level crossing. If any upgrades are planned to this crossing, or should any activities be included in the final development application that are within waterfront land, NRAR will need to be consulted in regards to the requirement for a Controlled Activity Approval under the Water Management Act 2000.

For further information, please contact me on 0428162097 or Tim.Baker@nrar.nsw.gov.au

Yours sincerely

Tim Baker
Senior Water Regulation Officer
Natural Resources Access Regulator
Department of Planning, Industry and Environment



APPENDIX 3

Community Information Sheet

Community Information Sheet

Berakee Quarry Expansion Project - Collie, NSW

October 2020

Berakee Quarry

Berakee Quarry ("the Quarry") was approved in 2017 by Gilgandra Shire Council on 29 January 2018 allowing for the extraction of up to 80,000 tonnes (t) of basalt from an area not exceeding 2 hectares on Lot 45 DP752563 (144 Ostlers Lane). The development consent was subsequently modified on 25 June 2019 to allow for the use of a private haulage road over Lot 52 DP43558. **Figure 1** identifies the location of the Quarry, private haul road and approved area of disturbance.

Regional Hardrock

Regional Hardrock (the quarrying division of the Maas Group), acquired the Quarry in August 2020, with the intent to increase the approved disturbance area and production limit so as to supply the construction of the Inland Rail Project as well as local and regional demand for high quality hard rock aggregates and gravels. Regional Hardrock is a privately owned company established to operate quarries, market the materials produced and maintain mobile equipment for hire.

Regional Hardrock recognises that genuine partnerships with our local communities are an essential part of our business success. We are committed to developing and maintaining long-term relationships with all stakeholders by communicating openly, honestly and in a transparent manner.

What is Proposed?

Regional Hardrock is seeking approval to expand Quarry operations to allow for the extraction of up to 4.95 million tonnes (Mt) of tertiary-aged basalt over 20 years (the Project). The Project would include campaign crushing and screening to produce basalt aggregates and construction materials for road base, road sheeting, infrastructure construction, rail ballast and concrete manufacture. The Project would also include ancillary activities including the expansion of stockpiling areas and surface water controls. The Project would supply hard rock materials to the Inland Rail Project.

The Project would include two stages. The first stage would involve production to supply the Inland Rail Project and local demand of 2.3 Mt over five years (up to 490,000 tpa). The second stage would involve production to satisfy local and regional demand estimated to be 2.4 Mt over 20 years (up to 250,000 tpa).

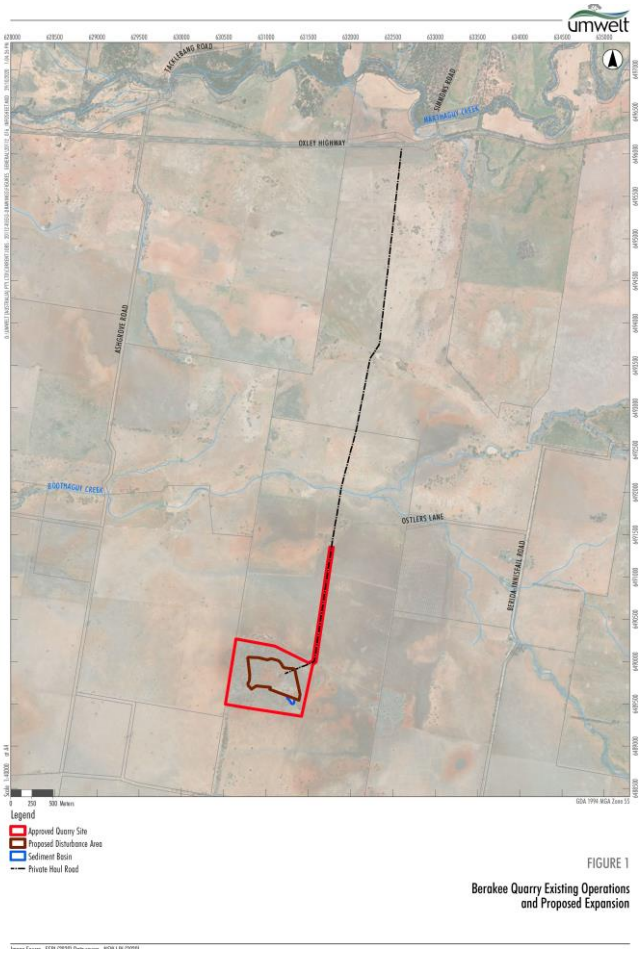


FIGURE 1
Berakee Quarry Existing Operations and Proposed Expansion

In order to produce 4.95 Mt of hard rock, and supply at a rate of up to 490,000 tpa, the extraction area and stockpiling areas of the Quarry would be increased. **Figure 1** illustrates the approximate areas of the Project, namely an extraction area of 8.4 ha and stockpiling area of 7.8 ha.

The basalt will be blasted and the fractured rock initially transported to surface by haul trucks where it will be crushed and screened to produce variously sized aggregates and other rock products. As the extraction area is established, Regional Hardrock intend on relocating the crushing infrastructure from surface to the Quarry extraction area floor to reduce impacts.

In order to accommodate the expanded Stage 1 operations, an increase in the average daily truck movements from 14 to 70 is proposed. Daily truck movements would decrease for Stage 2.

Hours of operation would increase slightly (from those currently approved).

- Extraction, crushing and stockpile management: 6.00 am to 6.00 pm Monday to Saturday
- Blasting: 9.00 am to 3.00 pm Monday to Friday
- Transport: 5.00 am to 10.00 pm Monday to Saturday.

Strategic Planning Context

The Project will be designated development and integrated development under the *Environmental Planning and Assessment Act 1979* (EP&A Act). The development is integrated on the basis that a variation to Environment Protection Licence 21093 would be required if the Project is approved.

As designated development, the Project will require an Environmental Impact Statement (EIS) to accompany the development application. Secretary's Environmental Assessment Requirements as issued by the Department of Planning, Industry & Environment have been sought which will identify the assessment requirements to be addressed in the EIS.

The Western Regional Planning Panel will be the determining authority for the extension Project (as extractive industries that are designated development are classed as regionally significant development under Schedule 7 of the State Environmental Planning Policy (*State and Regional Development 2011*). Once determined, Gilgandra Shire Council will be the consent authority.

Community Involvement

Regional Hardrock seeks community input on matters to be addressed in the EIS. This could include environmental, economic or social matters you consider important and relevant to the assessment of the Project. We welcome your input on any relevant matters or local knowledge that you believe should be considered.

Information gathered will be collated and considered as part of the EIS. Once completed, an opportunity will be provided to you to review the EIS and comment on the assessment and raise concerns, request additional information or indicate support.

How to Provide your Feedback

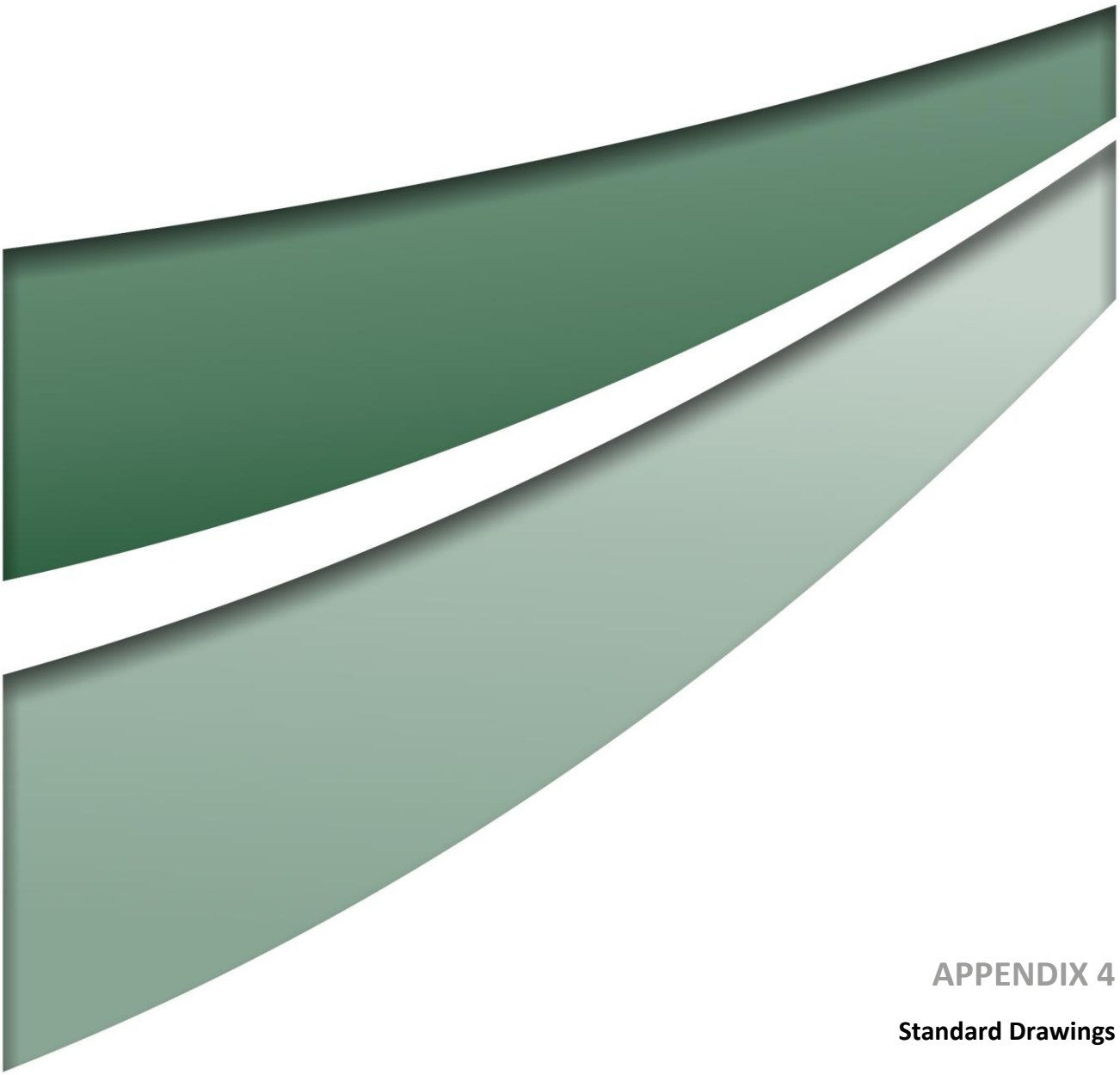
Regional Hardrock invites you to provide feedback via email or phone to Richard Tomkins (Regional Hardrock) or Alex Irwin (Umwelt). We look forward to your input and request any feedback by 13 November 2020.

Richard Tomkins

Regional Hardrock
Email: richard@regionalgroupaustralia.com.au
Ph: 0408 353 154

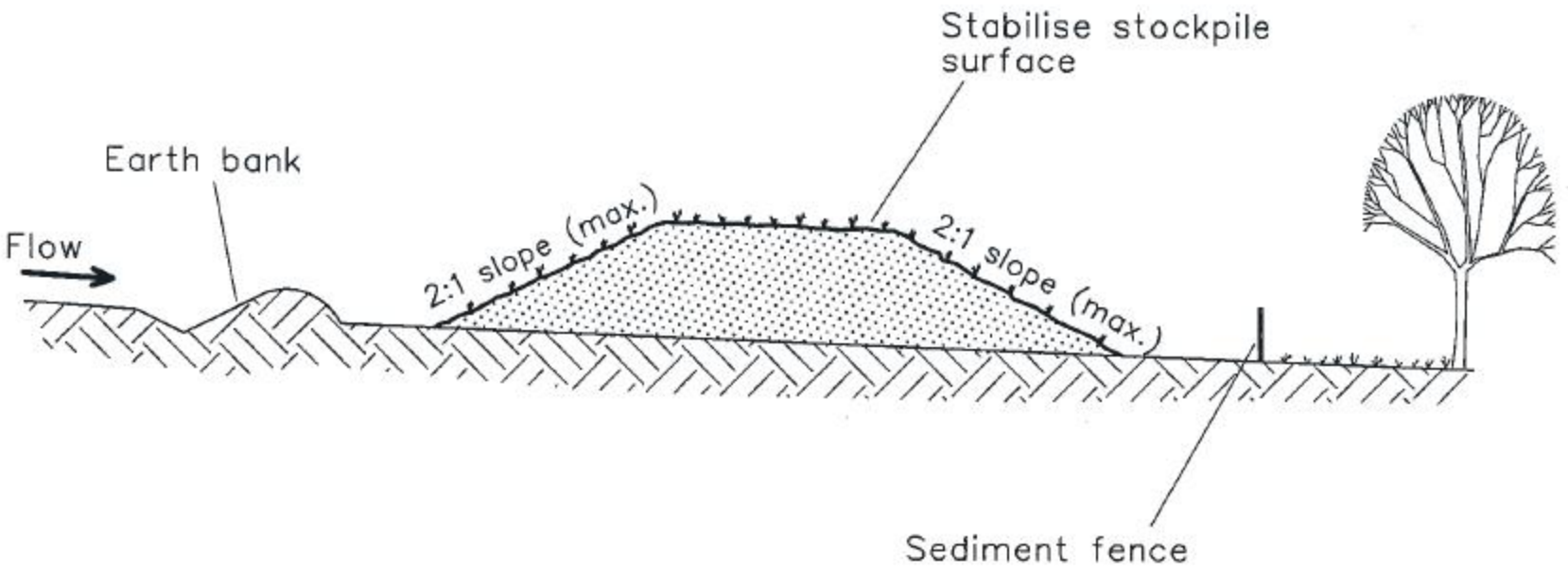
Alex Irwin

Umwelt (Australia) Pty Ltd
Email: airwin@umwelt.com.au
Ph: 0436 606 529



APPENDIX 4

Standard Drawings

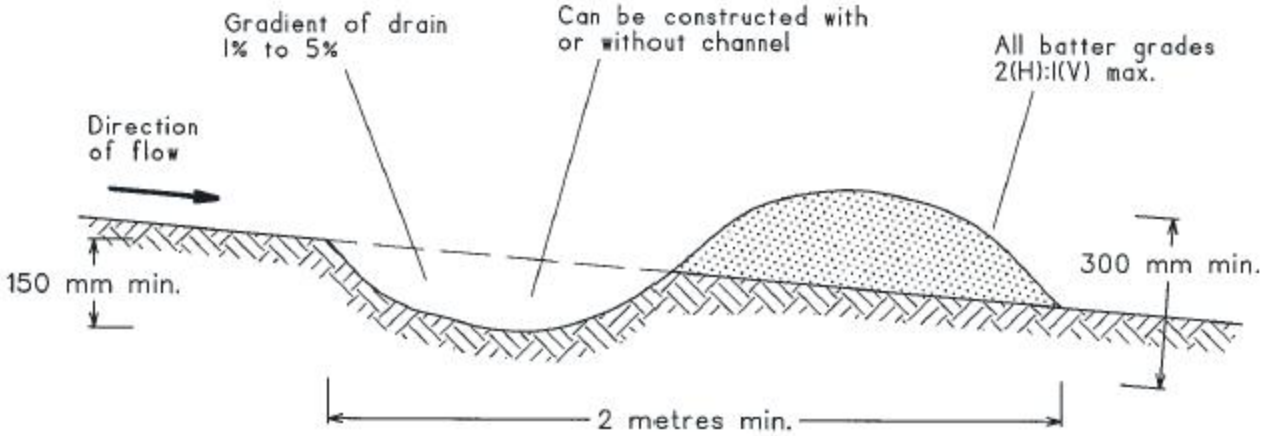


Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

STOCKPILES

SD 4-1



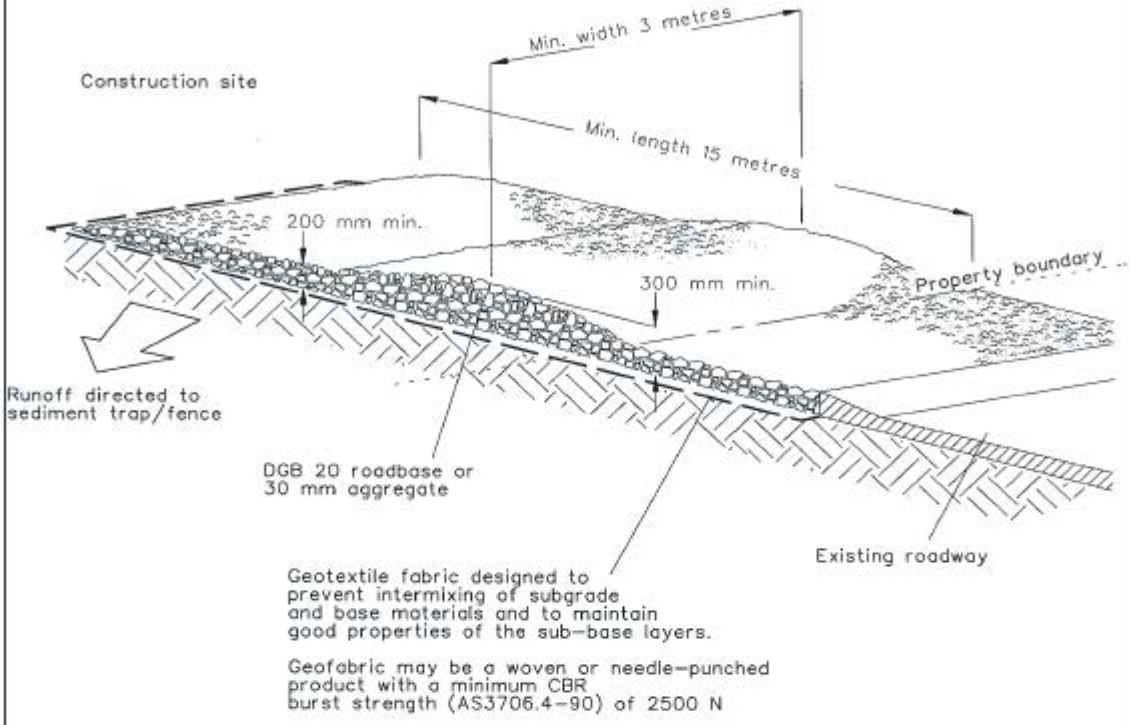
NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

EARTH BANK (LOW FLOW)

SD 5-5

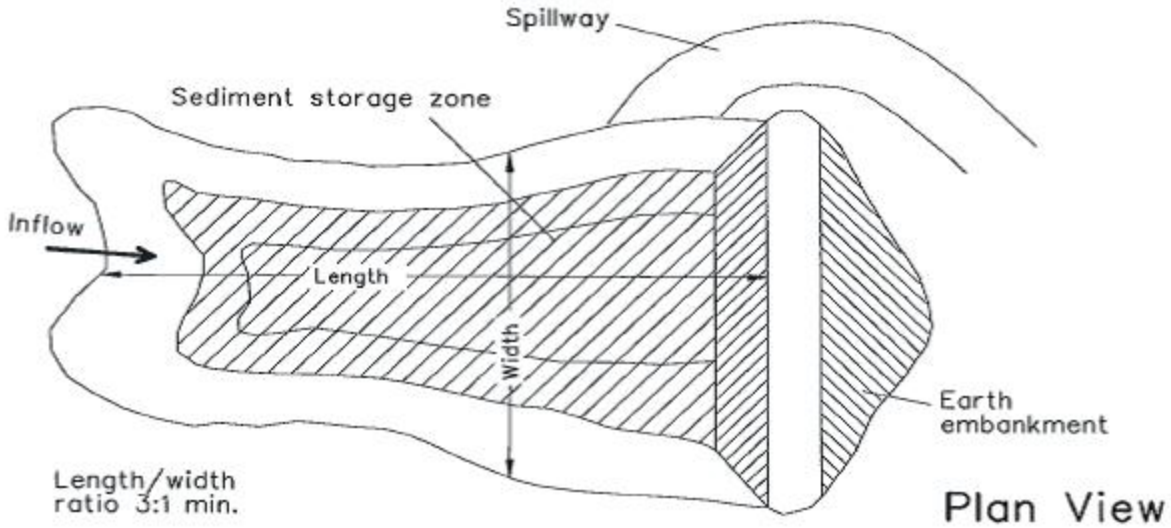


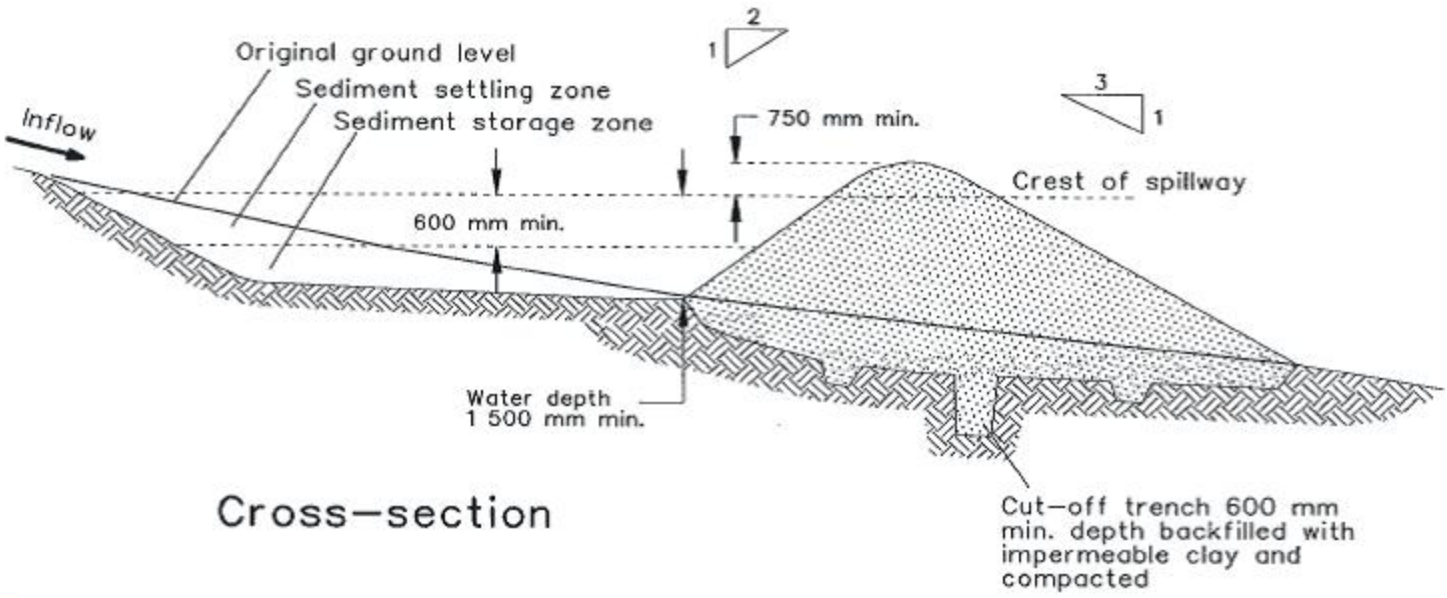
Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200-mm thick pad over the geotextile using road base or 30-mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

STABILISED SITE ACCESS

SD 6-14





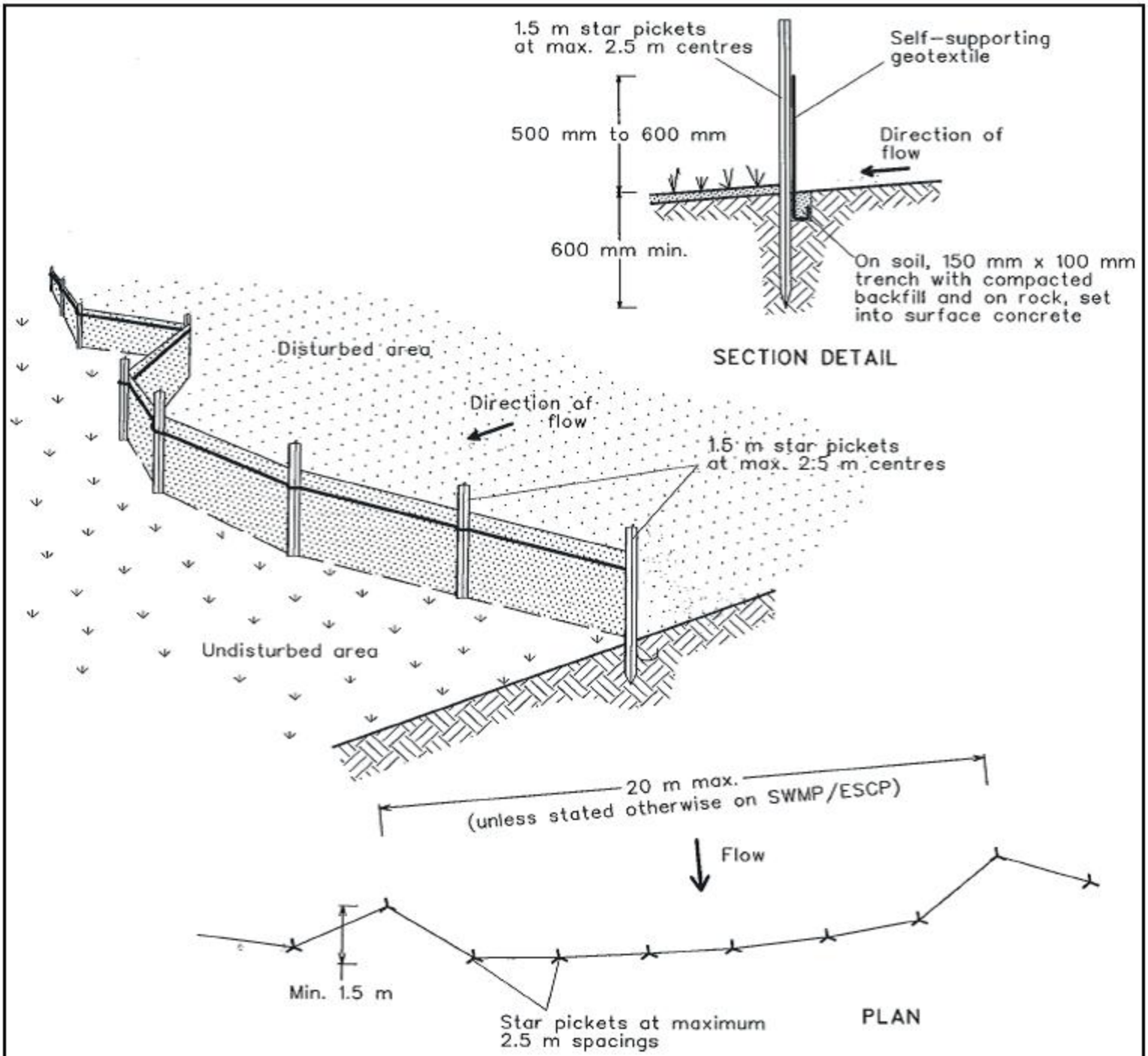
Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1,200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

EARTH BASIN - WET

(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

SD 6-4

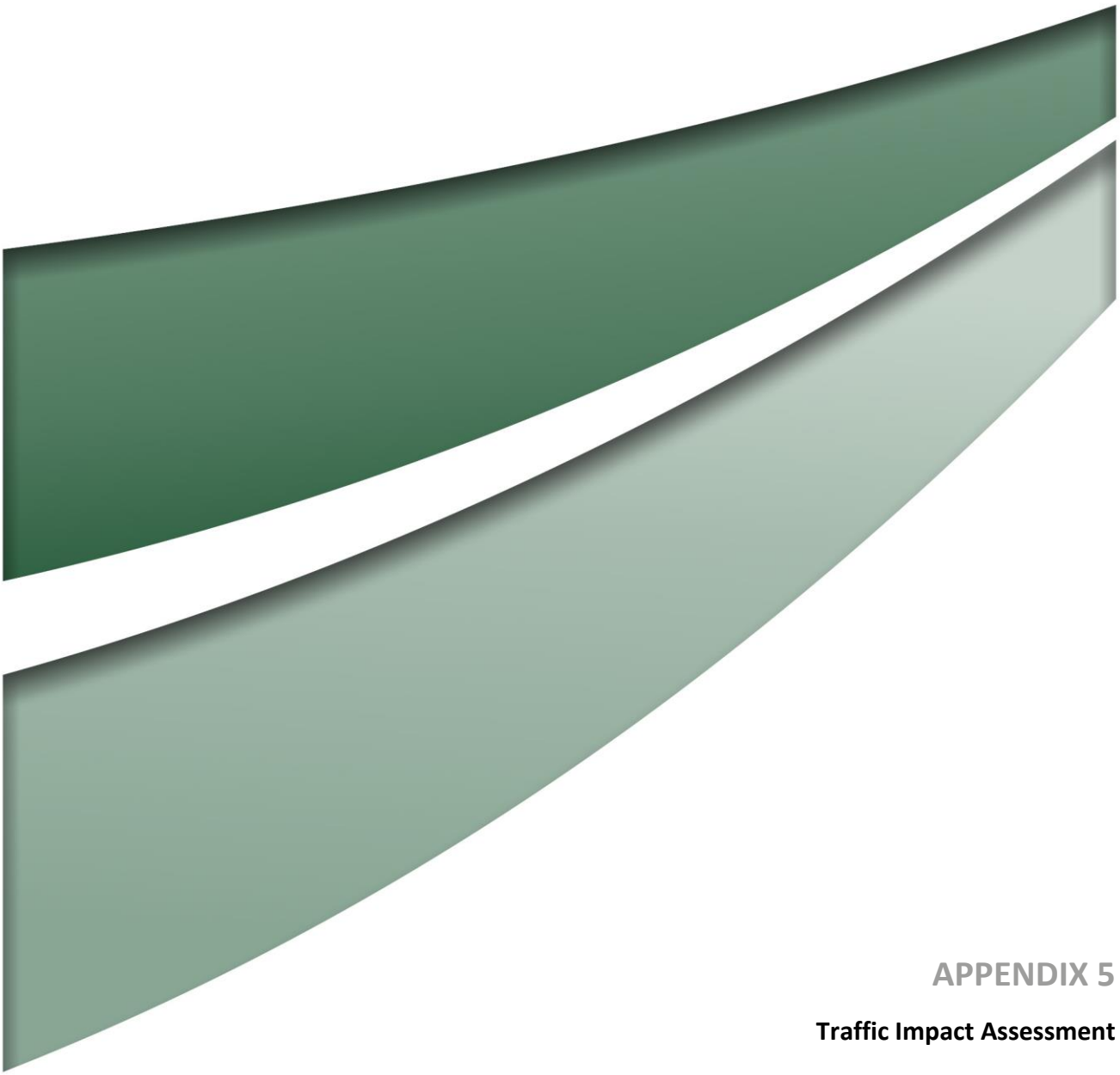


Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE

SD 6-8



APPENDIX 5

Traffic Impact Assessment

Traffic Impact Assessment

Berakee Quarry

80021014

Prepared for
Umwelt (Australia) Pty Ltd

20 January 2021

Cardno

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1	5/11/2020	Draft	Sabal Sharma	Hayden Calvey
2	7/12/2020	Draft Final-Updated Based on Client Comments	Sabal Sharma	Hayden Calvey
3	20/01/2021	Final- Inclusion of SEAR's	Sabal Sharma	Hayden Calvey

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

Table of Contents

1	Introduction		1
	1.1	Background	1
	1.2	SEARs	1
	1.3	Scope of Works	2
	1.4	Reference Documents	2
	1.5	Report Structure	2
2	Assessment Methodology		3
	2.1	Site Assessment	3
	2.2	Data Collection	3
	2.3	Parking Analysis	3
	2.4	Traffic Impact Analysis	3
	2.5	Mitigation Measures	3
3	Existing Conditions		4
	3.1	Site Location	4
	3.2	Road Hierarchy	5
	3.3	Speed Zoning	5
	3.4	Heavy Vehicle and Freight	6
	3.5	Fire Trails	7
	3.6	Crown Roads	8
	3.7	Crash History	8
	3.8	Traffic Volumes	9
	3.9	Road Performance	11
	3.10	Public Transport	11
4	Existing Site Operation		13
5	Proposal Description		15
6	Parking Assessment		17
	6.1	Car Parking Requirement	17
	6.2	Disabled Parking Requirements	17
	6.3	Motorcycle Parking Requirement	17
	6.4	Bicycle Parking Requirement	17
	6.5	Service Vehicle Requirements	17
7	Operational Traffic Assessment		18
	7.1	Existing Traffic Generation	18
	7.2	Assessment Years	18
	7.3	Future Development Traffic Generation	19
	7.4	Net Traffic Generation	20
	7.5	Development Traffic Distribution	20
	7.6	Cumulative Traffic Considerations	20

7.7 Traffic Distribution Summary 20
7.8 Intersection Assessment 23
7.9 Turn Warrant Assessment 25
7.10 Midblock Assessment 28
8 Construction Traffic Impact Considerations 30
9 Mitigation and Management Measures 31
9.1 Operation 31
9.2 Construction 31
10 Conclusion 32

Appendices

Appendix A Sidra Summary

Tables

Table 1-1 Berakee Quarry SEARs 1
Table 3-1 Oxley Highway Traffic Volumes 10
Table 3-2 Peak Hour Estimation 10
Table 3-3 Oxley Highway Existing Performance 11
Table 3-4 Gilgandra School Bus Frequency 12
Table 4-1 Approved quarry operations 13
Table 5-1 Proposed Development 16
Table 7-1 Existing Traffic Demand 18
Table 7-2 Existing traffic generation 18
Table 7-3 Existing Traffic Demand 19
Table 7-4 Future Traffic Demand 19
Table 7-5 Future Traffic Demand 19
Table 7-6 Net Truck Traffic Increase 20
Table 7-7 Employee Traffic Increase 20
Table 7-9 Intersection Performance 24
Table 7-10 Level of Service and Service Flows Rates 29
Table 7-11 Mid-Block Volumes 29
Table 7-12 Mid-Block Performance 29

Figures

Subject Site 4
Figure 3-2 Oxley Highway Speed Zoning 6
Figure 3-3 Existing Freight Network 7

Figure 3-4	Fire Trails	7
Figure 3-5	Crown Roads	8
Figure 3-7	Count Location	10
Figure 3-8	Gilgandra School Bus Route	11
Figure 4-2	Existing Quarry	14
	Proposed Quarry Site Layout	15
Figure 7-1	2025 Stage 1 AM/PM Peak	21
Figure 7-2	2025 Stage 1 Saturday Peak	21
Figure 7-3	2045 Stage 2 AM/PM Peak	22
Figure 7-4	2045 Stage 2 Saturday Peak	22
Figure 7-5	Oxley Highway/Private Haul Road Intersection layout	24
Figure 7-6	2025 Turn Warrant Assessment (AM/PM peak hour)	25
Figure 7-7	2025 Turn Warrant Assessment (SAT peak hour)	26
Figure 7-8	2045 Turn Warrant Assessment (AM/PM peak hour)	26
Figure 7-9	2045 Turn Warrant Assessment (SAT peak hour)	26
Figure 7-10	Service Flow Rates Definition of the Flow Boundaries between Levels of Service	28

1 Introduction

Cardno has been commissioned by Umwelt (Australia) Pty Limited, on behalf of Regional Hardrock Gilgandra Unit Trust to undertake a traffic and parking impact assessment to assess the potential impacts of a proposed expansion to operation at Berakee Quarry ("the Quarry"). The proposal seeks to increase the extraction area (to allow for extraction of up to 4.7 million tonnes (Mt) of basalt), associated disturbance for processing and stockpiling (for up to 250,000 t of product) and the production rate (up to a maximum of 495,000 tonnes per annum (tpa)). Transport of quarry products would continue to be via an established and approved private haul road between the Quarry and Oxley Highway over neighbouring properties. The Quarry is intended to be an important supplier of rock to the Inland Rail Project over the next couple of years.

This assessment has been undertaken to assess the impacts of the Quarry on traffic, transport, and local road infrastructure, as well as demonstrate the compliance of the development with relevant standards and Council controls where relevant.

1.1 Background

The Quarry was initially approved by Gilgandra Shire Council (DA 2017/218) to deliver up to 80,000 t of basalt via local roads Ostlers Lane and Berida-Innisfail Road to the Oxley Highway.

In 2019 the development consent was modified (DA 2017/218A) to approve access from the Quarry to the Oxley Highway via a private haul road over the Berakee and Wilgaroo properties and a BAL/BAR intersection. The intersection upgrade has been completed with a slight realignment of the primary lanes of travel to the south and converting the current eastbound lane to the pass-by lane of the BAR treatment. Transport of Quarry products via Ostlers Lane and Berida-Innisfail Road is no longer permissible.

The proposal seeks to increase production (up to a maximum of 495,000 tpa) with transport continuing via the approved private haul road. The quarry is intended to be an important supplier of rock to the Inland Rail Project over the next couple of years.

1.2 SEARs

By virtue of the proposal being for an extractive industries development of greater than 2ha in disturbance area and production greater than 30,000 m^3, the proposal represents designated development in accordance with Schedule 3 of the *Environmental Planning & Assessment Regulation 2000* (EP&A Reg). As designated development for the purpose of extractive industry, the development is also identified as Regional Development in accordance with Schedule 7 of State Environmental Planning Policy (SEPP) (State and Regional Development) 2011. As the resource which is the subject of the development application is less than 5 Mt and the production rate less than 500,000 tpa, the development is not State Significant Development (SSD) in accordance with this SEPP.

SEARs for the key traffic and transport issues for the project and the associated infrastructure are listed in **Table 1-1**. **Table 1-1** also indicates where each issue is addressed in this report.

Table 1-1 Berakee Quarry SEARs

SEARs	Section of this report where item is addressed in further detail
Accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for transportation of quarry products;	Section 7 Section 5
An assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road networks, detailing the nature of the traffic generated, transport routes, traffic volumes and potential impacts on local and regional roads;	Section 7
An assessment of cumulative traffic impacts on local and State road networks;	Section 7
A description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network (particularly the proposed transport routes) over the life of the development;	Section 9

Evidence of any consultation with relevant roads authorities, regarding the establishment of agreed contributions towards road upgrades or maintenance; and	No contributions identified.
A description of access roads, specifically in relation to nearby Crown roads and fire trails;	Section 3

1.3 Scope of Works

The main objective of this report is to evaluate the traffic impacts that are generated by the proposed increase in production, its associated impact on the surrounding road network. Cardno's scope of works for this study includes:

- Reviewing existing transport network conditions
- Estimate the traffic generated by the proposed development including likely distribution
- Analysis of the development's impact on the surrounding road network and intersection network at the design year including impacts on capacity, condition, safety, and efficiency

1.4 Reference Documents

- Guide to Traffic Generating Developments (TfNSW, 2002);
- Technical Direction (TfNSW, TDT 2013/04a);
- *O*xley Highway Draft Corridor Strategy (TfNSW, 2016);
- Austroads Guide to Road Design Part 4A (Austroads 2017);
- Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings (Austroads 2013);
- Guide to Traffic Management Part 12: Traffic Impacts of Developments (Austroads, 2016);
- NSW Long Term Transport Masterplan (TfNSW, 2012); and
- Road Design Guide (RTA now TfNSW) including Austroads supplements

1.5 Report Structure

Section 1 – Introduction
Overview of the proposal and requirements of the traffic and transport assessment

Section 2 – Assessment Methodology
Outlines the traffic and transport assessment methodology

Section 3 – Existing Conditions
Examination of the site and existing traffic and transport condition

Section 4 – Existing Site Operation
Summary of the existing consent condition of the site

Section 5 – Proposal Description
Summary of the proposal

Section 6 – Parking Assessment
Assessment of the car parking requirements due to the proposal

Section 7 – Operational Traffic Assessment
Examination of the operational traffic impact due to the proposal

Section 8 – Construction Traffic Impact Consideration
Outline traffic and transport impact during construction

Section 10 – Conclusion
Summarises the findings of the traffic and transport assessment

2 Assessment Methodology

2.1 Site Assessment

To appropriately review the Proposal's traffic and transport impact, the existing road and surrounding environs has been reviewed and assessed to understand the existing conditions. This includes undertaking a desktop review of the Proposal's locality, traffic data collection, review of other transport modes and road safety conditions.

2.2 Data Collection

At the time of this application, the traffic conditions on Oxley Highway and around the Proposal site are potentially impacted by the COVID-19 pandemic. The impact of COVID-19 on people's travel behaviour (both for commuting and recreational) is largely dependent on the NSW Government restrictions at the time as well as employer requirements (as an example, staged return to work or full time working from home). It is however acknowledged that the impact on traffic in this rural locality may be less noticeable than the central business districts.

The source of data is based on information supplied by the operator with regard to the existing operations (and forecasts) as well as a review of publicly available data from Transport for NSW (TfNSW) traffic volume viewer platform.

2.3 Parking Analysis

Council's Development Control Plan (DCP) is applicable and the parking requirements listed within Council's DCP have been taken into consideration where deemed necessary. For the most part, car parking for employees and visitors has been determined on a first principle approach based on existing and forecast operating conditions.

2.4 Traffic Impact Analysis

The traffic impact of the proposal has been determined through intersection analysis, turn warrant criteria and midblock assessment. Traffic modelling has been undertaken using SIDRA version 8 which is widely accepted by NSW Council's and TfNSW as a suitable software package for isolated intersections such as the intersection of the private haul road and the Oxley Highway. The turn warrant assessment is based on the relevant Austroads Guide to Road Design guideline whilst the midblock assessment is based on the criteria within both the TfNSW Guide and Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis.

The assessment has considered Stage 1 and Stage 2 of the application, each with different traffic profiles and design years. Stage 1 is characterised as operation conditions to meet the needs to the Inland Rail Project whilst Stage 2 is characterised as the conditions expected post the Inland Rail Project and to meet market demands.

The scenarios assessed for the peak hour assessment are based on the following:

- 2025 Design Year (Base)
- 2025 Design Year (Base + Stage 1 Development)
- 2045 Design Year (Base)
- 2045 Design Year (Base + Stage 2 Development)

The future year assessments include consideration of regional traffic growth along with the arterial road network (being Oxley Highway).

2.5 Mitigation Measures

The impacts of the Proposal in Stage 1 and Stage 2 operation, as well as construction, have been considered and addressed through a range of mitigation measures where necessary. This is to ensure the impact of the Proposal is not detrimental to the safe and efficient operation of the surrounding road network.

3 Existing Conditions

3.1 Site Location

The Quarry Site is located approximately 10 kilometres southeast of Collie, NSW within Gilgandra Shire Local Government Area (LGA). A private haul road, operated by contractual agreement with the owner of Lot 2 DP1265657 (“Berakee”) and Lot 52 DP43558 (“Wilgaroo”), provides direct access from the Quarry to the Oxley Highway, removing the need to use the local roads.

The Quarry Site is situated within rural properties characterised by open space and isolated dwellings in keeping with the rural surroundings.

The location of the site is shown in **Figure 1-1**.

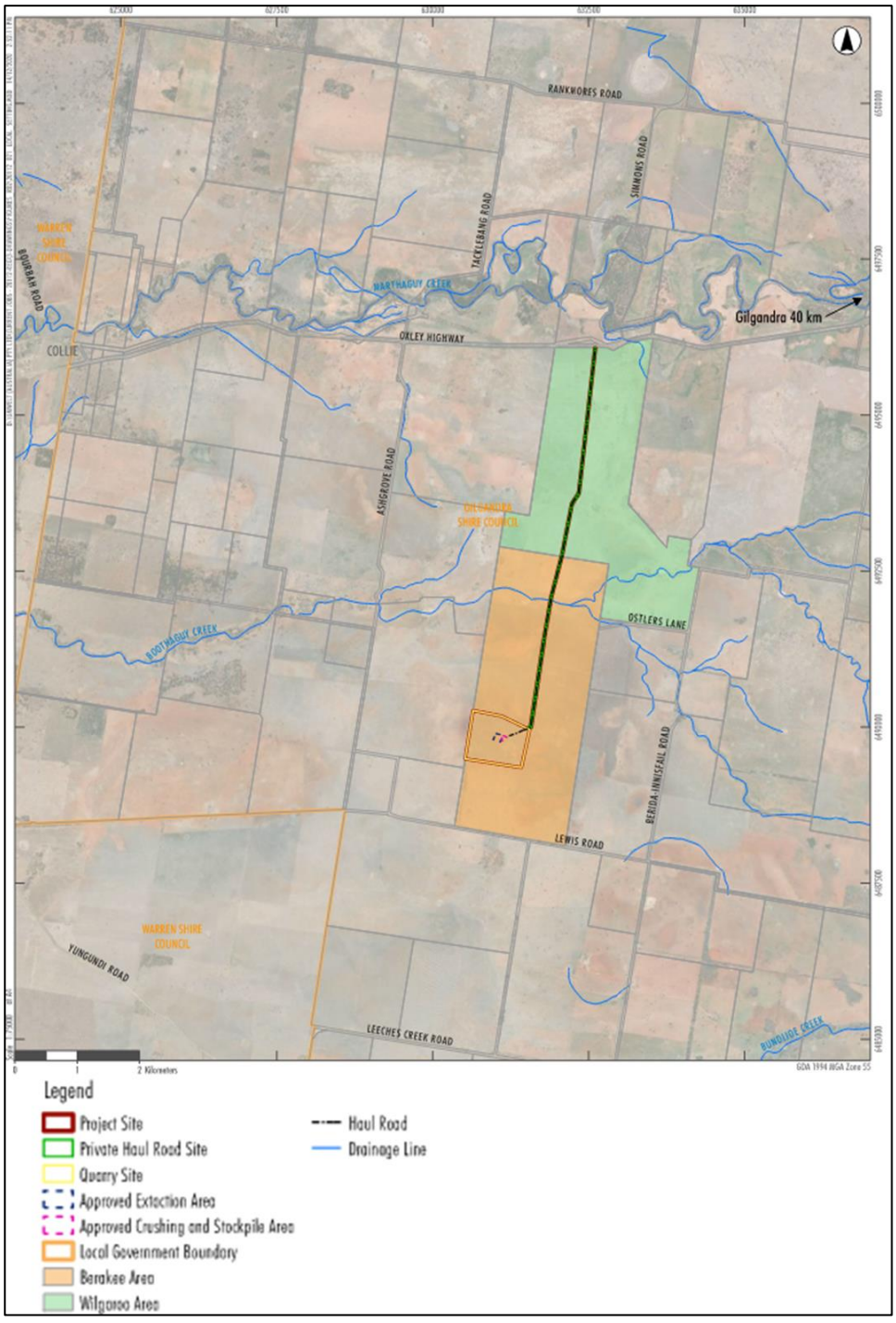


Figure 3-1 Subject Site

3.2 Road Hierarchy

TfNSW in partnership with local government established an administrative framework of State, Regional and Local Road categories to help manage the extensive network of roads.

Typically, state roads are managed and financed by TfNSW, and Regional / Local Roads are managed and financed by Councils. Notwithstanding, Regional Roads perform an intermediate function between the main arterial network of State Roads and Council-controlled Local Roads and therefore received financial assistance from TfNSW.

The key road network relevant to the subject site consists of:

- **Oxley Highway**

The Oxley Highway is a state highway (No 11) under the care and maintenance of TfNSW. The Oxley Highway starts from the Mitchell Highway at Nevertire before journeying to the Castlereagh Highway at Gilgandra, from where it is duplexed with the Newell Highway to Coonabarabran, thence to the New England Highway at Tamworth, with which it is duplexed to Bendemeer, the Thunderbolts Way at Walcha, and the Pacific Highway near Port Macquarie. In the vicinity of its site, Oxley Highway is a two-way two-lane road with a posted speed limit of 110 km/hr with lane widths of 3.5 m and sealed shoulders of at least 0.5 m.

- **Berida Innisfail Road**

Berida Innisfail Road is a local unsealed road under the care and maintenance of the local council. The main section of the carriageway in Berida Innisfail Road is approximately 10 m wide. The road is configured as a two-lane carriageway with one lane provided for each direction.

- **Ostlers Lane**

Ostlers Lane is a local road under the care and maintenance of the local council. The main section of the carriageway in Ostlers Lane is approximately 8 m wide. The road is configured as a two-lane carriageway with one lane provided for each direction.

- **Private Haul Road**

Private Haul Road is a road designed for heavy or bulk transfer of materials by haul trucks. The Private Haul Road traverses portions of the ‘Berakee’ (Lot 2 DP1265657) and ‘Wilgaroo’ (Lot 52 DP43558) properties and provides direct access to the Oxley Highway contractual and right of carriageway arrangements.

3.3 Speed Zoning

The Oxley Highway is subject to the signposted speed restriction of 110km/h. On approach to Collie this speed reduces to 80km/h. **Figure 3-2** provides an overview of the speed zones along the Oxley Highway.

Figure 3-2 Oxley Highway Speed Zoning

3.4 Heavy Vehicle and Freight

TfNSW imposes limitations on heavy vehicle routes throughout the state. Three tiers of mass limits are defined based on vehicle mass and axle group category:

- General Mass Limits (GML): Heavy vehicles with unrestricted access to the road system
- Concessional Mass Limits (CML): Increased mass limits for eligible vehicles, requires accreditation
- Higher Mass Limits (HML): The highest level of mass except for vehicles requiring special permits, requires accreditation, and GPS tracking to manage access and compliance.

Oxley Highway is approved for use by heavy vehicles up to 25/26 metre B-double as shown in **Figure 3-3**.

Figure 3-3 Existing Freight Network

3.5 Fire Trails

Fire Trails surrounding the subject site was reviewed from *NSW Spatial Services.* **Figure 3-4** shows the location of fire trails nearby the study area.

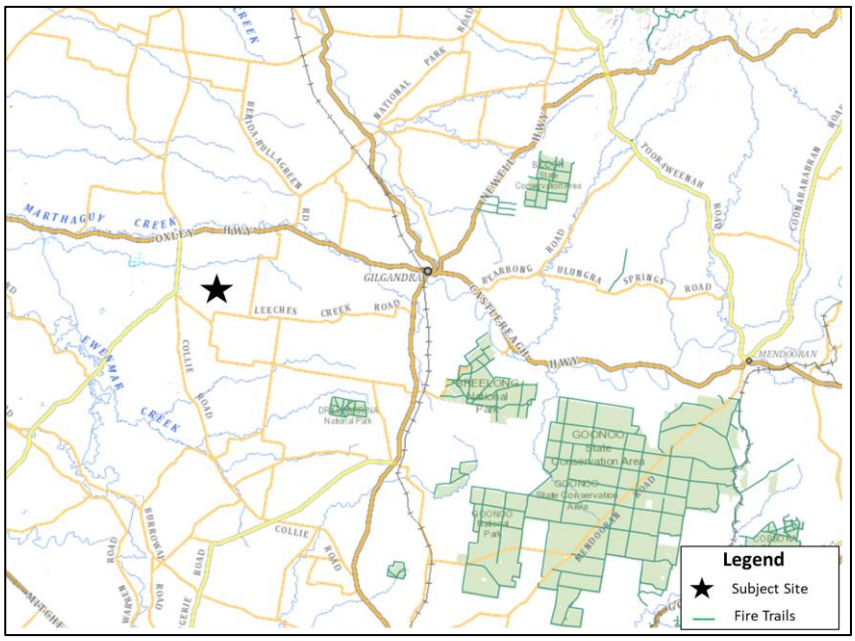


Figure 3-4 Fire Trails

Source: https://portal.spatial.nsw.gov.au/portal/home/webmap/viewer.html?layers=fe9e02f814e345bba2d9e77081faca6c, viewed: 12/01/2021

Figure 3-4 shows there are no fire trails in the immediate surrounding of the subject site however fire trails are provided mostly along the national parks such as Drillwarrina National Park, Breelong National Park etc. The Berakee Quarry proposal will have little to no impact on existing fire trails.

3.6 Crown Roads

The crown roads in the vicinity of the subject site is summarised in **Figure 3-5**. The Berakee Quarry proposal will have little to no impact on existing crown land / roads..

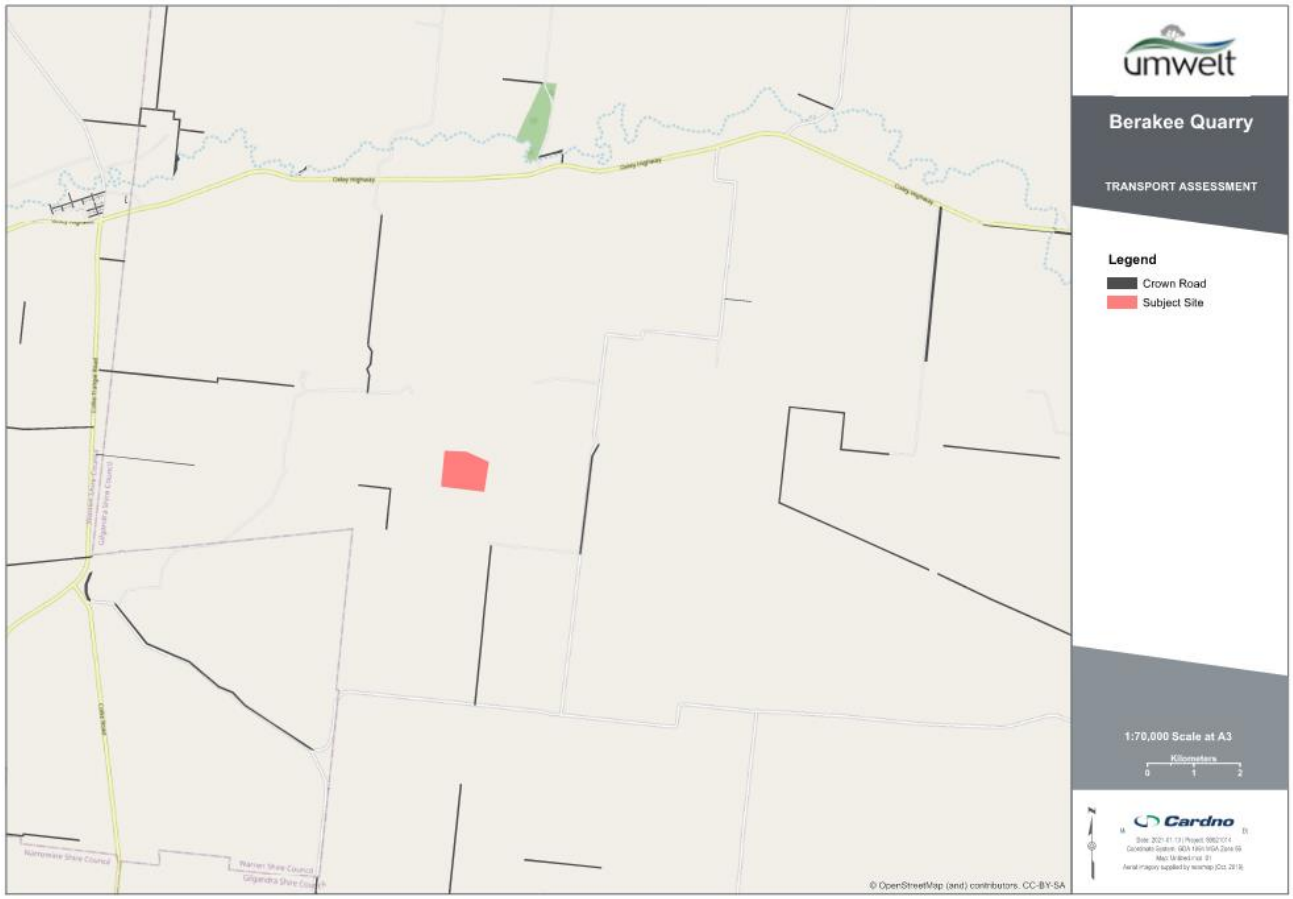


Figure 3-5 Crown Roads

3.7 Crash History

Crash data for the period 2014 to 2018 for the study area was accessed through TfNSW Centre for Road Safety. **Figure 3-6** shows the location of crashes nearby the study area.

Figure 3-6 Crash locations by injury severity within study area between 2014-2018

Source: Crash and casualty statistics, TfNSW via https://roadsafety.transport.nsw.gov.au/statistics/interactivecrashstats/nsw.html?tabnsw=7,viewed 03/9/2020

The following key findings were identified from the analysis of the crash data on the site:

- There were no crashes observed at Oxley Highway at Berida-Innisfail Road intersection, or along the alignment of Private Haul Road intersection.
- Most of the crashes are concentrated near the Oxley Highway / Newell Highway intersection.
- There were two crashes west of Berida-Innisfail Road along the Oxley Highway.
- There was one fatal crash observed along Oxley Highway, however, it is near Gilgandra which is a major town centre.

It is clear from the results above that the existing frequency of crashes is low along Oxley Highway near the subject site, particularly around the Private Haul Road intersection where the vehicles will primarily utilise to enter and exit the subject site. It is expected that the proposal to have no tangible impacts on the crash rates at the subject site.

3.8 Traffic Volumes

Traffic volumes on the Oxley Highway near the intersection of the private haul road and Oxley Highway have been reviewed. Referring to the Oxley Highway Draft Corridor Strategy (TfNSW, 2016) shows provides traffic volume results for the location 980m west of Berida Innisfail Road near Collie. The traffic surveys were conducted on 17 April -30 April 2015. The location of the survey site with reference to the subject site is shown in **Figure 3-7**

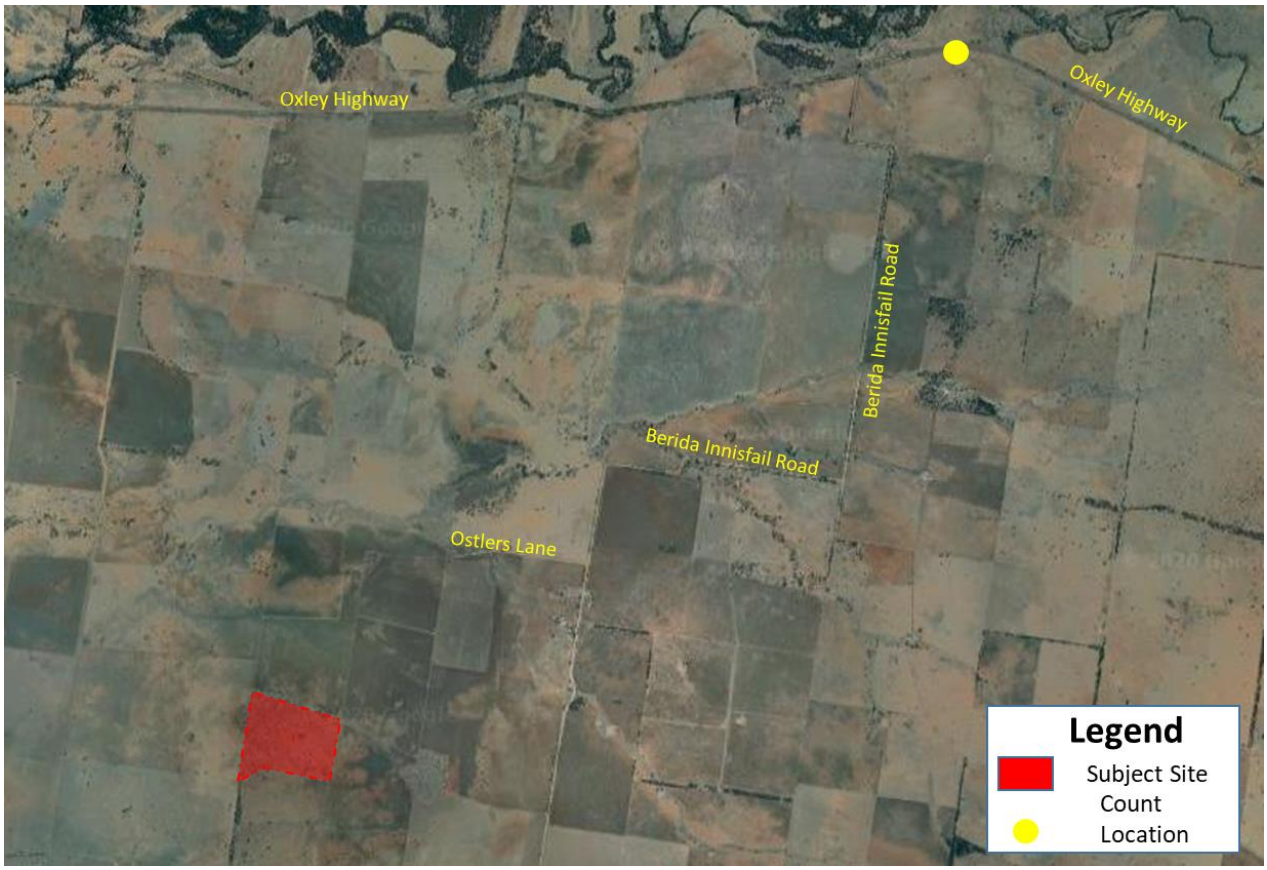


Figure 3-7 Count Location

The traffic volume at this location is summarised in **Table 3-1**.

Table 3-1 Oxley Highway Traffic Volumes

Site	East-Bound (vpd)	East-Bound HV%	West-Bound (vpd)	West-Bound HV%
Oxley Highway (980m west of Berida Bullagreen Road near Collie)	182	29 (15.9%)	186	34 (18.3%)

The strategy document also identifies the annual growth rate of 1.4% has been mentioned strategy from 2015-2035.

As the strategy does not provide a clear indication of peak hour volumes, reference is made to Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings for guidance on this detail. Austroads states that where peak hour volumes or peak hour percentages are not available, assume that the design peak hour volume equals 8% to 10% of the AADT for urban situations and that the design hour volume equals 11% to 16% of AADT for rural situations.

In addition to the Austroads Guide, Cardno has utilised TfNSW's traffic volume viewer platform to obtain the peak hour flow and AADT ratio based on a similar arterial route on the Newell Highway. Cardno has reviewed the count station located 920m south of Balladoran Railway Road, Gilgandra (Station ID: 6146) with results summarised in **Table 3-2**.

Table 3-2 Peak Hour Estimation

Year	Peak	AADT (both Direction)	Peak Hourly Flow (both Direction)	Peak Hour Time	Peak Hourly Flow/AADT Ratio
2019	AM	3,218	258	9.00 am- 10.00 am	8%
	PM	3,218	267	3.00 pm- 4.00 pm	8%
	SAT	3,218	228	9.00 am- 10.00 am	7%

Hence for this assessment the weekday AM/PM peak hour volume is assumed to be 8% of the AADT and Saturday peak hour volume is assumed to be 7% of the AADT.

The range of 11-16% recommended within Austroads is treated as a guide such that reliance on actual data obtained from the Newell Highway count station will be relied upon to inform the peak hour analysis.

3.9 Road Performance

For determining the existing road network performance of Oxley Highway the criteria contained within Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis was utilised. **Table 7-10** (refer to **Section 7.10**) illustrates theoretical road performance under different flow and speed conditions.

Table 3-3 shows the existing road performance.

Table 3-3 Oxley Highway Existing Performance

Road	Direction	AM Peak Hour Flow (veh/hr)	AM Peak LoS	PM Peak Hour Flow (veh/hr)	PM Peak LoS	SAT Peak Hour Flow (veh/hr)	SAT Peak LoS
Oxley Highway	Eastbound	15	A	15	A	13	A
	Westbound	15	A	15	A	13	A

The existing road volumes along Oxley Highway appear to be within acceptable LoS A.

3.10 Public Transport

Based on the Desktop review it was found that there limited regular public transport buses running near the subject site.

It has been found that Gilgandra School Bus (GA 01, GP 02) serviced by Ogdens Coaches runs along Oxley Highway nearby the subject site from Gilgandra to Collie. Also, it has been found that Gilgandra School Bus (GA 06, GP 06) serviced by Ogdens Coaches runs along Berida Innisfail Road.

Figure 3-8 shows the route map of Gilgandra School Bus nearby the subject site.

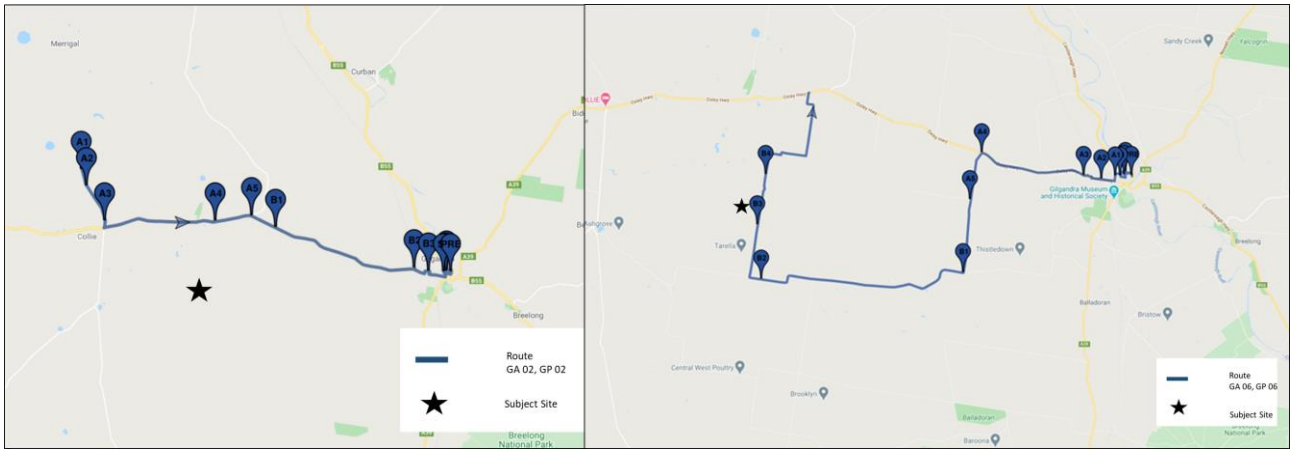


Figure 3-8 Gilgandra School Bus Route

The frequency of the Gilgandra School bus route is shown in **Table 3-4**.

Table 3-4 Gilgandra School Bus Frequency

Route	Peak	First Stop (Time)	Last Stop (Time)
GA 02, GP 02	AM	Cnr Pleasant View Lane/Bourbah Road (7:57 am)	Gilgandra Preschool (8:54 am)
	PM	Gilgandra Public School (3:20 pm)	Cnr Bourbah Road/Pleasant View Lane (4:21 pm)
GA 06, GP 06	AM	Berida-Innisfail Road, Booroona (7:50 am)	Gilgandra Preschool (8:54am)
	PM	Gilgandra Preschool (3:18 pm)	Berida-Innisfail Road, Booroona (4:30 pm)

4 Existing Site Operation

The Quarry was originally approved under DA 2017/218 to produce and deliver up to 80,000 tonnes of basalt via local roads such as Ostlers Lane and Berida-Innisfail Road to the Oxley Highway. In 2019 the development consent was modified (DA 2017/218A) to approve access from the existing quarry to the Oxley Highway via a private haul road over the Berakee and Wilgaroo properties and a Basic Auxiliary Right (BAR) and Basic Auxiliary Left (BAL) intersection

The approved existing quarry operations are summarised in **Table 4-1.**

Table 4-1 Approved quarry operations

Component	Approved
Site description	Lot 1 DP 1265657, Lot 2 DP1265657 (formerly Lot 45 DP752563 at time of approval) Right of carriageway over Lot 52, DP45338
Products	Basalt aggregates and construction materials
Resource size	750,000 t
Production rate	Up to 30,000 m3 (80,000 t) per annum
Quarry life	8-12 years
Disturbance footprint	Up to 2 ha
Extraction area	Up to 1.5 ha
Extraction design	Final floor elevation 240-242 m AHD Final face angle 75-85° Two faces 8-10 m high separated by a single bench 3-5 m wide
Extraction methods	Drill and blast
Extraction equipment	Bulldozer x 1 Drill rig x 1 Excavator x 1 Dump truck x 1 Backhoe x 1 Water cart x 1
Processing and Stockpiling area	Up to 0.5 ha (including material storage, crushing and roads) Small stockpiles maintained within the Processing Area and extraction area subject to available space
Processing operations	Mobile crushing unit, screening and stockpiling of in-situ materials only
Transport routes	Road transport up to B-double arrangement via private haulage route to the Oxley Highway Use of Ostlers Lane and Berida-Innisfail Road up to 30 June 2020
Truck movements	Average truck movements (based on 30 t payload per truck): Daily 14 Weekly 100 Annual 5,000
Water usage	Dust suppression only
Water source	Surface harvesting
Infrastructure and services	No power, water or sewage services to site.
Hours of operation	Monday to Friday 7.00 am to 6.00 pm Saturday 7.00 am to 4.00 pm No work on Sundays or Public Holidays
Blasting	Monday to Friday 9.00 am to 3.00 pm 3 blasts per annum
Employment	2-3 staff plus an additional 2-3 contractors during extraction and processing campaigns 2-3 contract truck drivers during extraction campaigns
Rehabilitation	Final landform to provide livestock shelter and water storage for ongoing grazing

The approved quarry site layout (as sourced from the original Statement of Environmental Effects for the Quarry (RWC, 2017) and referenced by Condition 1 of DA 2017/218A) is shown in **Figure 4-2**.

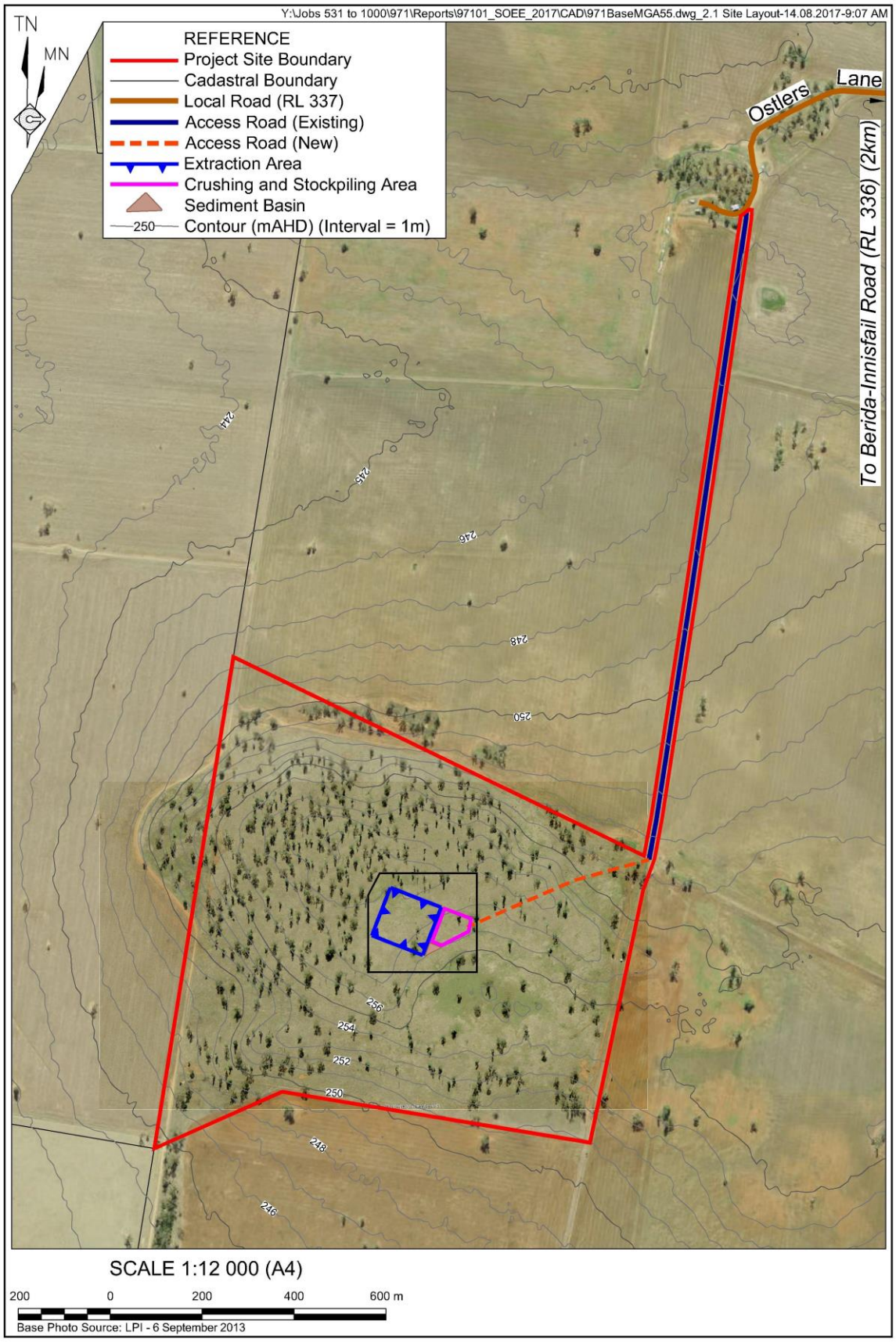


Figure 4-2 Existing Quarry

5 Proposal Description

The Proposal seeks to extend the extraction area / footprint to provide for additional basalt resources (up to 4.95 million tonnes (Mt)) and stockpiling areas (sufficient to hold up to 250,000 tonnes of product). The proposed Quarry Site layout is shown in **Figure 5-1**.

Figure 5-1 Proposed Quarry Site Layout

In order to achieve these increases, a number of associated changes to activities and infrastructure on the site would be required. **Table 5-1** outlines the details of the proposed development.

Table 5-1 Proposed Development

Parameter	Proposed Expansion Project	
Site description	Lot 1 DP 1265657 Right of carriageway over Lot 2 DP1265657 and Lot 52, DP45338	
Products	No change	
Resource size	4,700,000 t	
Production rate	Stage 1 – 2.3 Mt over 5 years (up to 495,000 tpa) Stage 2 – 2.4 Mt over 20 years (80,000 to 120,000 tpa)	
Quarry life	30 years	
Disturbance footprint	Up to 25 ha	
Extraction area	Up to 8.4 ha. No change to current development consent maximum extraction depth of 240 m AHD.	
Extraction design	No change	
Extraction methods	No change	
Extraction equipment	Stage 1 Bulldozer x 1 Drill rig x 1 Excavator x 1 Front-end loader x 1 Dump truck x 2 Backhoe x 1 Water cart x 1	Stage 2 Bulldozer x 1 Drill rig x 1 Excavator x 1 Dump truck x 1 Backhoe x 1 Water cart x 1
Processing operations	On-site crushing, screening and stockpiling of in-situ materials only.	
Transport routes	Predominantly 38 t capacity Truck & Dog arrangements, however, approval for access by vehicles up to B-double arrangement to be retained.	
Truck movements	Average truck movements (for Stage 1) (based on 38 t payload per truck): Daily 70 Weekly 496 Annual 25,000	
Water usage	Dust suppression and processing	
Water source	Surface harvesting from existing sediment basin and storage dams. May be supplemented by groundwater if water balance indicates additional requirements (under licence).	
Infrastructure and services	No power, water or sewage services to site. The following additional infrastructure will be required: • demountable office compound and amenities • rainwater tank for additional potable water supply • parking • diesel generator power • pump-out septic system	
Hours of operation	Monday to Friday 6.00 am to 6.00 pm Saturday 6.00 am to 6.00 pm No work on Sundays or Public Holidays Possible extension of transport into morning (from 5.00 am) and evening (to 10.00 pm) shoulder	
Employment	Up to 24 staff plus contract truck drivers during extraction campaigns.	

6 Parking Assessment

6.1 Car Parking Requirement

Council's DCP does not provide rates for quarry or similar extractive industrial sites. The car parking provision shall be based on the employee requirements of the site. Employees of the existing quarry operation predominantly rely on private cars to travel to/from the quarry. This existing condition is anticipated to continue under the Proposal.

As such, the employee requirements of up to 24 employees will require 24 on-site car parking spaces. Contracted drivers are assumed to travel to/from the site in their own heavy vehicle.

The proposal provides for on-site parking capable of servicing 24 employee parking spaces

6.2 Disabled Parking Requirements

Councils DCP specifies that all developments shall provide a minimum of one (1) disabled car parking space.

The disabled parking space should be designed with a suitable surface compliant with relevant Australian Standards and BCA requirements.

6.3 Motorcycle Parking Requirement

Council's DCP does not strictly specify motorcycle parking for a quarry of similar extractive industrial sites. The need for the motorcycle parking space is not warranted and can be appropriately managed on-site by quarry personnel if the need arises.

6.4 Bicycle Parking Requirement

Council's DCP does not strictly specify bicycle parking for a quarry of similar extractive industrial sites. Based on the Proposals location, the need for bicycle parking spaces is not warranted and therefore not required.

6.5 Service Vehicle Requirements

Servicing and delivery requirements for the Proposal are generally fuel delivery for on-site machinery, maintenance vehicles for on-site machinery, and other miscellaneous deliveries.

The frequency of deliveries to the Quarry is currently low and is expected to remain low for the Proposal. The design vehicle for deliveries will generally be rigid vehicles in most cases and not exceeding the B-Double and Semi-trailer vehicle types.

7 Operational Traffic Assessment

7.1 Existing Traffic Generation

7.1.1 Operational Traffic

Table 7-2 shows the average truck movements based on a 30 tonne payload per truck provided by the operator. It should be noted that the average truck movement includes two-way movement.

Table 7-1 Existing Traffic Demand

Demand	Average Truck Movement
Daily	14
Weekly	100
Annual	5,000

The existing peak hour trips for produce up to 80,000 tonnes of basalt annually is shown in **Table 7-2**

Table 7-2 Existing traffic generation

Quantity (tpa)	Hours of Operation	No of Work Hours in a Day	Average Daily Truck Movement	No of Trips per Hour
80,000 tonne	Weekday: 7.00 am to 6.00 pm	11	14	1
	Saturday: 7.00 am to 4.00 pm	9	14	2

Although the number of truck movements averaged over the transportation hours of the Quarry equates to 1 veh/hr on a weekday and 2 veh/hr on Saturday.

However based on the information provided by the client the approved quarry limit is up to 10 veh/hr. Hence for a conservative assessment peak hour traffic volumes of 10 truck movements per hour is used to inform this assessment.

7.1.2 Employee Traffic

The existing quarry employee traffic consists of 2-3 staff plus additional contractors only during extraction and processing campaigns.

It is expected that all employees/contractors will use motor vehicles as their principal transport to and from the Quarry. All employee vehicle trips will be light vehicle trips with travel to the Quarry generally prior to 7.00 am. Employee traffic exiting the Quarry will be more variable, however, it is expected the majority of employees will leave the Quarry between 4.00 pm and 6.15 pm each day. Employees will therefore arrive and leave the quarry outside the peak hours of the Oxley Highway/Private Haul Road intersection.

7.2 Assessment Years

As part of this study, there is a need to assess the intersection of the private haul road and the Oxley Highway intersection. The intersection upgrade has been completed with a slight realignment of the primary lanes of travel to the south and converting the current eastbound lane to the bypass lane of the BAR treatment at the intersection.

It is understood that the extraction operations for the Project would be undertaken over two stages:

- **Stage 1** – extraction of approximately 2.3 Mt over 5 years at a maximum of 495,000 tpa to supply hard rock materials to the Inland Rail Project
- **Stage 2** – extraction of 2.4 Mt over 20 years at a production rate of between 80,000 and 120,000 tpa following completion of the construction of the Inland Rail Project, to supply hard rock products to local markets.

The assessment year for Stage 1 is assumed to be the year 2025 coinciding with the assumed construction activity of the Inland Rail Project. This is considered to be the peak period based on the background growth assumptions being included in the modelling (acknowledging that the construction of the Inland Rail Project is likely to be nearing completion and thus traffic volumes reducing). For Stage 2 the assessment year is assumed to be the year 2045 (20 years following the completion of Stage 1).

The assessment years are conservative as it will account for additional background traffic growth described in **Section 3.8** as well.

7.3 Future Development Traffic Generation

7.3.1 Stage 1

7.3.1.1 Operational Traffic

The average truck movements for Stage 1 is based on a 38-tonne payload per truck as determined by the operator.

The future traffic demand anticipated due to the increased extraction production to a total of 495,000 tonnes per year is shown in **Table 7-3.**

Table 7-3 Existing Traffic Demand

Demand	Average Truck Movement
Average truck payload	38 tonne
Annual production	490,000 tonnes
Required truckloads per annum (required truck movements)	13,000 (26,000)
Average truckloads per day (average truck movements)	35 (70)

It should be noted that the 70 average truck movement per day includes two-way movement. The Stage 1 peak hour trips for produce up to 495,000 tonnes of basalt annually is shown in **Table 7-4**.

Table 7-4 Future Traffic Demand

Quantity (tpa)	Hours of transportation	No of Work Hours in a Day	Average Daily Truck Movement	No of Trips per Hour
490,000 tonne	Weekday: 5.00 am to 10.00 pm	17	70	4
	Saturday: 5.00 am to 10.00 pm	17	70	4

Although the proposed truck movements averaged over the proposed transportation hours of the Quarry equates to 4 veh/hr on weekday and Saturday the proposed quarry peak hour movements is estimated to be up to 20 veh/hr based on similar quarry sites. Hence for a conservative assessment, the proposed peak hour traffic volumes of 20 truck movements per hour is used to inform the Stage 1 assessment.

7.3.1.2 Employee Traffic

During Stage 1, it is assumed that there will be up to 24 staff plus contract truck drivers during extraction campaigns. However, the employees will therefore arrive and leave the quarry outside the peak hours of the Oxley Highway/Private Haul Road intersection.

7.3.2 Stage 2

7.3.2.1 Operational Traffic

The increase in trips has been linearly calculated based on the increase from 80,000 to 120,000 tpa (factor of 1.5). Therefore, the existing 14 trips per day currently occurring is estimated to increase to 21 trips per day

The future traffic demand anticipated due to the increased extraction production is shown in **Table 7-5.**

Table 7-5 Future Traffic Demand

Quantity (tpa)	Hours of transportation	No of Hours in a Day (Excluding school time)	No of Trips Per Day	No of Trips per Hour
120,000 tonne	Weekday: 5.00 am to 10.00 pm	17	21	1
	Saturday: 5.00 am to 10.00 pm	17	21	1

Although the proposed truck movements averaged over the proposed transportation hours of the quarry equates to 1 veh/hr on weekdays and Saturdays, the peak hour assessment will be based on the 20 veh/hr for the Stage 2 assessment.

7.3.2.2 Employee Traffic

During Stage 2 employment would revert to a level similar to that of the existing approved development and as summarised in **Section 7.1.** However, the employees will therefore arrive and leave the quarry outside the peak hours of the Oxley Highway/Private Haul Road intersection.

7.4 Net Traffic Generation

7.4.1 Operational Traffic

The net increase in truck movements per hour due to the proposal is summarised in **Table 7-6**. The net increase in operational traffic the difference of existing and approved quarry limit of 10 and 20 truck movements per hour respectively.

Table 7-6 Net Truck Traffic Increase

Stage	Weekday AM/PM Peak	Saturday Peak
Stage 1	10	10
Stage 2	10	10

Hence during Stage 1 and stage 2 there will be one additional vehicle every 6 minutes which are unlikely to create any significant traffic impacts to the road network.

7.4.2 Employee Traffic

The net increase in employee traffic per hour due to the proposal is summarised in **Table 7-7**.

Table 7-7 Employee Traffic Increase

Stage	Morning	Evening
Stage 1	21	21
Stage 2	-	-

Hence during Stage 1 there will be additional 21 employee vehicle in the morning and evening respectively. It should be noted that employees will therefore arrive and leave the quarry outside the peak hours of the Oxley Highway/Private Haul Road intersection.

7.5 Development Traffic Distribution

Based on the assumption that the Inland Rail Project will be the main customer for the product from the Quarry, approximately 95% of heavy vehicle movements onto the Oxley Highway would be in an easterly direction, requiring a right-hand turn. Following the completion of the Inland Rail Project (after Stage 1), heavy vehicle movements east and west onto the Oxley Highway are expected to be equal.

7.6 Cumulative Traffic Considerations

For this assessment annual growth rates of 1.4% have been adopted from Oxley Highway Draft Corridor Strategy to obtain the background traffic at Oxley Highway/Private Haul Road for the design 2025 and 2045 assessment year for Stage 1 and Stage 2.

7.7 Traffic Distribution Summary

The traffic volumes and distribution of proposed development generated traffic along with the background traffic for Stage 1 the assessment year 2025 and Stage 2 the assessment year 2045 is shown in **Figure 7-1 to Figure 7-4**.

7.7.1.1 Stage 1

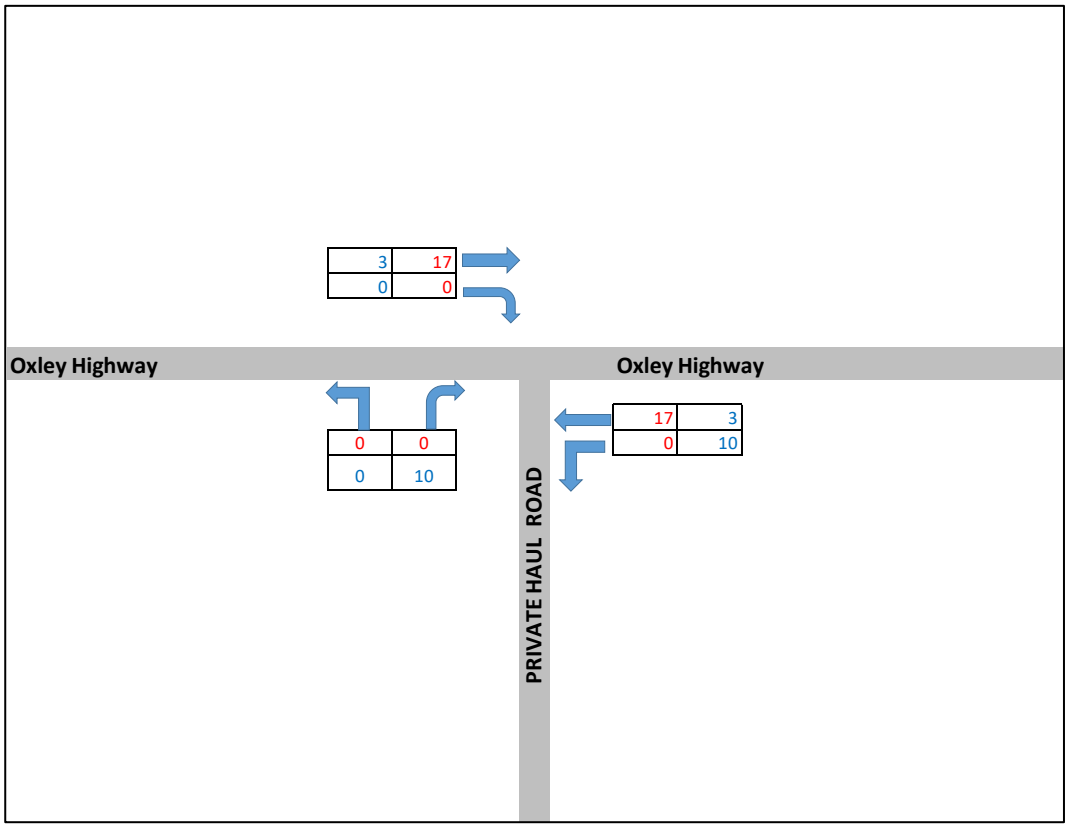


Figure 7-1 2025 Stage 1 AM/PM Peak

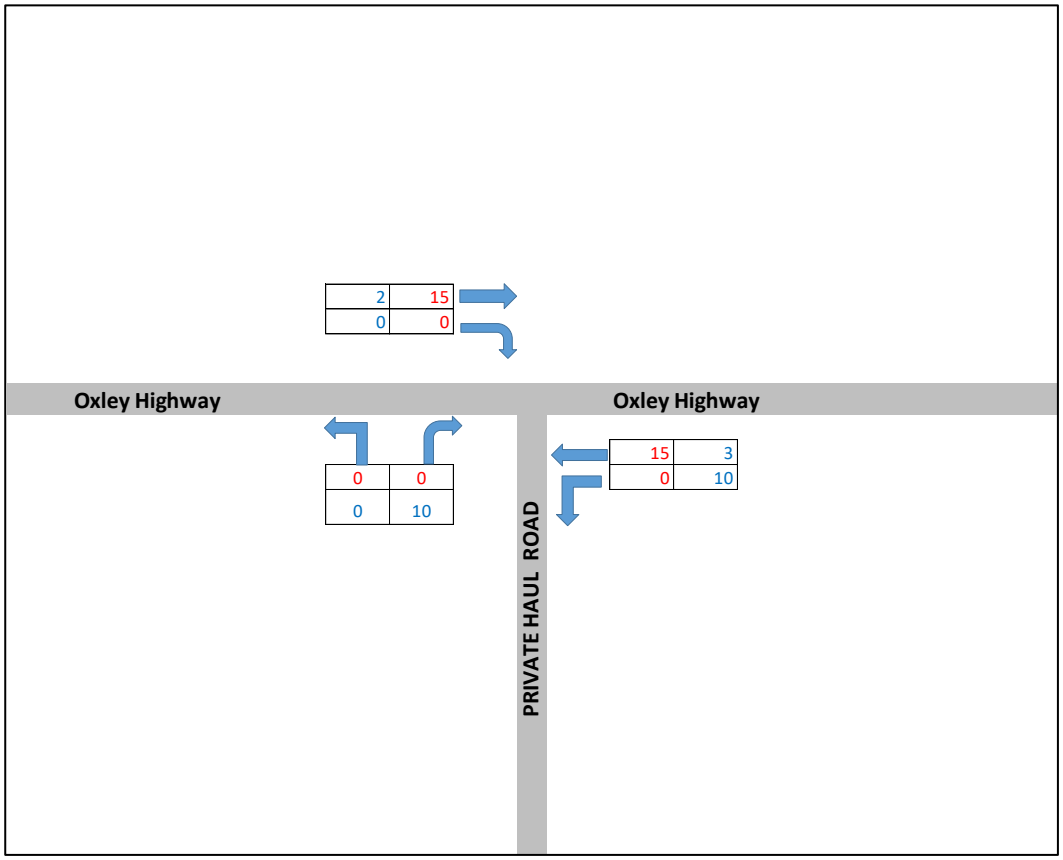


Figure 7-2 2025 Stage 1 Saturday Peak

7.7.1.2 Stage 2

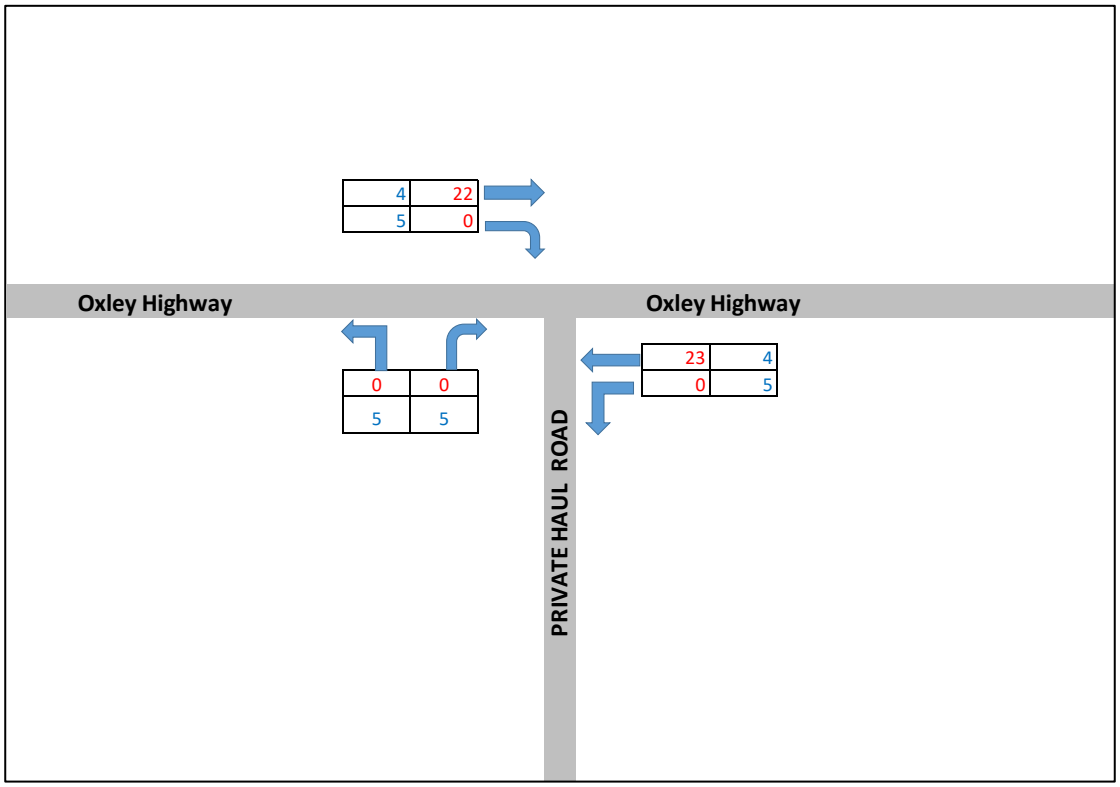


Figure 7-3 2045 Stage 2 AM/PM Peak

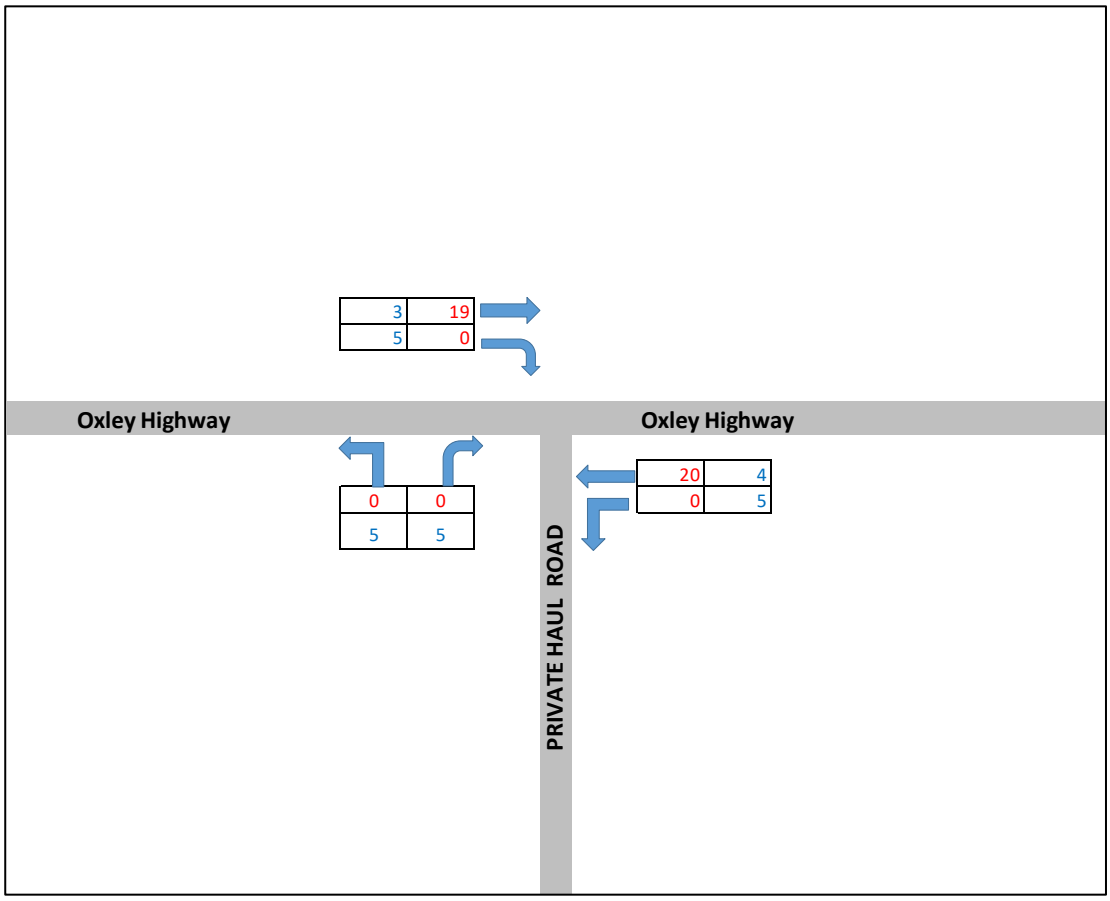


Figure 7-4 2045 Stage 2 Saturday Peak

7.8 Intersection Assessment

The intersection operation performance was assessed using the SIDRA Intersection 8.0 software package. The key indicator of intersection performance is typically the Level of Service (LoS), where results are placed on a scale from 'A' to 'F', outlined in the following table.

Table 7-8 Level of Service Criteria for Intersections

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Giveway & Stop Signs
A	< 14	Good Operation	Good Operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near Capacity & accident study required
E	57 to 70	At Capacity, at signals incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	> 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires additional capacity.

Source: Guide to Traffic Generating Developments (TfNSW, 2002)

The Average Vehicle Delay (AVD) provides a measure of the operational performance of an intersection and determines the LoS when applying the TfNSW method. It should be noted that the AVD's should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route). For traffic signals, the weighted average delay over all movements should be utilised. For roundabouts and priority control intersections (sign control) the critical movement for assessing LoS should be the movement with the highest average delay.

The Degree of Saturation (DoS) is another measure of the operational performance of individual intersections. For intersections controlled by traffic signals, both queue length and delay increase rapidly as DOS approaches 1.0. It is usual to attempt to keep DOS to less than 0.9. Degrees of Saturation in the order of 0.7 generally represent satisfactory intersection operation. When DOS exceed 0.9 queues can be anticipated.

7.8.2 Oxley Highway/Private Haul Road

The Oxley Highway/Private Haul Road intersection was modelled using SIDRA Intersection Analysis software (Version 8) to determine the traffic impacts associated with the proposed development.

The intersection geometry is illustrated in **Figure 7-5**.

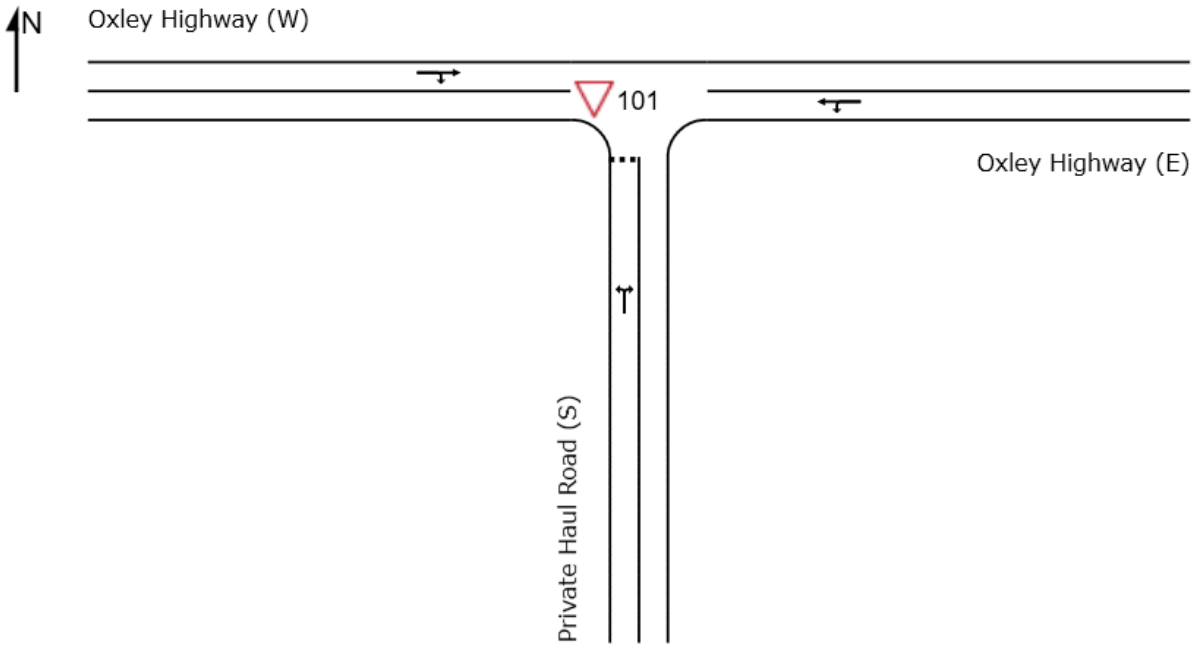


Figure 7-5 Oxley Highway/Private Haul Road Intersection layout

The SIDRA Intersection modelling for the design year peak hour respectively, incorporating the additional traffic generated by the proposed development is summarised in **Table 7-9.**

Table 7-9 Intersection Performance

Intersection	Weekday AM/PM Peak			SAT Peak		
	DoS	Delay (sec)	LoS	DoS	Delay (sec)	LoS
2025 Design Year (Base)	0.017	6.4	A	0.016	6.4	A
2025 Design Year(Base + Stage 1 Dev)	0.022	6.4	A	0.020	6.4	A
2045 Design Year(Base)	0.021	6.5	A	0.019	6.4	A
2045 Design Year(Base + Stage 2 Dev)	0.022	6.6	A	0.019	6.5	A

The results indicate that due to the addition of traffic generated by the proposed Stage1 and Stage 2 development the overall impact on the operation of the intersections is minimal, with the LoS generally unchanged between the “Base” and “Base + Development” scenarios.

Further to the results shown above, if the traffic volume generated during the peak hour was assumed based on the existing and proposed quarry limit, hence the intersection has sufficient capacity based on the DoS and Average Vehicle Delay being relatively low even in the quarry limits.

7.9 Turn Warrant Assessment

As additional vehicle trips are added to Oxley Highway/Private Haul Road intersection, the intersection layout has been reviewed in accordance with the Austroads Guide to Road Design – Part 4A – Unsignalised and Signalised Intersections.

For comparison, Cardno has undertaken a turn warrant assessment using the traffic volumes for the future year 2025 (including stages Quarry development and Oxley Highway volume background traffic growth). **Figure 7-6** and **Figure 7-7**shows the turn warrant assessment at Oxley Highway/Private Haul Road intersection for the Weekday and Saturday peak period respectively based on traffic volumes inclusive of Stage 1 Quarry development in 2025.

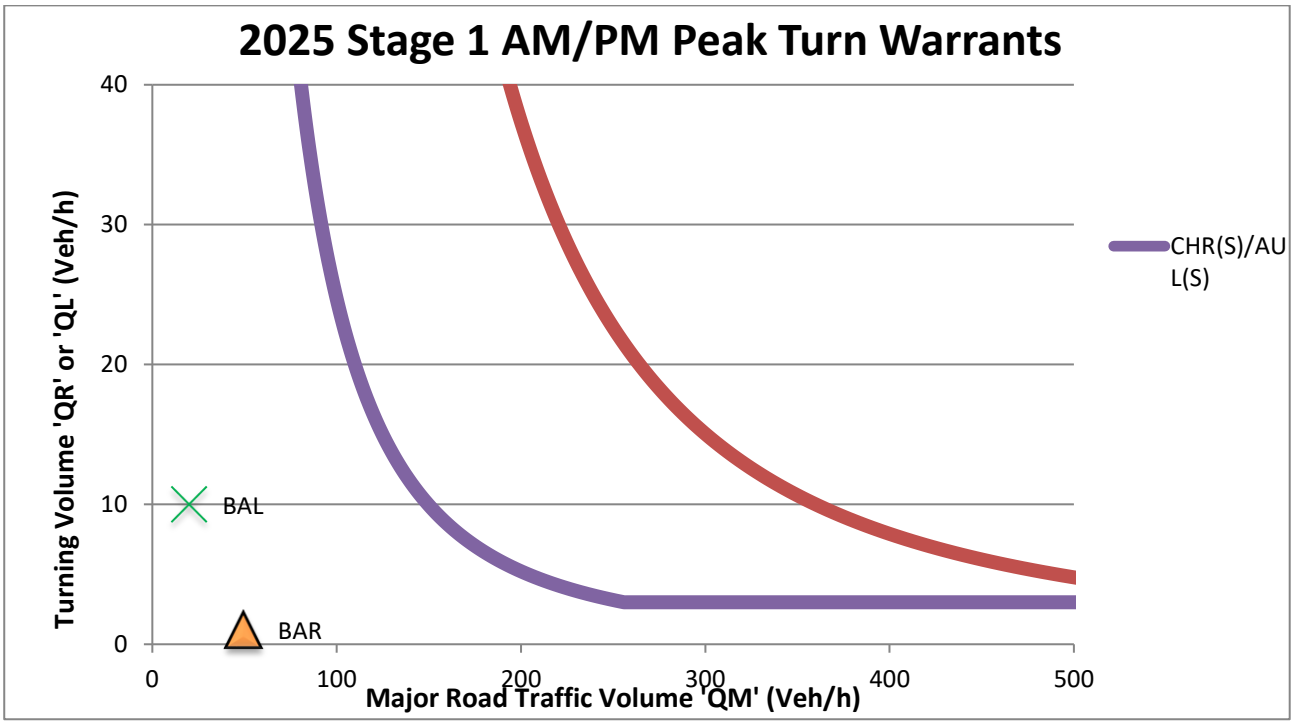


Figure 7-6 2025 Turn Warrant Assessment (AM/PM peak hour)

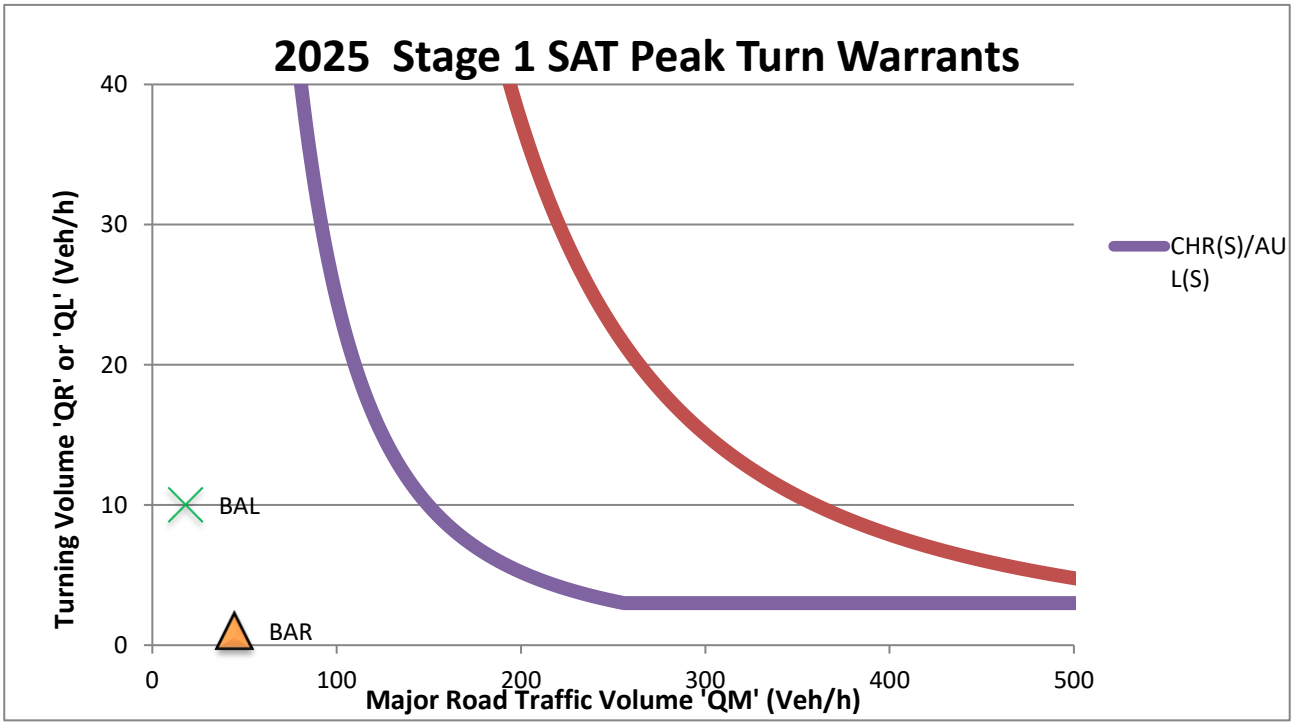


Figure 7-7 2025 Turn Warrant Assessment (SAT peak hour)

It is noted, by 2025 (Stage 1), the turn warrants indicate BAR/BAL is required at Oxley Highway/Private Haul Road intersection which is satisfied by the current configuration of the intersection.

Figure 7-8 and **Figure 7-9** show the turn warrant assessment at Oxley Highway/Private Haul Road intersection for year 2045 (including Stages 2 Quarry development and Oxley Highway volume background traffic growth.

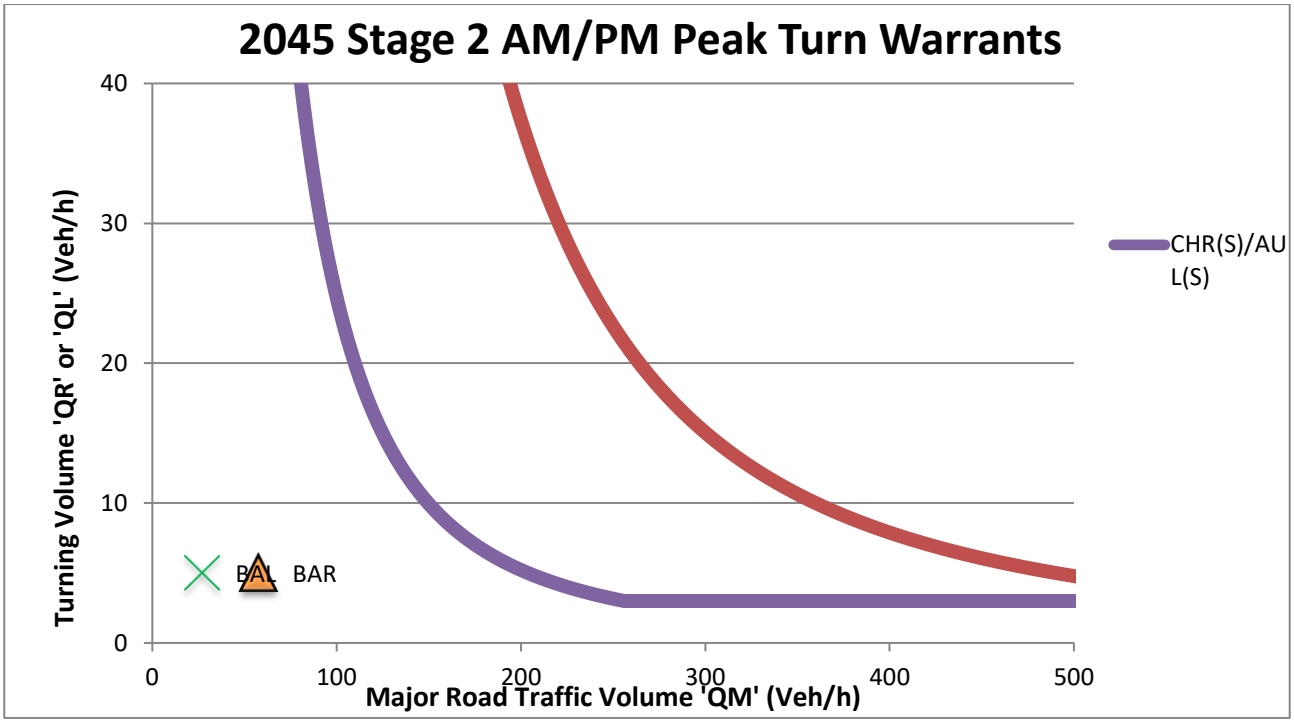


Figure 7-8 2045 Turn Warrant Assessment (AM/PM peak hour)

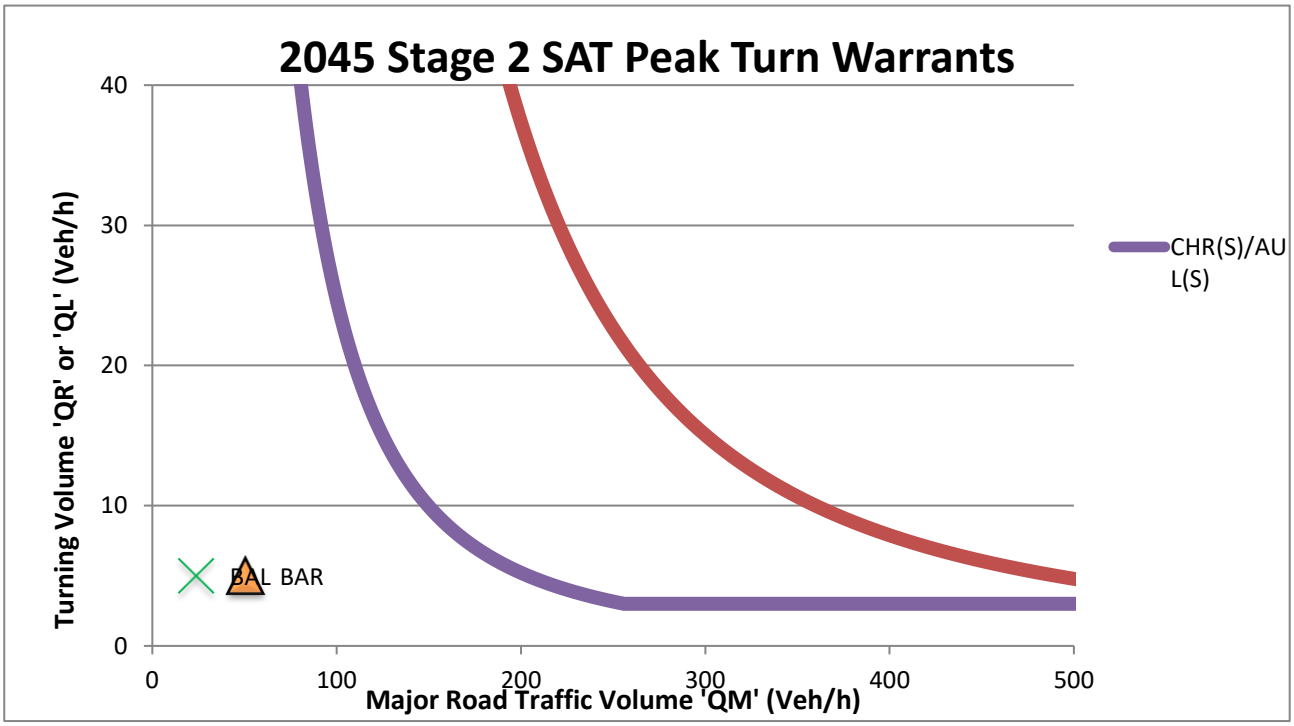


Figure 7-9 2045 Turn Warrant Assessment (SAT peak hour)

From the warrant assessment, it is shown by 2045 (Stage 2), the turn warrants indicate BAR/BAL is required at Oxley Highway/Private Haul Road intersection, which is satisfied by the current configuration of the intersection.

In addition to the above, the potential need for an acceleration lane for vehicles exiting the site in the eastbound direction has been considered unnecessary for the following reasons:

- The highest traffic generation from the Proposal occurs in Stage 1 only which is for an estimated duration of 5 years, which is relatively short in the context of the quarries lifespan;
- The amount of opposing eastbound traffic on the Oxley Highway is relatively low, at some 20 vehicles during the peak hour, or 1 vehicle every 3 minutes. Based on this, there would be sufficient gap in the traffic stream to accommodate the peak hour generation from the Proposal; and
- There is adequate sight lines to / from the west for vehicles emerging from the private haul road such that there is no road safety deficiency identified that would otherwise be mitigated by the provision of an acceleration lane.

7.10 Midblock Assessment

For the purposes of determining mid-block road capacity, traffic performance was assessed using criteria contained within Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis. **Figure 7-10** illustrates theoretical road performance under different flow and speed conditions, also referred to as Service Flow Rates. Austroads describes Service Flow Rate as the maximum hourly rate at which vehicles can reasonably be expected to traverse a point under the prevailing roadway, traffic and control conditions while maintaining a designated level of service. They indicate the vehicle capacity for each level of service and are used to determine the level of service corresponding to actual traffic volumes.

For example, a traffic flow of 1,450 passenger cars per lane travelling at 110 km/h results in LoS C, however, the same volume travelling at an average speed of 60km/h results in LoS E. These thresholds were used to assess level of service as part of the study.

At each level of service, the service flow rate is defined as the maximum for that level. Service flow rates are discrete values, whereas the level of service represents a range of conditions. Service flow rates therefore effectively define the flow boundaries between the levels of service.

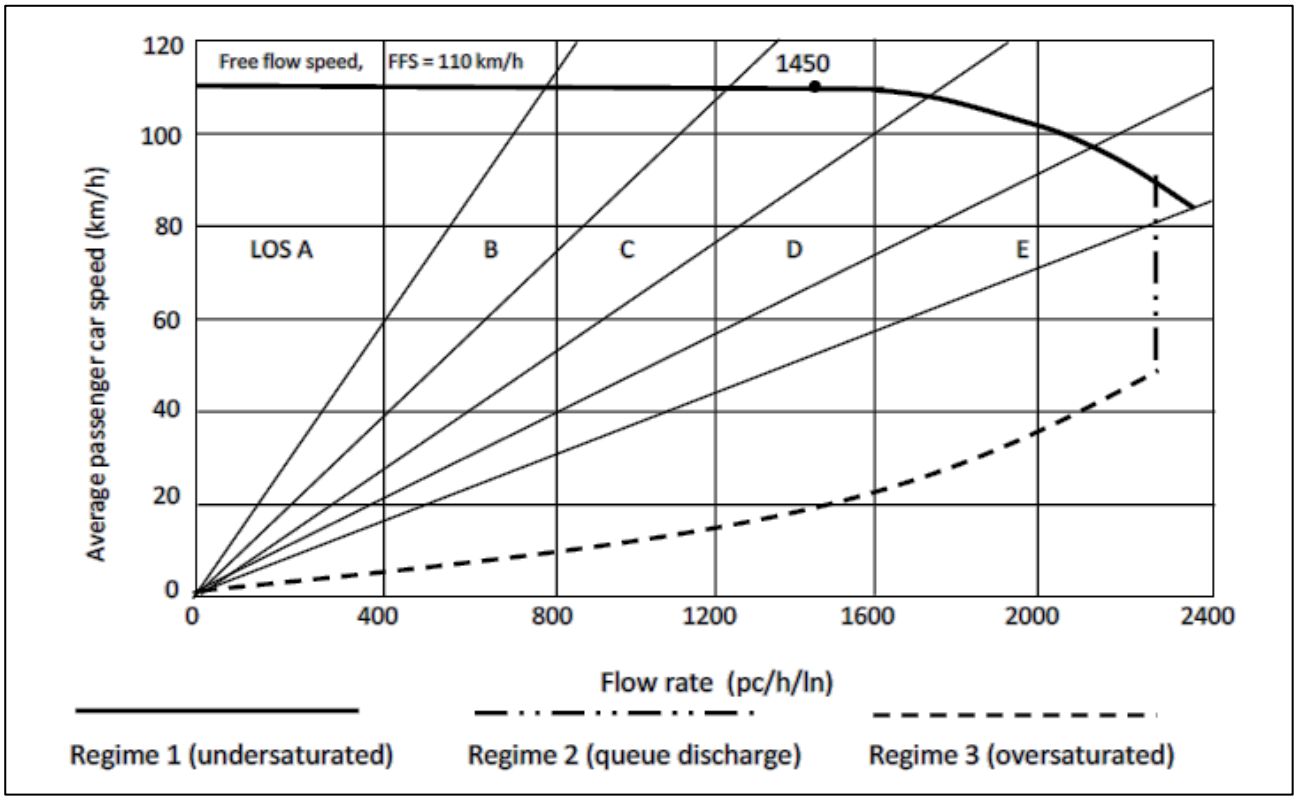


Figure 7-10 Service Flow Rates Definition of the Flow Boundaries between Levels of Service

Source: Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis

Table 7-10 provides definitions for the Service Flow Rate and LoS classifications 'A' to 'F'.

Table 7-10 Level of Service and Service Flows Rates

LoS	Description	Speed and Flow Ranges *
A	A condition of free-flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.	60km/h - 0-400 veh/h/ln 90km/h - 0-600 veh/h/ln 110km/h - 0-800 veh/h/ln
B	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is a little less than with level of service A.	60km/h - 400-650 veh/h/ln 90km/h – 600-900 veh/h/ln 110km/h -800-1,200 veh/h/ln
C	Also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.	60km/h - 650-850 veh/h/ln 90km/h – 900-1,400 veh/h/ln 110km/h -1,200-1,650 veh/h/ln
D	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.	60km/h – 850 – 1,250 veh/h/ln 90km/h –1,400 – 1,800 veh/h/ln 110km/h -1,650 – 1,900 veh/h/ln
E	Traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause breakdown.	60km/h –1,250 – 1,650 veh/h/ln 90km/h – 1,800 – 2,000 veh/h/ln 110km/h – 1,900 – 2,100 veh/h/ln
F	In the zone of forced flow, where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.	60km/h – above1,650 veh/h/ln 90km/h – above 2,000 veh/h/ln 110km/h – above 2,100 veh/h/ln

Source: Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis

** Approximate range*

In order to compare the potential impacts of the proposed quarry modification on the surrounding road network, the mid-block volumes have been assessed
The mid-block volumes are summarised in **Table 7-11** below.

Table 7-11 Mid-Block Volumes

Road	Direction	2025 with Stage 1 AM/PM Peak	2025 with Stage 1 SAT Peak	2045 with Stage 2 AM/PM Peak	2045 with Stage 2 SAT Peak
Oxley Highway	Eastbound	19	17	31	27
	Westbound	30	28	32	28
Private Haul Road	Northbound	10	10	10	10
	Southbound	10	10	10	10

The LoS associated with the peak hour volumes for the assessment years is provided below.

Table 7-12 Mid-Block Performance

Road	Direction	2025 with Stage 1 AM/PM Peak	2025 with Stage 1 SAT Peak	2045 with Stage 2 AM/PM Peak	2045 with Stage 2 SAT Peak
Oxley Highway	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Private Haul Road	Northbound	A	A	A	A
	Southbound	A	A	A	A

Mid-block volumes along Oxley Highway and Private Haul appear to be within acceptable LoS performance criteria.

8 Construction Traffic Impact Considerations

It is understood that additional on-site infrastructure will be required as follows:

- demountable office compound and amenities
- rainwater tank for additional potable water supply
- parking
- diesel generator power
- pump-out septic system

Subject to the approval, the construction work hours are expected to be in accordance with the NSW Interim Construction Noise Guidelines as follows:

- Monday to Friday 7am to 6pm
- Saturday 8am to 1pm
- Sunday No work
- Public Holidays No work

The infrastructure required to be constructed is considered to be relatively small scale and unlikely to generate significant amounts of traffic or parking. Nevertheless, a Construction Traffic Management Plan (CTMP) may be required to appropriately outline the parking needs of construction staff, traffic generation from deliveries and construction staff and other measures to appropriate manage the construction activities impact on the external road network, if any.

9 Mitigation and Management Measures

9.1 Operation

The assessment of the traffic and transport impacts associated with the Proposal have been shown to be minimal and within the surrounding road networks capacity.

Nevertheless, as the site will generate predominantly heavy vehicle traffic / vehicle types, it is appropriate that controls / measures on driver code of conduct and fatigue management be implemented as follows:

- fatigue management include a drivers code of conduct that addresses:
  - travelling speeds;
  - procedures to ensure that drivers to and from the site adhere to the designated over dimensional and heavy vehicle routes; and
  - procedures to ensure that drivers to and from the site implement safe driving practices; and
  - Include a detailed program to monitor and report on the effectiveness of these measures and the code of conduct.
    A Traffic Management Plan (TMP) is to be prepared for the operation of the site post approval of the EIS in consultation with Council and TfNSW.

9.2 Construction

The extent of construction on-site is considered to be minor and unlikely to generate significant heavy vehicle movements. It is deemed appropriate that the conditional consent refer to relevant noise and dust control measures where necessary along with WH&S requirements associated with the construction activity.

10 Conclusion

Cardno has been commissioned by Umwelt (Australia) Pty Limited, on behalf of Regional Hardrock Gilgandra Unit Trust to undertake a traffic and parking impact assessment to assess the potential impacts due to proposed modifications to an existing development consent for Berakee Quarry. The Quarry Site is located approximately 10 kilometres southeast of Collie, NSW within Gilgandra Shire LGA.

The following has been identified within this traffic impact assessment:

- It is understood that the extraction operations for the Project would be undertaken over two stages:
  - Stage 1 – extraction of approximately 2.3 Mt over 5 years (up to 495,000 tpa) to supply hard rock materials to the Inland Rail Project
  - Stage 2 – extraction of 2.4 Mt over 20 years (between 80,000 and 120,000 tpa) following completion of the construction of the Inland Rail Project, to supply hard rock products to local markets
- The assessment year for Stage 1 is assumed to be the year 2025 concurrent with the opening year for the Inland Rail Project. For Stage 2 the assessment year is assumed to be the year 2045 (20 years following the completion of Stage 1).
- Based on the existing and proposed quarry limit of 10 and 20 veh/hr, the proposed quarry is estimated to generate a net increase of one additional vehicle every 6 minutes which is unlikely to create any significant traffic impacts to the road network.
- Oxley Highway/Private Haul Road intersection will operate satisfactorily at LoS A in the peak hour with the additional traffic generated by the proposed development. The level of service is unchanged between the design year base and design year base with development scenarios.
- From the warrant assessment, it is shown during Stage 1 and Stage 2 development the turn warrants indicate BAR/BAL is required at Oxley Highway/Private Haul Road intersection, which is satisfied by the current configuration of the intersection.
- Based on the above, it is concluded that the Proposal in the annual extraction rate during Stage 1 and Stage 2 development and will not significantly increase the traffic demand in the peak period or result in adverse road conditions.

APPENDIX A

SIDRA SUMMARY

MOVEMENT SUMMARY

Site: 101 [Oxley Highway/Private Haul Road 2025 Base AM/PM]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Private Haul Road (S)												
1	L2	1	0.0	0.002	5.6	LOS A	0.0	0.1	0.09	0.56	0.09	53.4
3	R2	1	100.0	0.002	6.4	LOS A	0.0	0.1	0.09	0.56	0.09	50.7
Approach		2	50.0	0.002	6.1	LOS A	0.0	0.1	0.09	0.56	0.09	52.0
East: Oxley Highway (E)												
4	L2	1	100.0	0.013	6.1	LOS A	0.0	0.0	0.00	0.05	0.00	55.6
5	T1	21	15.0	0.013	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	59.7
Approach		22	19.0	0.013	0.6	NA	0.0	0.0	0.00	0.05	0.00	59.5
West: Oxley Highway (W)												
11	T1	21	15.0	0.012	0.0	LOS A	0.0	0.0	0.01	0.03	0.01	59.7
12	R2	1	0.0	0.012	5.5	LOS A	0.0	0.0	0.01	0.03	0.01	57.4
Approach		22	14.3	0.012	0.3	NA	0.0	0.0	0.01	0.03	0.01	59.6
All Vehicles		46	18.2	0.013	0.5	NA	0.0	0.1	0.01	0.06	0.01	59.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Oxley Highway/Private Haul Road 2025 Stage1 AM/PM]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Private Haul Road (S)												
1	L2	1	0.0	0.005	5.6	LOS A	0.0	0.2	0.11	0.57	0.11	53.3
3	R2	3	100.0	0.005	6.4	LOS A	0.0	0.2	0.11	0.57	0.11	50.6
Approach		4	75.0	0.005	6.2	LOS A	0.0	0.2	0.11	0.57	0.11	51.3
East: Oxley Highway (E)												
4	L2	3	100.0	0.015	6.1	LOS A	0.0	0.0	0.00	0.13	0.00	55.2
5	T1	21	15.0	0.015	0.0	LOS A	0.0	0.0	0.00	0.13	0.00	59.2
Approach		24	26.1	0.015	1.4	NA	0.0	0.0	0.00	0.13	0.00	58.6
West: Oxley Highway (W)												
11	T1	21	15.0	0.012	0.0	LOS A	0.0	0.0	0.01	0.03	0.01	59.7
12	R2	1	0.0	0.012	5.5	LOS A	0.0	0.0	0.01	0.03	0.01	57.4
Approach		22	14.3	0.012	0.3	NA	0.0	0.0	0.01	0.03	0.01	59.5
All Vehicles		51	25.0	0.015	1.0	NA	0.0	0.2	0.01	0.12	0.01	58.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Oxley Highway/Private Haul Road 2025 Stage 1 SAT]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Private Haul Road (S)												
1	L2	1	0.0	0.005	5.6	LOS A	0.0	0.2	0.10	0.57	0.10	53.4
3	R2	3	100.0	0.005	6.3	LOS A	0.0	0.2	0.10	0.57	0.10	50.7
Approach		4	75.0	0.005	6.2	LOS A	0.0	0.2	0.10	0.57	0.10	51.3
East: Oxley Highway (E)												
4	L2	3	100.0	0.014	6.1	LOS A	0.0	0.0	0.00	0.14	0.00	55.1
5	T1	19	16.7	0.014	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	59.1
Approach		22	28.6	0.014	1.5	NA	0.0	0.0	0.00	0.14	0.00	58.5
West: Oxley Highway (W)												
11	T1	18	11.8	0.010	0.0	LOS A	0.0	0.0	0.01	0.03	0.01	59.6
12	R2	1	0.0	0.010	5.5	LOS A	0.0	0.0	0.01	0.03	0.01	57.4
Approach		19	11.1	0.010	0.3	NA	0.0	0.0	0.01	0.03	0.01	59.5
All Vehicles		45	25.6	0.014	1.1	NA	0.0	0.2	0.01	0.14	0.01	58.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Oxley Highway/Private Haul Road 2045 Base AM/PM]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Private Haul Road (S)												
1	L2	1	0.0	0.002	5.6	LOS A	0.0	0.1	0.11	0.56	0.11	53.3
3	R2	1	100.0	0.002	6.5	LOS A	0.0	0.1	0.11	0.56	0.11	50.6
Approach		2	50.0	0.002	6.1	LOS A	0.0	0.1	0.11	0.56	0.11	51.9
East: Oxley Highway (E)												
4	L2	1	100.0	0.017	6.1	LOS A	0.0	0.0	0.00	0.04	0.00	55.7
5	T1	28	14.8	0.017	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.8
Approach		29	17.9	0.017	0.4	NA	0.0	0.0	0.00	0.04	0.00	59.6
West: Oxley Highway (W)												
11	T1	27	15.4	0.016	0.0	LOS A	0.0	0.0	0.01	0.02	0.01	59.7
12	R2	1	0.0	0.016	5.5	LOS A	0.0	0.0	0.01	0.02	0.01	57.5
Approach		28	14.8	0.016	0.2	NA	0.0	0.0	0.01	0.02	0.01	59.6
All Vehicles		60	17.5	0.017	0.4	NA	0.0	0.1	0.01	0.05	0.01	59.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Oxley Highway/Private Haul Road 2045 Base SAT]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Private Haul Road (S)												
1	L2	1	0.0	0.002	5.6	LOS A	0.0	0.1	0.10	0.56	0.10	53.3
3	R2	1	100.0	0.002	6.4	LOS A	0.0	0.1	0.10	0.56	0.10	50.7
Approach		2	50.0	0.002	6.1	LOS A	0.0	0.1	0.10	0.56	0.10	52.0
East: Oxley Highway (E)												
4	L2	1	100.0	0.015	6.1	LOS A	0.0	0.0	0.00	0.04	0.00	55.7
5	T1	25	16.7	0.015	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.7
Approach		26	20.0	0.015	0.5	NA	0.0	0.0	0.00	0.04	0.00	59.6
West: Oxley Highway (W)												
11	T1	23	13.6	0.014	0.0	LOS A	0.0	0.0	0.01	0.03	0.01	59.7
12	R2	1	0.0	0.014	5.5	LOS A	0.0	0.0	0.01	0.03	0.01	57.4
Approach		24	13.0	0.014	0.2	NA	0.0	0.0	0.01	0.03	0.01	59.6
All Vehicles		53	18.0	0.015	0.5	NA	0.0	0.1	0.01	0.06	0.01	59.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Oxley Highway/Private Haul Road 2045 Stage 2 AM/PM]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Private Haul Road (S)												
1	L2	1	0.0	0.002	5.6	LOS A	0.0	0.1	0.11	0.56	0.11	53.3
3	R2	1	100.0	0.002	6.5	LOS A	0.0	0.1	0.11	0.56	0.11	50.6
Approach		2	50.0	0.002	6.1	LOS A	0.0	0.1	0.11	0.56	0.11	51.9
East: Oxley Highway (E)												
4	L2	1	100.0	0.017	6.1	LOS A	0.0	0.0	0.00	0.04	0.00	55.7
5	T1	28	14.8	0.017	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.8
Approach		29	17.9	0.017	0.4	NA	0.0	0.0	0.00	0.04	0.00	59.6
West: Oxley Highway (W)												
11	T1	27	15.4	0.016	0.0	LOS A	0.0	0.0	0.01	0.02	0.01	59.7
12	R2	1	0.0	0.016	5.5	LOS A	0.0	0.0	0.01	0.02	0.01	57.5
Approach		28	14.8	0.016	0.2	NA	0.0	0.0	0.01	0.02	0.01	59.6
All Vehicles		60	17.5	0.017	0.4	NA	0.0	0.1	0.01	0.05	0.01	59.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Oxley Highway/Private Haul Road 2025 Base SAT]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Private Haul Road (S)												
1	L2	1	0.0	0.002	5.6	LOS A	0.0	0.1	0.08	0.56	0.08	53.4
3	R2	1	100.0	0.002	6.3	LOS A	0.0	0.1	0.08	0.56	0.08	50.7
Approach		2	50.0	0.002	6.0	LOS A	0.0	0.1	0.08	0.56	0.08	52.0
East: Oxley Highway (E)												
4	L2	1	100.0	0.012	6.1	LOS A	0.0	0.0	0.00	0.06	0.00	55.6
5	T1	19	16.7	0.012	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	59.7
Approach		20	21.1	0.012	0.6	NA	0.0	0.0	0.00	0.06	0.00	59.4
West: Oxley Highway (W)												
11	T1	18	11.8	0.010	0.0	LOS A	0.0	0.0	0.01	0.03	0.01	59.6
12	R2	1	0.0	0.010	5.5	LOS A	0.0	0.0	0.01	0.03	0.01	57.4
Approach		19	11.1	0.010	0.3	NA	0.0	0.0	0.01	0.03	0.01	59.5
All Vehicles		41	17.9	0.012	0.6	NA	0.0	0.1	0.01	0.07	0.01	59.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

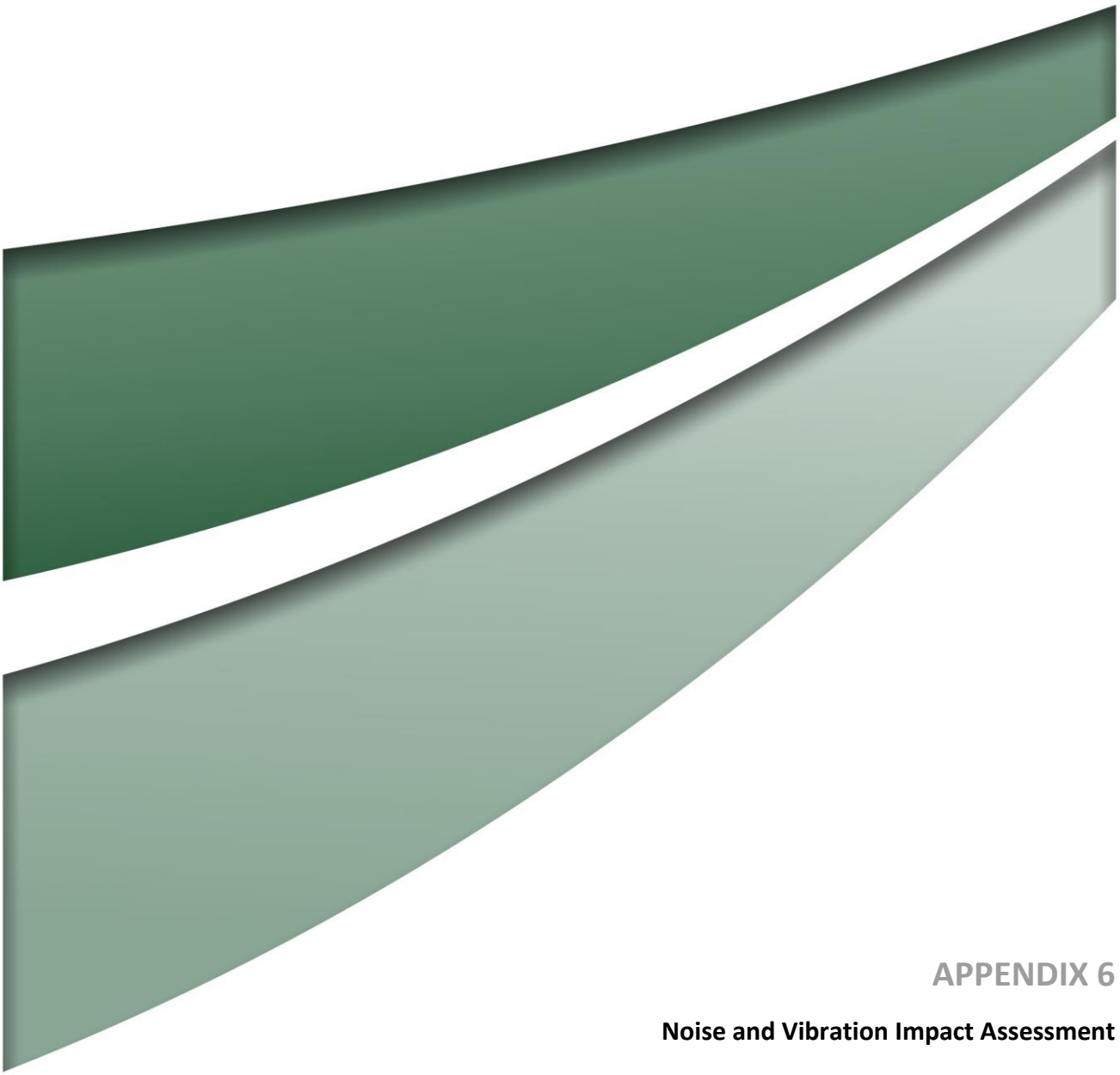
MOVEMENT SUMMARY

Site: 101 [Oxley Highway/Private Haul Road 2045 Stage 2 SAT]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Private Haul Road (S)												
1	L2	1	0.0	0.002	5.6	LOS A	0.0	0.1	0.10	0.56	0.10	53.3
3	R2	1	100.0	0.002	6.4	LOS A	0.0	0.1	0.10	0.56	0.10	50.7
Approach		2	50.0	0.002	6.1	LOS A	0.0	0.1	0.10	0.56	0.10	52.0
East: Oxley Highway (E)												
4	L2	1	100.0	0.015	6.1	LOS A	0.0	0.0	0.00	0.04	0.00	55.7
5	T1	25	16.7	0.015	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.7
Approach		26	20.0	0.015	0.5	NA	0.0	0.0	0.00	0.04	0.00	59.6
West: Oxley Highway (W)												
11	T1	23	13.6	0.014	0.0	LOS A	0.0	0.0	0.01	0.03	0.01	59.7
12	R2	1	0.0	0.014	5.5	LOS A	0.0	0.0	0.01	0.03	0.01	57.4
Approach		24	13.0	0.014	0.2	NA	0.0	0.0	0.01	0.03	0.01	59.6
All Vehicles		53	18.0	0.015	0.5	NA	0.0	0.1	0.01	0.06	0.01	59.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



APPENDIX 6

Noise and Vibration Impact Assessment

Noise and Vibration Impact Assessment

Berakee Quarry Extension

Prepared for: Umwelt (Australia) Pty Ltd
January 2021
MAC201046-01RP1V1

Muller Acoustic Consulting

Document Information

Noise and Vibration Impact Assessment

Berakee Quarry Extension

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CONTENTS

1 INTRODUCTION 5

1.1 PROJECT DESCRIPTION 6

1.2 HOURS OF OPERATION 9

1.3 POTENTIALLY SENSITIVE RECEIVERS 9

1.4 COVERAGE OF SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS 11

2 NOISE AND BLASTING POLICY AND GUIDELINES 13

2.1 INTERIM CONSTRUCTION NOISE GUIDELINE 13

2.1.1 STANDARD HOURS FOR CONSTRUCTION 14

2.1.2 OUT OF HOURS CONSTRUCTION 14

2.1.3 CONSTRUCTION NOISE MANAGEMENT LEVELS 14

2.2 NOISE POLICY FOR INDUSTRY 16

2.2.1 PROJECT NOISE TRIGGER LEVELS 17

2.2.2 PROJECT INTRUSIVENESS NOISE LEVEL (PINL) 17

2.2.3 PROJECT AMENITY NOISE LEVEL (PANL) 17

2.2.4 MAXIMUM NOISE LEVEL ASSESSMENT 20

2.3 ROAD NOISE POLICY 20

2.4 ANZEC BLASTING GUIDELINES 21

3 ASSESSMENT CRITERIA 23

3.1 CONSTRUCTION NOISE MANAGEMENT LEVELS 23

3.2 OPERATIONAL CRITERIA 23

3.2.1 PROJECT INTRUSIVENESS NOISE LEVELS 23

3.2.2 PROJECT AMENITY NOISE LEVELS 24

3.2.3 PROJECT NOISE TRIGGER LEVELS 24

3.2.4 MAXIMUM NOISE ASSESSMENT TRIGGER LEVELS 25

3.3 ROAD TRAFFIC NOISE CRITERIA 25

3.3.1 RELATIVE INCREASE CRITERIA 26

3.4 ANZEC GUIDELINE BLASTING LIMITS 26

4 NOISE ASSESSMENT METHODOLOGY 27

4.1 CONSTRUCTION NOISE MODELLING PARAMETERS 27

4.2 OPERATIONAL NOISE MODELLING PARAMETERS 28
4.2.1 METEOROLOGICAL ANALYSIS 28
4.2.2 OPERATIONAL NOISE MODELLING SCENARIOS 29
4.2.3 SOUND POWER LEVELS - OPERATION 30
4.3 ROAD NOISE ASSESSMENT METHODOLOGY 31
4.4 BLASTING AND VIBRATION ASSESSMENT METHODOLOGY 32
4.4.1 INDICATIVE BLAST DESIGN 32
4.4.2 AIR-BLAST OVERPRESSURE 33
4.4.3 GROUND-BORNE VIBRATION 33
5 NOISE MODELLING RESULTS AND DISCUSSION 35
5.1 CONSTRUCTION PHASE NOISE RESULTS 35
5.2 OPERATIONAL NOISE RESULTS 36
5.3 MAXIMUM NOISE LEVEL ASSESSMENT 37
5.4 TRAFFIC NOISE RESULTS 38
5.5 BLASTING RESULTS 39
5.5.1 EFFECTS OF VIBRATION ON INFRASTRUCTURE FROM BLASTING 40
5.5.2 EFFECTS OF BLASTING ON ANIMALS AND LIVESTOCK 40
6 NOISE MONITORING AND MANAGEMENT 41
6.1 NOISE MANAGEMENT MEASURES 41
6.2 NOISE MONITORING 41
7 CONCLUSION 43
APPENDIX A – GLOSSARY OF TERMS
APPENDIX B – NEWA ANALYSED METEOROLOGY
APPENDIX C – NOISE MODEL CONTOURS

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Umwelt (Australia) Pty Ltd (Umwelt) on behalf of Regional Hardrock Gilgandra Unit Trust (Regional Hardrock) to prepare a Noise and Vibration Impact Assessment (NVIA) to quantify potential noise emissions associated with the extension to the Berakee Quarry (the 'Quarry').

The NVIA is provided to accompany the Environmental Impact Statement (EIS) being prepared to assess the proposed extension to operations ('the proposal'). The NVIA has been undertaken in accordance with the following policies and guidelines:

- NSW Environment Protection Authority's (EPA's), Noise Policy for Industry (NPI), 2017;
- NSW Department of Environment and Climate Change (DECC), Interim Construction Noise Guideline (ICNG), 2009;
- NSW Department of Environment, Climate Change and Water (DECCW), NSW Road Noise Policy (RNP), 2011;
- Australian Standard AS2187.2-2006 (AS2187.2) – Explosives-Storage and Use Part 2: Use of Explosives; and
- Australian and New Zealand Environment Council (ANZEC), 1990, Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A.**

1.1 Project Description

MAC understands that Regional Hardrock proposes to extend the extraction area and associated processing and stockpiling area, increase the production rate and extend the life of the Quarry, located on Lot 1 DP1265657, near Collie NSW. The extension is to provide for additional basalt resource (up to 4.7 Mt) and stockpiling requirements (sufficient to hold up to 250,000t of product) to initially satisfy demand generated by the construction of the Inland Rail Project and then by local and regional demand. To achieve these increases, a number of associated changes to activities and infrastructure on the Project Site would be required including additional extraction equipment and changes to processing equipment, truck movements, water usage, blasting frequency and employment.

The Project Site is located approximately 10km southeast of Collie, NSW (see **Figure 1**). The layout of the Project Site is shown in **Figure 2** which identifies the Extraction Area, the Processing Area and the Stockpiling Area, as well as the locations of key infrastructure.

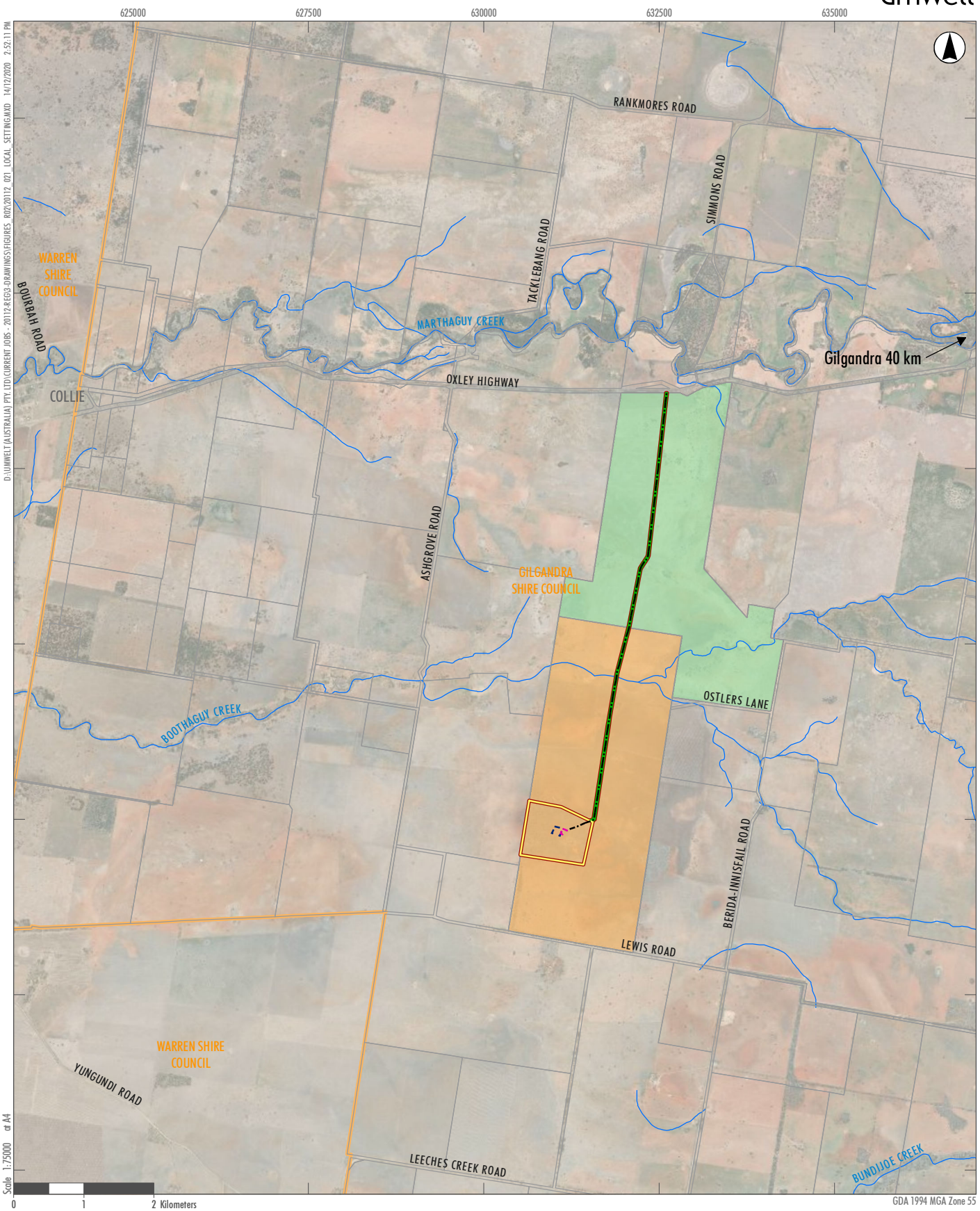
Extraction operations for the Quarry would be undertaken over two stages:

- Stage 1 – extraction of approximately 2.3Mt over 5 years (ie 490,000tpa) to supply hard rock materials to the Inland Rail Project.
- Stage 2 – extraction of 2.4Mt over 20 years (ie 80,000 to 120,000tpa) following completion of the construction of the Inland Rail Project, to supply hard rock products to local and regional markets.

The design criteria for the proposed Extract Area are as follows:

- Maximum Extraction Area Footprint – 8.4ha (based on restriction of depth to 240m AHD as per the current development consent).
- Elevation of final floor – between 240 and 242m AHD.
- Volume – approximately 1,680,000m^3.
- Indicative angle of final faces – between 75^o and 85^o.
- Two final faces of 8m and 10m in height separated by single bench of between 3m and 5m in width.

Processing operations will be undertaken on a campaign basis using a mobile crushing unit which will initially be placed within the existing Crushing and Stockpile Area before being progressively relocated following each blast to adjoin the blasted rock pile (in-pit).



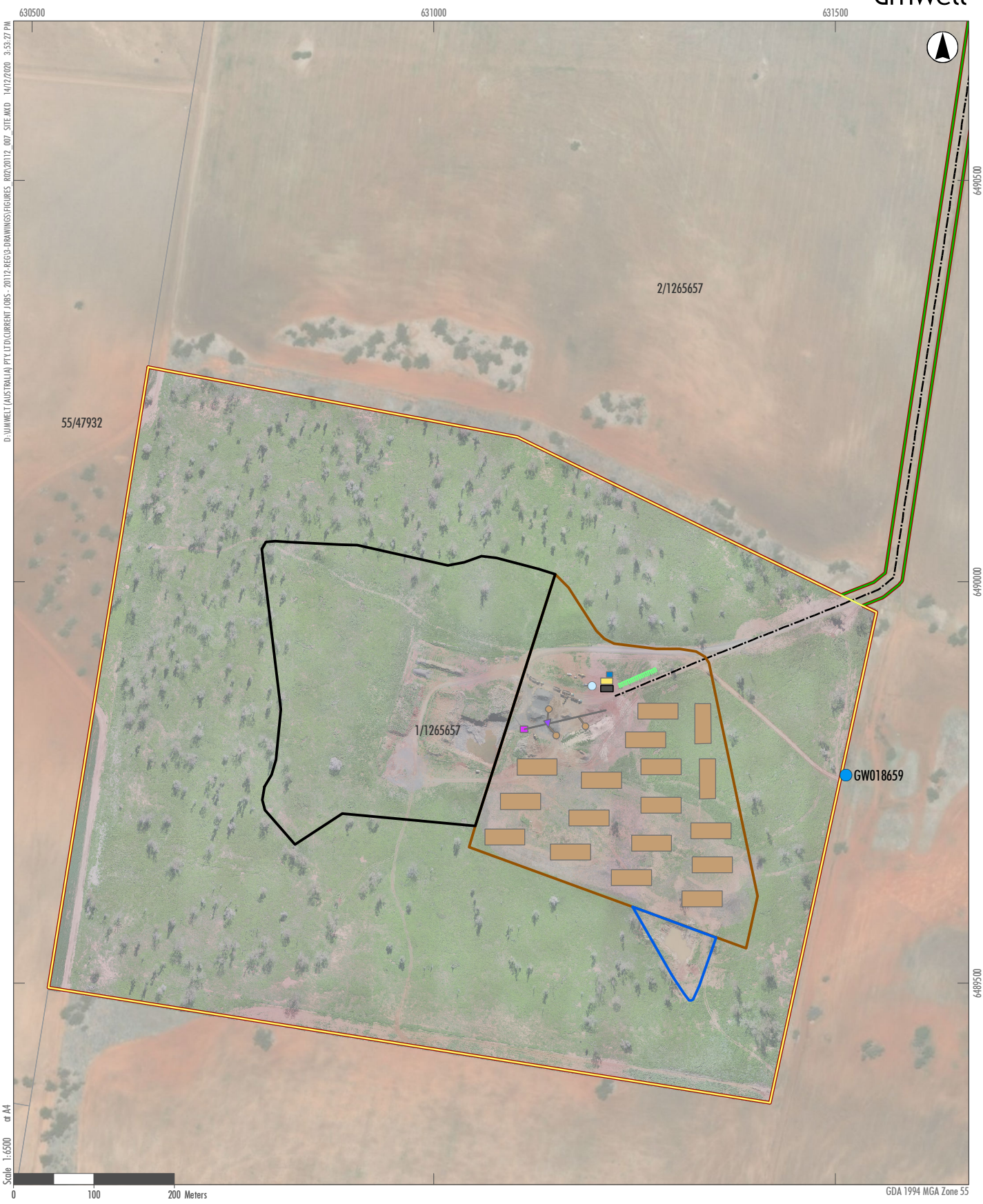
Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Approved Extraction Area
- Approved Crushing and Stockpile Area
- Local Government Boundary
- Berakee Area
- Wilgaroo Area
- Haul Road
- Drainage Line

Figure 1

Local Setting

Image Source: ESRI (2020) Data source: NSW LPI (2020)



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Extraction Area
- Stockpile Area
- Sediment Basin
- Crib Room
- Amenities
- Site Office
- Stockpile
- Secondary Cone Crusher
- Primary Jaw Crusher
- Conveyor
- Car Parking
- Haul Road
- Groundwater Bores
- Water Tank

Figure 2

Quarry Site Layout

Image Source: ESRI (2020) Data source: NSW LPI (2020)

1.2 Hours of Operation

Table 1 presents the operating hours for the existing quarry. It is noted that the operation hours for the extraction, processing, loading and blasting components of the Project remain unchanged from the existing approved Quarry. The Proponent proposes an extension to transportation hours to meet anticipated demand by allowing for pre-loaded trucks to exit the Quarry between 5am and 6am and for unladen trucks to arrive back to the Quarry between 6pm and 10pm.

Table 1 Hours of Quarry Operation

Activity	Monday to Friday	Saturday	Sunday
Extraction, Processing and Loading[1]	6am – 6pm	6am –6pm	N/A
Blasting	9am – 3pm	N/A	N/A
Truck Despatch	5am – 10pm	6am – 3pm	N/A

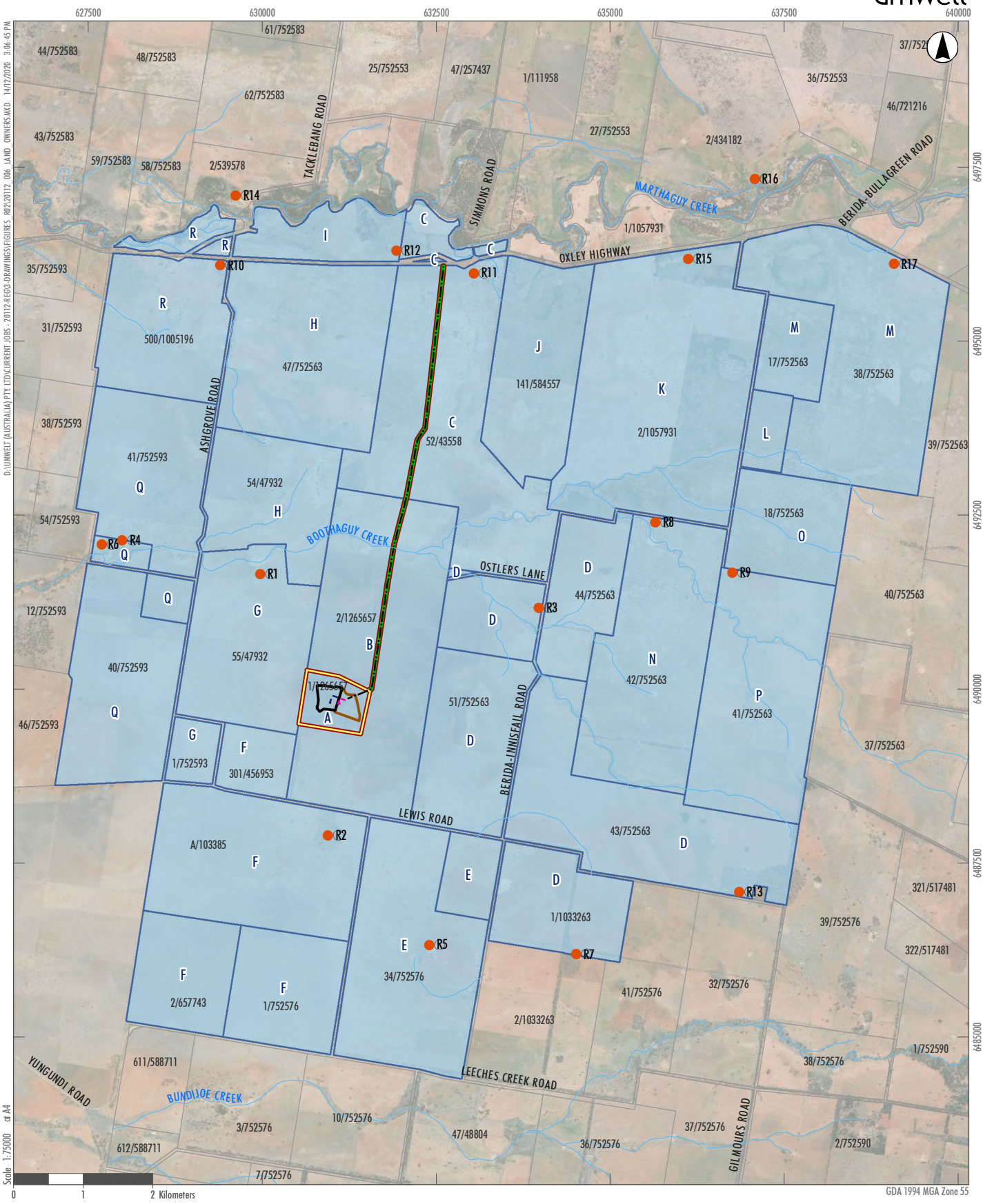
Note 1: Toolbox meetings, pre-start inspections and other activities not involving mobile equipment operations may be undertaken prior to 6am.

1.3 Potentially Sensitive Receivers

From review of aerial imagery and associated project information, the following potentially sensitive receivers have been identified. Receivers in the locality are primarily rural residential. **Table 2** presents a summary of receiver identification, address and MGA(55) coordinates. The location of the receivers are presented visually in **Figure 3**.

Table 2 Receiver Locations

Receivers	Address	MGA55 Coordinates	
		Easting	Northing
R1	467 Ashgrove Road	629973	6491655
R2	196 Lewis Road	630950	6487897
R3	1179 Berida-Innisfail Road	633976	6491163
R4	464 Ashgrove Road	627989	6492143
R5	1326 Berida-Innisfail Road	632401	6486325
R6	464 Ashgrove Road	627697	6492078
R7	1179 Berida-Innisfail Road	634512	6486187
R8	557 Berida-Innisfail Road	635653	6492399
R9	60 Prouts Road	636758	6491673
R10	52 Ashgrove Road	629398	6496093
R11	2661 Oxley Highway	633045	6495980
R12	2770 Oxley Highway	631932	6496305
R13	1179 Berida-Innisfail Road	636855	6487084
R14	200 Tacklebang Road	629623	6497097
R15	2357 Oxley Highway	636122	6496189
R16	2248 Oxley Highway	637078	6497337
R17	2027 Oxley Highway	639077	6496112



Legend

- Project Site
- Private Haul Road Site
- Quarry Site
- Proposed Extraction Area
- Proposed Crushing and Stockpile Area
- Approved Extraction Area
- Approved Crushing and Stockpile Area
- Land Ownership
- Haul Road
- Drainage Line
- Receiver Locations

Figure 3

Land Ownership

Image Source: ESRI (2020) Data source: NSW LPI (2020)

1.4 Coverage of Secretary's Environmental Assessment Requirements

The key issues to be addressed, as part of this NVIA are outlined in the Secretary's Environmental Assessment Requirements (SEARs) which are reproduced in **Table 3.**

Table 3 Coverage of SEARs and Other Government Agency Requirements

Noise and Vibration Assessment Requirement	Reference
Coverage of Secretary's Environmental Assessment Requirements	
Include a quantitative assessment of potential:	
▪ Construction and operational noise and off-site transport noise impacts of the development in accordance with the Interim Construction Noise Guideline, NSW Noise Policy for Industry and NSW Road Noise Policy respectively;	Section 5
▪ Reasonable and feasible mitigation measures to minimise noise emissions; and	Section 6
▪ Monitoring and management measures.	Section 6
Blasting and Vibration – including:	
▪ A description of the proposed blasting hours, frequency and methods; and	Section 1.2 / 4.4
▪ An assessment of the likely blasting and vibration impacts of the development having regard to the relevant ANZEC guidelines and paying particular attention to impacts on people, buildings, livestock, infrastructure and significant natural features.	Section 5.5
Coverage of Issues Identified by Other Government Agencies	
Gilgandra Shire Council (14 September 2020):	
▪ The impacts of noise, vibration and blasting will need to be assessed specifically to this site and not solely by reference to other similar sites. Data collected from blasting and crushing operations conducted on this site in relation to the existing quarry approval should be included.	Section 5
EPA (15 September 2020):	
▪ Identify the existing noise environment (including any relevant noise assessment groupings) and identify applicable noise goals in line with relevant guidance/standards.	Section 1.3 / 2.2 / 3
▪ Identify potential noise and vibration sources and impacts during both construction and operational stages and identify best practice mitigation measures (pollution control) and strategies to be incorporated for both stages to minimise noise and vibration emissions/impacts (with proposed timing), including validation monitoring, in line with relevant guidance/standards.	Section 4 / 5 / 6
▪ Propose representative noise monitoring locations for determining compliance with applicable noise goals and where relevant noise goals would be set as representative limits.	Section 6.2

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2 Noise and Blasting Policy and Guidelines

The following section summarises the relevant policy and guidelines for the proposal.

2.1 Interim Construction Noise Guideline

The assessment and management of noise from construction work is completed with reference to the Interim Construction Noise Guideline (ICNG). The ICNG is specifically aimed at managing noise from construction work regulated by the EPA and is used to assist in setting statutory conditions in licences or other regulatory instruments.

The ICNG sets out procedures to identify and address the impact of construction noise on residences and other sensitive land uses. This section provides a summary of noise objectives that are applicable to the assessment. The ICNG provides two methodologies for the assessment of construction noise emissions:

- Quantitative, which is suited to major construction proposals with typical durations of more than three weeks
- Qualitative, which is suited to short term infrastructure maintenance (for proposals with a typical duration of less than three weeks).

The methodology for a quantitative assessment requires a more complex approach, involving noise emission predictions from construction activities to the relevant assessment locations, whilst the qualitative assessment methodology is a more simplified approach that relies more on noise management strategies.

2.1.1 Standard Hours for Construction

Table 4 summaries the ICNG recommended standard hours for construction works.

Table 4 Recommended Standard Hours for Construction

Daytime	Construction Hours
Monday to Friday	7am to 6pm
Saturdays	8am to 1pm
Sundays or Public Holidays	No construction

2.1.2 Out of Hours Construction

Works conducted outside of recommended standard hours are considered out of hours work (OOH). The ICNG suggests that any request to vary the hours of construction activities as identified above shall be:

- considered on a case by case basis or activity-specific basis;
- accompanied by details of the nature and need for activities to be undertaken during the varied construction hours; and
- accompanied by written evidence that activities undertaken during the varied construction hours are strongly justified; appropriate consultation with potentially affected receivers and notification of the relevant regulatory authorities has occurred; and all practicable and reasonable mitigation measures will be put in place.

2.1.3 Construction Noise Management Levels

Table 5 reproduces the ICNG management levels for residential receivers. The construction noise management levels are the sum of the management level and relevant rating background level (RBL) for each specific assessment period.

Table 5 Noise Management Levels		
Time of Day	Management Level $LA_{eq,15min}$[1]	How to Apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays.	Noise affected RBL + 10dB.	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq(15min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of work to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA.	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account times identified by the community when they are less sensitive to noise such as before and after school for work near schools, or mid-morning or mid-afternoon for work near residences; and if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours.	Noise affected RBL + 5dB.	A strong justification would typically be required for work outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dBA above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

Note 1: The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the construction noise management levels for noise assessment purposes and is the median of the ABL's.

2.2 Noise Policy for Industry

The EPA released the Noise Policy for Industry (NPI) in October 2017 which provides a process for establishing noise criteria for consents and licenses enabling the EPA to regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997.

The objectives of the NPI are to:

- provide noise criteria that is used to assess the change in both short term and long term noise levels;
- provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals;
- promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified; and
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, considering the matters that must be considered under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

The policy sets out a process for industrial noise management involving the following key steps:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels (criteria), above which noise management measures are required to be considered. They are derived by considering two factors: shorter-term intrusiveness due to changes in the noise environment; and maintaining the noise amenity of an area.
2. Predict or measure the noise levels produced by the development with regard to the presence of annoying noise characteristics and meteorological effects such as temperature inversions and wind.
3. Compare the predicted or measured noise level with the PNTL, assessing impacts and the need for noise mitigation and management measures.
4. Consider residual noise impacts - that is, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures. This may involve balancing economic, social and environmental costs and benefits from the proposed development against the noise impacts, including consultation with the affected community where impacts are expected to be significant.

5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.

6. Monitor and report environmental noise levels from the development.

2.2.1 Project Noise Trigger Levels

The policy sets out the procedure to determine the PNTLs relevant to an industrial development. The PNTL is the lower (ie, the more stringent) of the **Project Intrusiveness Noise Level** (PINL) and **Project Amenity Noise Level** (PANL) determined in accordance with Section 2.3 and Section 2.4 of the NPI.

2.2.2 Project Intrusiveness Noise Level (PINL)

The PINL ($LA_{eq(15min)}$) is the RBL + 5dB and seeks to limit the degree of change a new noise source introduces to an existing environment. Hence, when assessing intrusiveness, background noise levels need to be measured.

For low noise environments, such as rural environments, minimum assumed RBLs apply within the NPI and can be adopted in lieu of completing background noise measurements. This is considered the most conservative method for establishing noise criteria for a project. These result in minimum intrusiveness noise levels as follows:

- Minimum Day RBL = 35dBA;
- Minimum Evening RBL = 30dBA; and
- Minimum Night RBL = 30dBA.

Due to the rural nature of the locality, the PINLs for the proposal have been determined based on the minimum RBL+5dBA.

2.2.3 Project Amenity Noise Level (PANL)

The PANL is relevant to a specific land use or locality. To limit continuing increases in intrusiveness levels, the ambient noise level within an area from all combined industrial sources should remain below the recommended amenity noise levels specified in Table 2.2 (of the NPI). The NPI defines two categories of amenity noise levels:

- **Amenity Noise Levels (ANL)** – are determined considering all current and future industrial noise within a receiver area; and
- **Project Amenity Noise Level (PANL)** – is the recommended level for a receiver area, specifically focusing on the project being assessed.

Additionally, Section 2.4 of the NPI states: "*to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows*":

PANL for new industrial developments = recommended **ANL** minus 5dBA.

The following exceptions apply when deriving the PANL:

- areas with high traffic noise levels;
- proposed developments in major industrial clusters;
- existing industrial noise and cumulative industrial noise effects; and
- greenfield sites.

Furthermore, where the PANL is applicable and can be satisfied, the assessment of cumulative industrial noise is not required.

The recommended amenity noise levels as per Table 2.2 of the NPI are reproduced in **Table 6**.

Table 6 Amenity Criteria

Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level dB LAeq(period)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks.	See column 4	See column 4	5dB above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School Classroom	All	Noisiest 1-hour period when in use	35 (internal) 45 (external)
Hospital ward			
- internal	All	Noisiest 1-hour	35
- external	All	Noisiest 1-hour	50
Place of worship - internal	All	When in use	40
Passive Recreation	All	When in use	50
Active Recreation	All	When in use	55
Commercial premises	All	When in use	65
Industrial	All	When in use	70

Notes: The recommended amenity noise levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7 of the NPI.

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

2.2.4 Maximum Noise Level Assessment

The potential for sleep disturbance from maximum noise level events from a project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed the following criteria, a detailed maximum noise level event assessment should be undertaken:

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

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

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

- how often the events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the development;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current understanding of effects of maximum noise level events at night.

2.3 Road Noise Policy

The road traffic noise criteria are provided in the Department of Environment, Climate Change and Water NSW (DECCW), Road Noise Policy (RNP), 2011. The policy sets out noise criteria that provide for a degree of amenity appropriate for the land use and road category.

For some industries such as mines and extractive industries, that are not served by arterial roads, a principal haulage route may be identified. The RNP indicates that where local authorities identify a 'principal haulage route', the noise criteria for the route should match those for arterial/sub-arterial roads, recognising that they carry a different level and mix of traffic to local roads.

2.4 ANZEC Blasting Guidelines

Noise and vibration levels from blasting are assessable against criteria established in the Australian and New Zealand Environment Council (ANZEC) – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration. The blasting limits are generally consistent with the guideline levels contained within AS2187:2006 Part 2 – Explosives - Storage and Usage – Part 2. Where compliance is achieved, the risk of human annoyance is minimised.

Furthermore, for damage induced vibration, German Standard DIN 4150 - Part 3: 1999 provides the strictest guideline levels of vibration velocity for evaluating the effects of vibration in structures. Blasting and vibration induced damage criteria relevant to this assessment are presented in detail in Section 3.4.

The guidelines recommend that blasting should generally be permitted during the hours of 9am to 5pm Monday to Saturday only. Blasting should not occur on Sundays or Public Holidays. Furthermore, blasting should generally take place no more than once per day.

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3 Assessment Criteria

The following sections summarise the relevant noise and blasting criteria for the proposal.

3.1 Construction Noise Management Levels

Noise Management Levels (NMLs) for construction activities for all residential receivers are 45dB $LA_{eq(15min)}$ (RBL +10dB). Construction activities are planned for standard hours, however the relevant NML standard construction hours and out of hours periods are summarised in **Table 7**.

Table 7 Construction Noise Management Levels

Location	Assessment Period	RBL dB LA_{90}	NML dB $LA_{eq(15min)}$
All Residential Receivers	Day (Standard Hours)	35	45 (RBL+10dBA)
	Evening (OOH Period 1)	30	35 (RBL+5dBA)
	Night (OOH Period 2)	30	35 (RBL+5dBA)

3.2 Operational Criteria

3.2.1 Project Intrusiveness Noise Levels

The PINLs for the Project are presented in **Table 8** and have been determined based on the RBL +5dBA.

Table 8 Intrusiveness Noise Levels

Receiver Type	Period[1]	Adopted RBL[2] dB LA_{90}	PINL dB $LA_{eq(15min)}$
Residential	Morning Shoulder	30	35
	Day	35	40
	Evening	30	35

Note 1: Morning Shoulder – the period from 6am to 7am Monday to Saturday; Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening – the period from 6pm to 10pm.

Note 2: Minimum RBLs adopted.

3.2.2 Project Amenity Noise Levels

The PANLs for residential receivers potentially affected by the Project are presented in **Table 9**.

Table 9 Project Amenity Noise Levels

Receiver Type	Noise Amenity Area	Assessment Period[1]	Recommended ANL dB $LA_{eq(period)}$[2]	PANL dB $LA_{eq(15min)}$[3]
Residential Receivers	Rural	Morning Shoulder	40	43
		Day	50	53
		Evening	45	48

Note 1: Morning Shoulder – the period from 6am to 7am Monday to Saturday; Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening – the period from 6pm to 10pm.

Note 2: Recommended amenity noise levels as per Table 2.2 of the NPI.

Note 3: Includes a +3dB adjustment to the amenity period level to convert to a 15-minute assessment period as per Section 2.2 of the NPI.

3.2.3 Project Noise Trigger Levels

The PNTLs are the lower of either the PINL or the PANL. **Table 10** presents the derivation of the PNTL in accordance with the methodologies outlined in the NPI.

Table 10 Project Noise Trigger Levels

Receiver Type	Period	RBL	PINL dB $LA_{eq(15min)}$	PANL dB $LA_{eq(15min)}$	PNTL dB $LA_{eq(15min)}$
Residential	Morning Shoulder	30	35	43	**35**
	Day	35	40	53	**40**
	Evening	30	35	48	**35**

Note 1: Morning Shoulder – the period from 6am to 7am Monday to Saturday; Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening – the period from 6pm to 10pm.

3.2.4 Maximum Noise Assessment Trigger Levels

The maximum noise trigger levels shown in **Table 11** are based on night time RBLs and trigger levels as per Section 2.5 of the NPI. The trigger levels will be applied to transient noise events that have the potential to cause sleep disturbance.

Table 11 Maximum Noise Assessment Trigger Levels

Residential Receivers			
$L_{Aeq(15min)}$		L_{Amax}	
40dB $L_{Aeq(15min)}$ or RBL + 5dB		52dB L_{Amax} or RBL + 15dB	
Trigger	40	Trigger	52
RBL 30+5dB	35	RBL 30+15dB	45
Highest	**40**	**Highest**	**52**

Note: Monday to Saturday; Night 10pm to 7am. On Sundays and Public Holidays; Night 10pm to 8pm.

Note: As per Section 2.5 of the NPI, the highest of the two criteria are adopted as the trigger level.

3.3 Road Traffic Noise Criteria

In accordance with the RNP, this assessment has adopted the 'Freeway/arterial/sub-arterial road' category for the designated inbound and outbound transport routes, consistent with the classification of the haulage route as a 'principal haulage route'. **Table 12** reproduces the road traffic noise assessment criteria relevant for this road type.

Table 12 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Type of Project/development	Assessment Criteria - dB(A)	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/sub-arterial road	Existing residences affected by additional traffic on existing freeways/sub-arterial/roads generated by land use developments	60dB(A) $L_{Aeq(15hr)}$	55dB(A) $L_{Aeq(9hr)}$

Note: For road noise assessments, the day period is from 7am to 10pm (ie there is no evening assessment period as there is with operational noise). Night is from 10pm to 7am.

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2dB, which is generally accepted as the threshold of perceptibility to a change in noise level.

3.3.1 Relative Increase Criteria

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receivers must be considered. Receivers experiencing increases in total traffic noise levels above those presented in **Table 13** due to the addition of project vehicles on the Oxley Highway should be considered for mitigation.

Table 13 Increase Criteria for Residential Land Uses

Road Category	Type of Project/Development	Total Traffic Noise Level Increase, dB(A)	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/sub-arterial roads and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $LA_{eq(15hr)}$ +12dB (external)	Existing traffic $LA_{eq(9hr)}$ +12dB (external)

3.4 ANZEC Guideline Blasting Limits

The ANZEC blasting limits for air-blast overpressure and ground vibration are presented in **Table 14**.

Table 14 ANZEC Guideline Blasting Limits

	Overpressure dB (Linear Peak)	Ground Vibration PPV (mm/s)
Recommended Maximum (95% of all blasts)	115	5
Level not to be exceeded	120	10
Long term goal for ground vibration	N/A	2

4 Noise Assessment Methodology

A computer model was developed to quantify the proposal noise emissions to neighbouring receivers for typical construction activities and operations. DGMR (iNoise, Version 2020.0) noise modelling software was used to quantify noise emissions from typical construction activities and operations. iNoise is a new intuitive and quality assured software for industrial noise calculations in the environment. 3D noise modelling is considered industry best practice for assessing noise emissions from projects.

The model incorporated a three-dimensional digital terrain map giving all relevant topographic information used in the modelling process. Additionally, the model uses relevant noise source data, ground type, attenuation from barrier or buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

The model calculation method used to predict noise levels was in accordance with ISO 9613-1 'Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere' and ISO 9613-2 'Acoustics - Attenuation of sound during propagation outdoors. Part 2: General method of calculation'. The ISO 9613 standard from 1996 is the most used noise prediction method worldwide. Many countries refer to ISO 9613 in their noise legislation. However, the ISO 9613 standard does not contain guidelines for quality assured software implementation, which leads to differences between applications in calculated results. In 2015 this changed with the release of ISO/TR 17534-3. This quality standard gives clear recommendations for interpreting the ISO 9613 method. iNoise fully supports these recommendations. The models and results for the 19 test cases are included in the software.

4.1 Construction Noise Modelling Parameters

A worst-case modelling scenario was adopted in this assessment to represent maximum noise emissions during construction of temporary amenities and formation of the carpark hardstand area. It is noted that there are potentially multiple and varied plant items which may be used in the construction phase of this project. Notwithstanding, the adopted fleet sound power level is considered representative of construction activities for this type of project.

The noise emission levels used in modelling are summarised in **Table 15**.

Table 15 Equipment Sound Power Levels - Construction		
Item	$LA_{eq(15min)}$ Sound Power Level (SWL), dBA	Period of Operation
Backhoe (small) (x1)	103	Day Only
Road Truck (x1)	102	Day Only
Grader (x1)	104	Day Only
Hand power tools	97	Day Only
Total Fleet	**108**	**Day Only**

4.2 Operational Noise Modelling Parameters

The model incorporated three-dimensional digitised ground contours for the fixed plant and surrounding area, as derived from the plans for the proposal superimposed onto the surrounding land base topography. Where relevant, modifying factors in general accordance with Fact Sheet C of the NPI have been applied to calculations.

4.2.1 Meteorological Analysis

Noise emissions from industry can be significantly affected by prevailing weather conditions. Wind has the potential to increase noise at a receiver when it is at low velocities and travels from the direction of the noise source. As the strength of the wind increases, the noise produced by the wind will mask the audibility of most industrial sources.

Meteorological conditions that enhance received noise levels include source to receiver winds and the presence of temperature inversions. To account for potential enhancements, the NPI specifies that the source to the receiver wind component speeds up to 3m/s for 30% or more of the time in any seasonal period (ie day, evening or night), is considered to be a feature wind and predictions must incorporate these conditions.

To determine the prevailing conditions for the Quarry, weather data during the period September 2017 to September 2019 was obtained from the Bureau of Meteorology's (BOM) Dubbo Airport (AWS) weather station located approximately 58km south-south-east of the Quarry Site. The data was analysed using the EPA's Noise Enhancement Wind Analysis (NEWA) program in order to determine the frequency of occurrence of winds of speeds up to 3m/s in each season.

Table 16 summarises the results of the wind analysis and includes the dominant wind direction and percentage occurrence during each season for each assessment period. The results of the detailed analysis of meteorological data is presented in **Appendix B**.

Table 16 Seasonal Frequency of Occurrence Wind Speed Intervals			
Season	Period[1]	Wind Direction ±(45°)	% Wind Speeds (m/s)
			0.5 to 3 m/s
Summer	Day	NNW	8
	Evening	NE	12
	Night	ESE	14
Autumn	Day	ESE	12
	Evening	ESE	16
	Night	ESE	17
Winter	Day	ESE	12
	Evening	SSW, SW	16
	Night	ESE	21
Spring	Day	ESE	8
	Evening	SSW, SW	12
	Night	ESE	15

Based on the results of this analysis, prevailing winds are not applicable for the assessment and the relevant meteorological conditions adopted are summarised in **Table 17**.

Table 17 Modelled Site Specific Meteorological Parameters				
Assessment Condition	Temperature	Wind Speed / Direction	Relative Humidity	Stability Class
Morning Shoulder - Inversion	10°C	2m/s / all directions	90%	F
Day - Calm	20°C	n/a	60%	n/a
Evening - Inversion	15°C	2m/s / all directions	70%	F

Note: Morning Shoulder – the period from 6am to 7am Monday to Saturday; Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening – the period from 6pm to 10pm.

4.2.2 Operational Noise Modelling Scenarios

The extraction operations of the Project would be undertaken over two stages. Stage 1 operations would involve the extraction of approximately 2.3Mt over 5 years (ie 490,000tpa) to supply hard rock material to the Inland Rail Project. During this stage, primary crushing activities would initially occur at the natural land surface before being relocated into the extraction area as the Quarry expands. During Stage 2, quarrying operations would continue down to approximately 240 to 242m AHD and the intensity of extraction would be reduced to approximately 80,000 to 120,000tpa of hard rock products to supply local markets.

To represent the worst-case operational activities, one (1) modelling scenario was adopted to assess operational noise emissions during Stage 1 of the Project. It is considered that where operational noise

emissions for Stage 1 of the Project are demonstrated to achieve the operational noise criteria, noise emissions during Stage 2 operations would also achieve the criteria.

The scenario is summarised below:

- Stripping of soil by bulldozer or excavator to expose the basalt resource. Soil would be spread onto the amenity bund or placed in wind row stockpiles within the Extraction Area footprint;
- The in-situ rock would be fragmented using conventional drill and blast techniques;
- Extracted Quarry material would be transferred direction to a mobile crushing unit (MCU) or to the Run-of-Mine (ROM) stockpile by front-end loader;
- After crushing, the Quarry products would be loaded to haul trucks and distributed to stockpiles within the Stockpile Area; and
- Road trucks would transport the material offsite via the private haul road.

It is noted that the MCU would initially be placed within the existing crushing and stockpiling area before being relocated within the pit to adjoin the blasted rock pile. The MCU in pit locations would be approximately 10m to 15m below the natural land surface level.

4.2.3 Sound Power Levels - Operation

Mobile plant noise emission data used in modelling for this assessment were obtained from the MAC noise database for relevant noise sources that are proposed to be used in the Quarry. The noise emission levels used in modelling are summarised in **Table 18**.

Table 18 Equipment Sound Power Levels

Item	dB $L_{Aeq(15min)}$ Sound Power Level (SWL)	Period of Operation		
Operational Noise Sources		**Day**	**Evening**	**Morning Shoulder**
Drill Rig (x1)	114	✓	x	✓
Bulldozer (x1)	111	✓	x	✓
Excavator (x1)	106	✓	x	✓
Dump Truck (x2)	105	✓	x	✓
Water Truck (x1)	101	✓	x	✓
Mobile Crushing Unit	113	✓	x	✓
Loader (x1)[1]	106	✓	x	✓
Backhoe (x1)	103	✓	x	✓
Road Trucks (70/day)	102	✓	✓	✓
Sleep Disturbance Assessment (L_{Amax})				
Truck Loading	117	x	x	✓

Note 1: Loader not used during Stage 2 of operations.

4.3 Road Noise Assessment Methodology

Extracted material would typically be transported from the proposal using B-Double configuration trucks or similar. Once loaded within the Stockpile Area, trucks would exit the Project Site onto to the private haul road to the Oxley Highway, which traverses portions of the 'Berakee' and 'Wilgaroo' properties under a right of carriageway agreement (see **Figure 1**).

Once at the Oxley Highway, which is a major east west transport route linking the mid north coastal reasons to the central western regions of NSW, approximately 95% of heavy vehicle movements would be in an easterly direction.

There are no residential receivers immediately adjacent to the private haul road. The closest offset distances to receivers along the Oxley Highway are approximately 100m within the vicinity of the Quarry and approximately 70m to receivers within the township of Collie.

Maximum dispatch from the Quarry will be up to 35 loads per day (70 movements) and up to a maximum of 10 loads per hour (20 movements). There would be approximately 12 light vehicle movements associated with the proposal per day. Based on annual average daily traffic (AADT) volumes from the TfNSW Traffic Volume Viewer (2009), the Oxley Highway carries approximately 550 vehicles per day with approximately 19% of those classified as heavy vehicles.

The United States (US) Environment Protection Agency's road traffic calculation method was used to predict the LA_{eq} noise levels from proposal related trucks travelling past existing receivers on Ostlers Lane. This method is an internationally accepted theoretical traffic noise prediction model and is ideal for calculating road traffic noise where relatively small traffic flows are encountered.

4.4 Blasting and Vibration Assessment Methodology

4.4.1 Indicative Blast Design

The in-situ rock would be fragmented using drill and blast techniques. The indicative blast design parameters are provided in **Table 19**.

Table 19 Blast Parameters

Parameter	Value
Blast hole diameter	89mm
Blast hole depth	5.5 to 11m
Blast hole spacing	~3m x 3m
Depth of stemming	1 to 2m
Size of blast	8,000 to 12,000bcm
Area of blast	500 to 1,500m^3
Bulk explosive type/initiation system	ANFO/None
Maximum Instantaneous Change (MIC)	Up to 50kg

4.4.2 Air-Blast Overpressure

Calculation of overpressure has been completed using the following AS2187.2 equation:

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

Where:

P = Pressure, in kilopascals;

Q = Effective explosives charge mass, in kilograms (MIC);

R = Distance from charge, in metres;

K_a = Site constant, a conservative value of 25 was adopted; and

a = Site exponent, a value of -1.45 was adopted.

The conversion of 'P' to unweighted decibels (dBZ) is completed using the following formula:

$$\mathrm{SPL} = 10\ x \log \left(\frac{P}{P_0} \right)^2$$

4.4.3 Ground-Borne Vibration

Preliminary estimations for vibration have been completed using the following AS2187.2 equation:

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

Where:

V = ground vibration as vector peak particle velocity, in mm/s;

R = distance between charge and point of measurement, in m;

Q = maximum instantaneous charge (effective charge mass per delay), in kg;

K_g = a constant related to site and rock properties for estimation purposes, a value of 1140 was adopted as per AS2187.2 to predict the 50% chance of exceedance in "average conditions"; and

B = a constant related to site and rock properties for estimation purposes, a value of 1.6 was adopted.

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5 Noise Modelling Results and Discussion

5.1 Construction Phase Noise Results

Predicted noise levels for the construction scenario described in **Section 4.1** are provided in **Table 20**. The results of the analysis show that noise emissions from each of the construction scenarios are predicted to satisfy the relevant noise management levels at all receiver locations.

Table 20 Combined Noise Predictions – Construction Scenarios

Receiver	Predicted Noise Level dB $LA_{eq(15min)}$	Day Period NML dB $LA_{eq(15min)}$	Compliant
R1	<30	45	✓
R2	<30	45	✓
R3	<30	45	✓
R4	<30	45	✓
R5	<30	45	✓
R6	<30	45	✓
R7	<30	45	✓
R8	<30	45	✓
R9	<30	45	✓
R10	<30	45	✓
R11	<30	45	✓
R12	<30	45	✓
R13	<30	45	✓
R14	<30	45	✓
R15	<30	45	✓
R16	<30	45	✓
R17	<30	45	✓

5.2 Operational Noise Results

Predicted Quarry operations include extraction, processing, product loading and transportation. The predicted noise levels at each receiver during calm and prevailing meteorological conditions are provided in **Table 21**. The noise contour maps for the Quarry operations are provided in **Appendix C**.

The results of the predictive modelling show that noise emissions from the Quarry satisfy the PNTL at all residential receivers, for each operational scenario under normal operating conditions. The assessment considered both calm and adverse (F Class inversion) meteorological scenarios.

Table 21 Predicted Operational Noise Levels, dB $LA_{eq(15min)}$

Receiver	Predicted Noise Level dB LAeq(15min)			PNTL dB LAeq(15min)			Compliant
	Shoulder[1]	Day	Evening[1,2]	Shoulder	Day	Evening	
R1	<30	<30	<30	35	40	35	✓
R2	33	31	<30	35	40	35	✓
R3	<30	<30	<30	35	40	35	✓
R4	<30	<30	<30	35	40	35	✓
R5	<30	<30	<30	35	40	35	✓
R6	<30	<30	<30	35	40	35	✓
R7	<30	<30	<30	35	40	35	✓
R8	<30	<30	<30	35	40	35	✓
R9	<30	<30	<30	35	40	35	✓
R10	<30	<30	<30	35	40	35	✓
R11	<30	<30	<30	35	40	35	✓
R12	<30	<30	<30	35	40	35	✓
R13	<30	<30	<30	35	40	35	✓
R14	<30	<30	<30	35	40	35	✓
R15	<30	<30	<30	35	40	35	✓
R16	<30	<30	<30	35	40	35	✓
R17	<30	<30	<30	35	40	35	✓

Note: Morning Shoulder – the period from 6am to 7am Monday to Saturday or 6am to 8am Sundays and public holidays; Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays.

Note 1: Assessed during inversion conditions.

Note 2: Trucks returning to Quarry Site during evening only.

5.3 Maximum Noise Level Assessment

In assessing sleep disturbance, a typical L_{Amax} noise source of 117dB was used to represent transient events associated with loading trucks with Quarry products to the assessed residential receivers under F Class stability conditions (ie worst case).

The results of the analysis identify that maximum noise trigger levels will be satisfied for all residential receivers, hence no further assessment or detailed analysis is required. Predicted noise levels from L_{Amax} events are presented in **Table 22**.

Table 22 Predicted Maximum Noise Levels

Receiver	Period	Noise Predictions dB L_{Amax}	Trigger Level dB L_{Amax}
R1	Morning Shoulder	<30	52
R2		<30	52
R3		<30	52
R4		<30	52
R5		<30	52
R6		<30	52
R7		<30	52
R8		<30	52
R9		<30	52
R10		<30	52
R11		<30	52
R12		<30	52
R13		<30	52
R14		<30	52
R15		<30	52
R16		<30	52
R17		<30	52

Note: Morning Shoulder – the period from 6am to 7am Monday to Saturday or 6am to 8am Sundays and public holidays.

5.4 Traffic Noise Results

The results of the traffic noise calculations for operational road traffic are presented in **Table 23** for the closest residential receivers to the Oxley Highway, identified as 1 Coonamble Street and 1840 Oxley Highway, setback approximately 70m and 100m respectively from the carriageway.

Maximum dispatch from the Quarry will be up to 35 loads per day (70 movements) and up to a maximum of 10 loads per hour (20 movements). There would be approximately 12 light vehicle movements associated with the proposal per day. For this assessment, it has been assumed that all vehicles travel along the proposed haul route to the Oxley Highway.

Based on the most recent AADT volumes, the Oxley Highway carries approximately 550 vehicles per day with approximately 19% of those classified as heavy vehicles.

Table 23 Operational Road Traffic Noise Levels – Residential Receivers

Offset Distance (m)	Assessment Criteria[1]	Traffic Noise dB $LA_{eq(period)}$		
		Existing Traffic Noise	Existing + Future Quarry Combined	Total Change
1 Coonamble Street				
70m	Day 60 dB $LA_{eq(15hr)}$	35.4	37.1	+1.7
	Night 55 dB $LA_{eq(9hr)}$	32.6	34.0	+1.4
1840 Oxley Highway				
100m	Day 60 dB $LA_{eq(15hr)}$	31.8	33.4	+1.6
	Night 55 dB $LA_{eq(9hr)}$	<30	30.4	+1.5

Note 1: Day 7am to 10pm. Night 10pm to 7am.

The traffic noise contribution from the Quarry is predicted to remain below the relevant day and night assessment criteria for the nearest residential receivers.

5.5 Blasting Results

The Proponent anticipates the requirement for up to 12 blasts per year during Stage 1, and approximately three blast per year during Stage 2.

Blast overpressure and vibration have been calculated to each assessed receiver for the proposal adopting a Maximum Instantaneous Charge (MIC) of up to 50kg. Calculated levels for overpressure and vibration have been compared to the relevant ANZEC criteria and are presented in **Table 24**. Results identify blasts of MICs up to 50kgs would satisfy relevant ANZEC overpressure and vibration criteria.

Notwithstanding, the proposed MIC blast patterns should be completed in conjunction with an appropriate blast monitoring program.

Table 24 Blasting Emissions

Receiver ID[1]	Distance to Charge km	Airblast Overpressure dBZ Peak	Ground Vibration mm/s
R1	2.1	102	0.12
R2	1.9	103	0.14
R3	3.2	97	0.06
R4	3.8	94	0.05
R5	3.8	95	0.05
R6	4.0	94	0.04
R7	5.0	91	0.03
R8	5.3	90	0.03
R9	6.0	89	0.02
R10	6.5	88	0.02
R11	6.5	88	0.02
R12	6.5	88	0.02
R13	6.4	88	0.02
R14	7.4	86	0.02
R15	8.1	85	0.01
R16	9.6	83	0.01
R17	10.2	82	0.01

5.5.1 Effects of Vibration on Infrastructure from Blasting

The nearest significant infrastructure to the Quarry is the Oxley Highway approximately 6.3km to the north of the Quarry. Vibration levels at the Oxley Highway are calculated to be below 5mm/s. Hence there are no significant vibration effects from blasting on significant infrastructure.

5.5.2 Effects of Blasting on Animals and Livestock

Blast effects resulting from the Quarry are predicted to be, at worst for overpressure up to 103dBZ, and for vibration up to 0.14mm/s at the nearby residential receiver locations. The calculated blast over pressure and vibration levels are well below the regulatory criteria and considerably lower than other sources of overpressure that horses or livestock are likely to be already subjected to such as lightning strikes which are typically between 120dBZ and 130dBZ[1].

[1] Equine Health Impact Statement – Drayton South Coal Project (2015)

6 Noise Monitoring and Management

6.1 Noise Management Measures

Although it is demonstrated that noise levels are predicted to meet the relevant noise goals and no further mitigation measures are required, to proactively address any potential residual noise impacts, a noise management plan (NMP) may be considered for the Quarry. The NMP will guide, manage, quantify and control noise emissions from the Quarry through the implementation of feasible and reasonable best management practices. These may include:

- Scheduling the use of noisy equipment at the least-sensitive time of day;
- Strictly adhering to the proposed hours of operation;
- Siting noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area.
- Keeping equipment well maintained and operating it in a proper and efficient manner.
- Employing 'quiet' practices when operating equipment, for example, positioning idling trucks in appropriate areas.
- Running staff-education programs and regular tool box talks on the effects of noise and the use of quiet work practices.

The NMP may also address the use of best available technology including alternatives to tonal reversing alarms, efficient muffler design, and using enclosures, as well as reducing noise in transmission or at the receiver.

6.2 Noise Monitoring

It is recommended that the NMP includes a provision for attended noise monitoring within the community in response to received complaints, if any. The operator attended noise measurements and recordings would be conducted to quantify noise emissions from the Quarry as well as the overall level of ambient noise.

As per the EPA's Recommended Environmental Assessment Requirements, it is recommended that one (1) round of validation monitoring is undertaken within six (6) months of initiation of operations. Where validation monitoring is undertaken, the survey should be carried out at the nearest residential receiver locations, identified as R1 and R2, and occur under normal operating conditions. The survey should include one (1) 15-minute measurement at each of the nominated receivers during the morning shoulder period (6am to 7am) and day period (7am to 6pm). The noise measurements would occur in accordance with the method outlined below.

When required, the operator shall quantify and characterise the energy equivalent (L_{Aeq}) intrusive noise level from the project over a 15-minute measurement period. In addition, the operator shall quantify and characterise the overall levels of ambient noise over the 15-minute measurement interval. It is recommended that instrumentation used during the monitoring is to be equivalent to a Type 1 meter with 1/3 octave band analysis and have audio recording functionality for post processing source identification. It is noted that 1/3 octave band analysis is required to establish whether modification factors in accordance with the NPI are to be applied.

All acoustic instrumentation used as part of the attended monitoring program must been designed to comply with the requirements of AS IEC 61672.1-2019, Electroacoustics - Sound level meters - Specifications and shall have current calibration certificates. All instrumentation shall be programmed to record statistical noise level indices in 15-minute intervals including L_{Amax}, L_{Amin} and L_{Aeq}.

Instrument calibration shall be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA. The measurement position(s) should be selected considering:

- weather conditions such as rain and wind, insect noise;
- the location and direction of any noise source/s;
- the most sensitive position at the affected receiver; and
- the need to avoid reflecting surfaces (where possible).

7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has conducted a NVIA of potential impacts from the proposal for extension of the Berakee Quarry near Collie, NSW. The assessment has quantified potential construction and operational noise emissions pertaining to extraction, processing, drilling and dispatch via road trucks, as well as blasting noise and vibration emissions.

The results of the NVIA demonstrate that construction and operational noise levels would achieve the relevant ICNG and NPI criteria for all assessment periods at each assessed receiver location.

An assessment of maximum noise levels demonstrated that noise emissions from the proposal are predicted to remain below the EPA trigger levels for sleep disturbance at all receiver locations.

The NVIA demonstrates that the project related road traffic noise levels will meet the objectives of the RNP for the nearest residential receivers to the Oxley Highway.

Airblast overpressure and vibration levels are also predicted to meet the criteria at all assessed receivers for blasts up to 50kg MIC.

Based on the NVIA results, there are no noise or blasting related issues which would prevent the approval of the project. The results of the assessment show compliance with the relevant operational and road noise criteria. Additionally, the results of the assessment demonstrate compliance with the relative EPA and DECCW policies, without ameliorative measures being required.

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Appendix A – Glossary of Terms

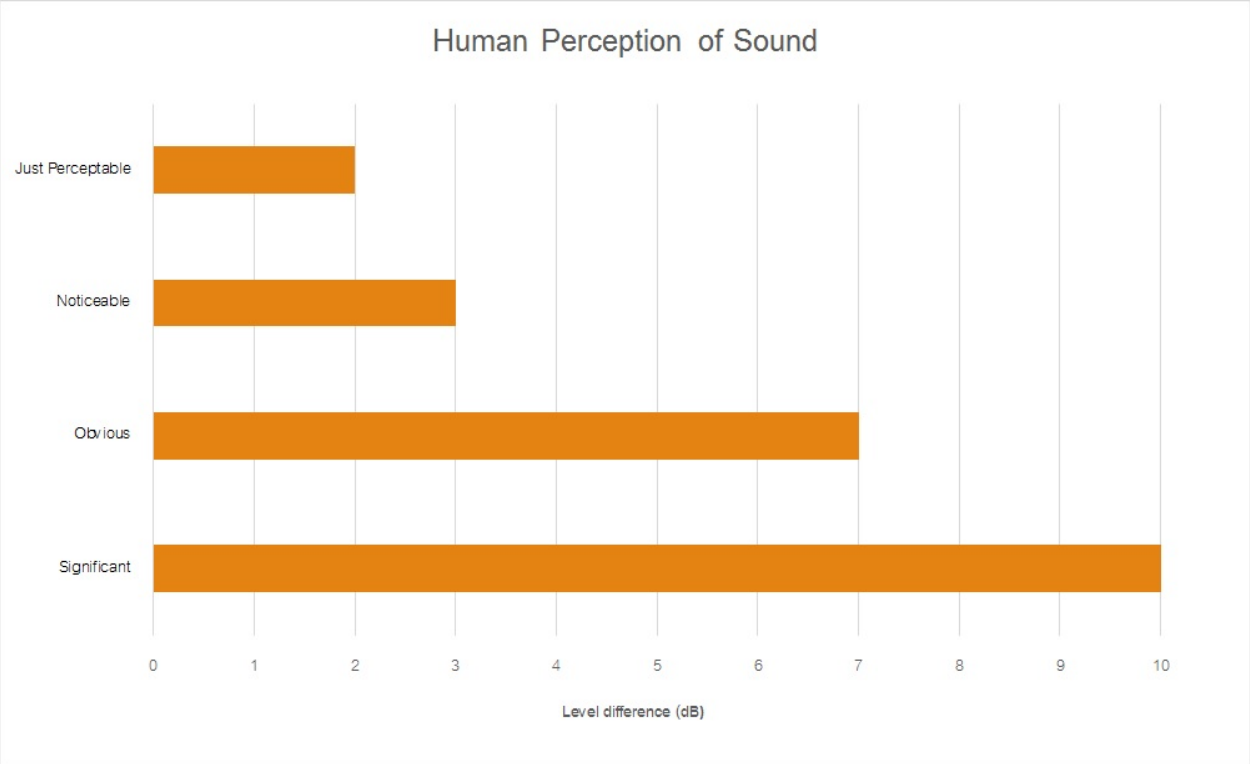
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA_{90} statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dB(A)	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear. In some cases the overall change in noise level is described in dB rather than dB(A), or dB(Z) which relates to the weighted scale.
dB(Z)	Linear Z-weighted decibels.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA_{10}	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA_{90}	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LA_{eq}	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LA_{max}	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dB(A)	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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Appendix B – NEWA Analysed Meteorology

Table B1 NEWA Analysed Daytime Meteorological Conditions, Dubbo Airport AWS NSW					
Direction ± 45°	Season	Day Percentage Occurrence %	Direction	Season	Day Percentage Occurrence %
0	Summer	7	180	Summer	3
0	Autumn	6	180	Autumn	8
0	Winter	6	180	Winter	9
0	Spring	5	180	Spring	6
22.5	Summer	7	202.5	Summer	4
22.5	Autumn	7	202.5	Autumn	6
22.5	Winter	6	202.5	Winter	7
22.5	Spring	6	202.5	Spring	5
45	Summer	6	225	Summer	4
45	Autumn	8	225	Autumn	5
45	Winter	6	225	Winter	6
45	Spring	6	225	Spring	4
67.5	Summer	5	247.5	Summer	4
67.5	Autumn	8	247.5	Autumn	5
67.5	Winter	6	247.5	Winter	7
67.5	Spring	6	247.5	Spring	4
90	Summer	4	270	Summer	5
90	Autumn	9	270	Autumn	4
90	Winter	9	270	Winter	7
90	Spring	7	270	Spring	4
112.5	Summer	5	292.5	Summer	5
112.5	Autumn	12	292.5	Autumn	6
112.5	Winter	12	292.5	Winter	8
112.5	Spring	8	292.5	Spring	5
135	Summer	5	315	Summer	6
135	Autumn	11	315	Autumn	5
135	Winter	11	315	Winter	8
135	Spring	7	315	Spring	5
157.5	Summer	3	337.5	Summer	8
157.5	Autumn	8	337.5	Autumn	7
157.5	Winter	9	337.5	Winter	7
157.5	Spring	5	337.5	Spring	6

Table B2 NEWA Analysed Evening Meteorological Conditions, Dubbo Airport AWS NSW					
Direction ± 45°	Season	Evening Percentage Occurrence %	Direction	Season	Evening Percentage Occurrence %
0	Summer	8	180	Summer	7
0	Autumn	5	180	Autumn	14
0	Winter	7	180	Winter	15
0	Spring	4	180	Spring	11
22.5	Summer	9	202.5	Summer	7
22.5	Autumn	8	202.5	Autumn	13
22.5	Winter	7	202.5	Winter	16
22.5	Spring	6	202.5	Spring	12
45	Summer	12	225	Summer	6
45	Autumn	14	225	Autumn	10
45	Winter	10	225	Winter	16
45	Spring	10	225	Spring	12
67.5	Summer	11	247.5	Summer	6
67.5	Autumn	13	247.5	Autumn	9
67.5	Winter	10	247.5	Winter	14
67.5	Spring	11	247.5	Spring	10
90	Summer	9	270	Summer	5
90	Autumn	14	270	Autumn	5
90	Winter	11	270	Winter	11
90	Spring	10	270	Spring	8
112.5	Summer	10	292.5	Summer	5
112.5	Autumn	16	292.5	Autumn	4
112.5	Winter	13	292.5	Winter	10
112.5	Spring	11	292.5	Spring	6
135	Summer	8	315	Summer	5
135	Autumn	15	315	Autumn	3
135	Winter	12	315	Winter	7
135	Spring	10	315	Spring	4
157.5	Summer	4	337.5	Summer	8
157.5	Autumn	10	337.5	Autumn	4
157.5	Winter	8	337.5	Winter	6
157.5	Spring	6	337.5	Spring	3

Table B3 NEWA Analysed Night time Meteorological Conditions, Dubbo Airport AWS NSW					
Direction ± 45°	Season	Night Percentage Occurrence %	Direction	Season	Night Percentage Occurrence %
0	Summer	4	180	Summer	6
0	Autumn	4	180	Autumn	11
0	Winter	5	180	Winter	14
0	Spring	2	180	Spring	11
22.5	Summer	8	202.5	Summer	5
22.5	Autumn	6	202.5	Autumn	7
22.5	Winter	6	202.5	Winter	9
22.5	Spring	4	202.5	Spring	10
45	Summer	13	225	Summer	3
45	Autumn	10	225	Autumn	6
45	Winter	8	225	Winter	6
45	Spring	7	225	Spring	6
67.5	Summer	13	247.5	Summer	3
67.5	Autumn	12	247.5	Autumn	4
67.5	Winter	10	247.5	Winter	6
67.5	Spring	10	247.5	Spring	6
90	Summer	13	270	Summer	2
90	Autumn	14	270	Autumn	4
90	Winter	16	270	Winter	7
90	Spring	12	270	Spring	5
112.5	Summer	14	292.5	Summer	2
112.5	Autumn	17	292.5	Autumn	4
112.5	Winter	21	292.5	Winter	7
112.5	Spring	15	292.5	Spring	4
135	Summer	10	315	Summer	2
135	Autumn	14	315	Autumn	3
135	Winter	19	315	Winter	6
135	Spring	15	315	Spring	4
157.5	Summer	6	337.5	Summer	4
157.5	Autumn	12	337.5	Autumn	4
157.5	Winter	16	337.5	Winter	5
157.5	Spring	11	337.5	Spring	3

Appendix C – Noise Model Contours

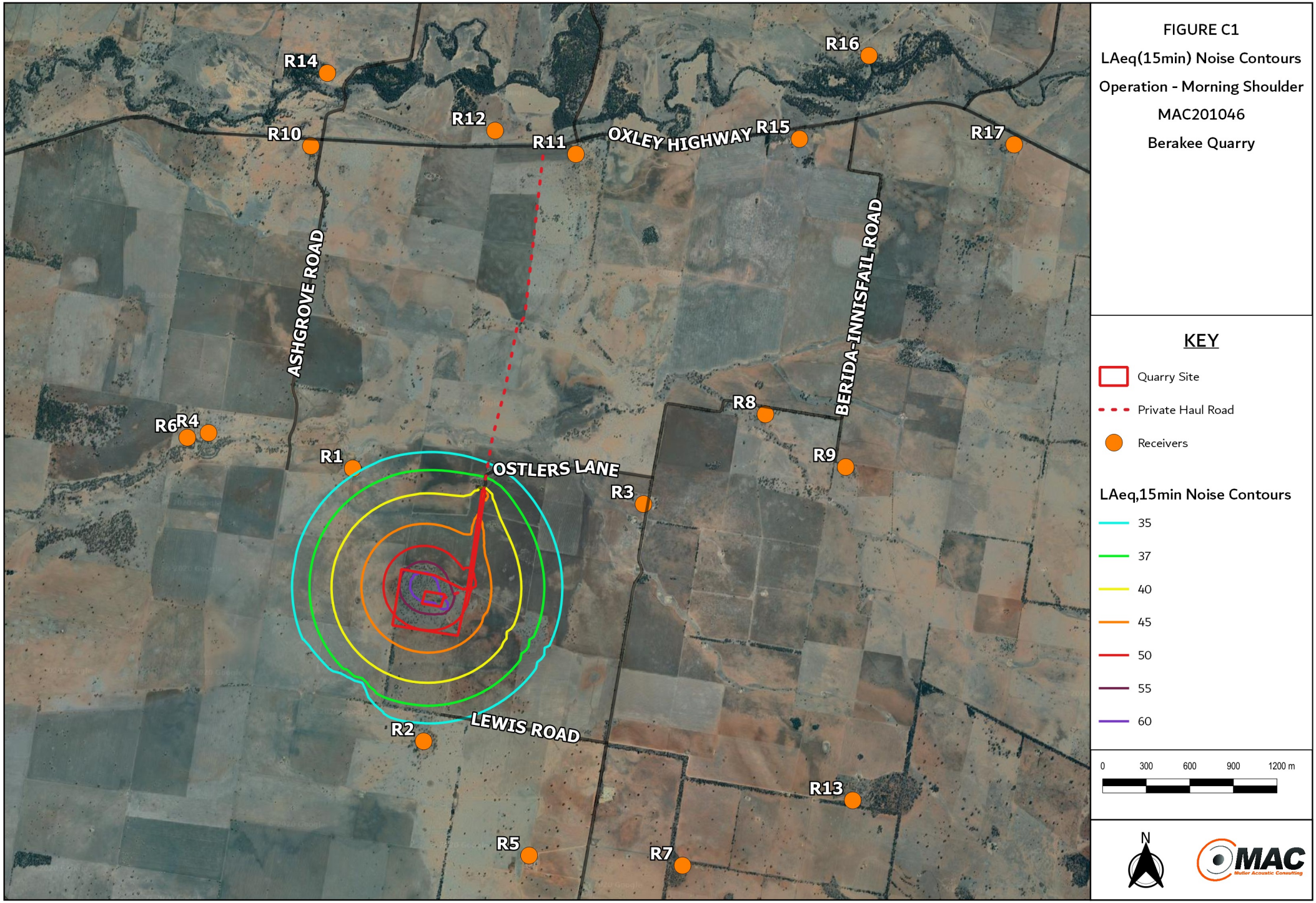

FIGURE C1

LAeq(15min) Noise Contours

Operation - Morning Shoulder

MAC201046

Berakee Quarry

KEY

- Quarry Site
- Private Haul Road
- Receivers

LAeq,15min Noise Contours

- 35
- 37
- 40
- 45
- 50
- 55
- 60

0 300 600 900 1200 m

N

MAC
Muller Acoustic Consulting

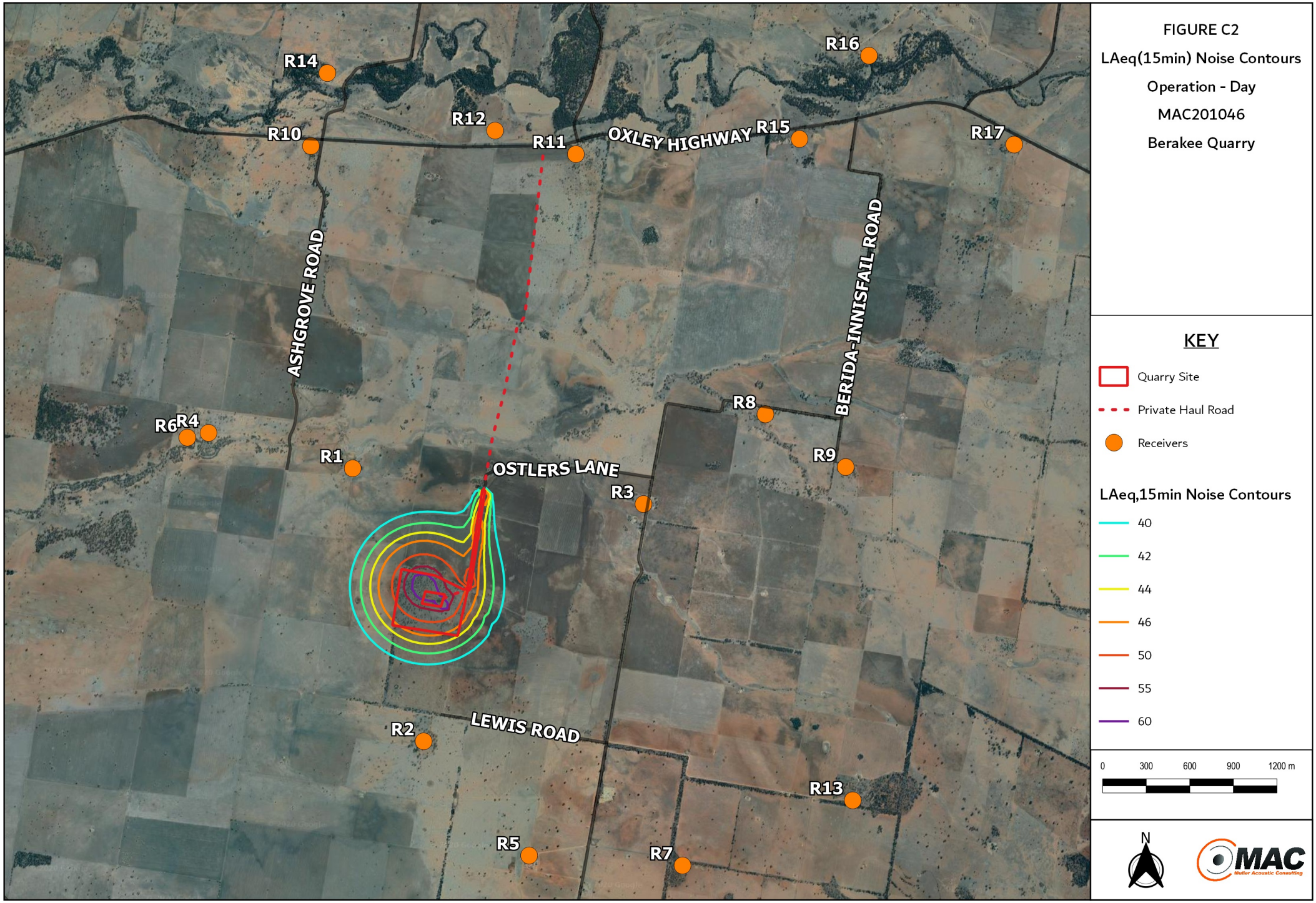
R14
R16
R12
R10
R11
OXLEY HIGHWAY
R15
R17
ASHGROVE ROAD
BERIDA-INNISFAIL ROAD
R8
R6
R4
R1
OSTLERS LANE
R9
R3
R2
LEWIS ROAD
R13
R5
R7
FIGURE C2
LAeq(15min) Noise Contours
Operation - Day
MAC201046
Berakee Quarry
KEY
Quarry Site
Private Haul Road
Receivers
LAeq,15min Noise Contours
40
42
44
46
50
55
60
0
300
600
900
1200 m
N
MAC
Muller Acoustic Consulting

FIGURE C3

LAeq(15min) Noise Contours

Operation - Evening

MAC201046

Berakee Quarry

KEY

- Quarry Site
- Private Haul Road
- Receivers

LAeq,15min Noise Contours

- 35
- 37
- 40
- 45
- 50
- 55
- 60

0 300 600 900 1200 m

N

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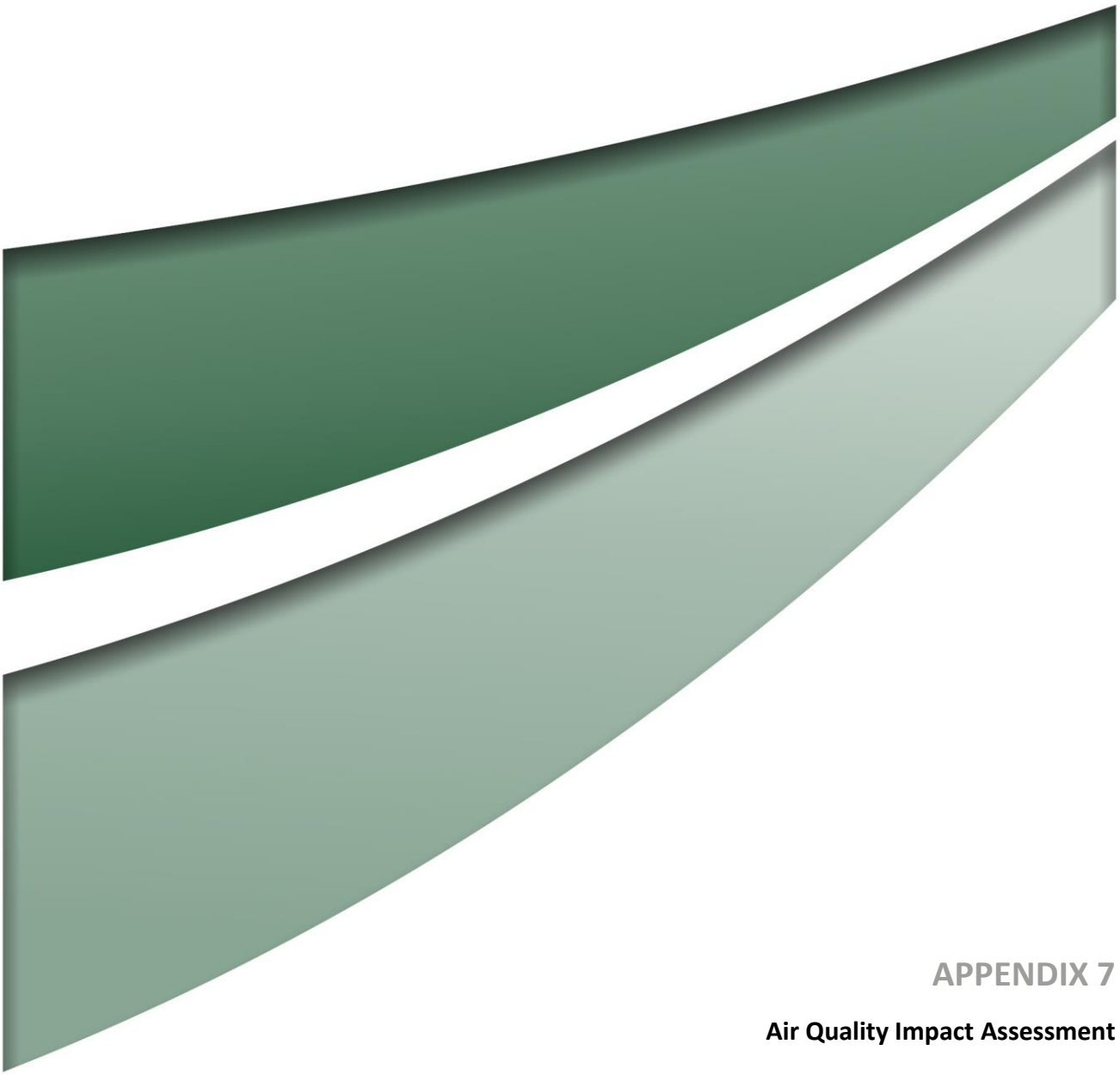

APPENDIX 7

Air Quality Impact Assessment

Berakee Quarry

Air Quality Impact Assessment

F0 | V0

6 January 2021

Umwelt (Australia) Pty Ltd

Berakee Quarry

Project No: IA231100
Document Title: Air Quality Impact Assessment
Document No.: F0
Revision: V0

Date: 6 January 2021
Client Name: Umwelt (Australia) Pty Ltd

Project Manager: Luke Spencer
Author: Luke Spencer
File Name: Berakee Quarry report_F0v0.docx

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Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
D0vA	10/11/2020	Draft for internal TR	LS	SL	SL	SL
D0vB	12/11/2020	2nd draft for internal review	LS	SL	SL	SL
D0v0	24/11/2020	Draft for client review	LS	SL	SL	SL
F0v0	06/01/2021	Draft addressing client comments and SEARs	LS	SL	SL	SL

Contents

Executive Summary 1
1. Introduction 4
2. Proposal details 5
2.1 Site and surrounds 5
2.2 Proposal overview 7
2.3 Key air quality-related matters 8
3. Policy setting and assessment criteria 9
4. Existing environment 12
4.1 Surrounding receivers 12
4.2 Terrain 12
4.3 Meteorology 13
4.4 Background air quality 18
4.4.1 Overview 18
4.4.2 Particulate matter as PM_{10} 19
4.4.3 Particulate matter as $PM_{2.5}$ 21
4.4.4 Total suspended particulates (TSP) 23
4.4.5 Deposited dust 24
4.5 Selection of a representative assessment year and establishment of background air quality conditions 24
5. Emissions to air 26
5.1 Emissions inventory 26
5.2 Emission controls 27
6. Assessment approach 29
6.1 Overview 29
6.2 Meteorological modelling 29
6.3 Dispersion modelling 30
7. Assessment of impacts 33
7.1 Overview 33
7.2 Particulate matter as PM_{10} 33
7.3 Particulate matter as $PM_{2.5}$ 34
7.4 Total suspended particulates (TSP) 36
7.5 Deposited dust 37
8. Safeguards and monitoring 38
9. Conclusions 39
10. References 40

Appendix A. Emissions calculations

Appendix B. CALPUFF discrete receiver locations

Appendix C. Incremental contour plots

Table 1.1 SEARs air quality assessment requirements 4
Table 2.1 Key details of existing and proposed operations 7
Table 3.1 EPL 21093 dust management requirements 9
Table 3.2 EPA impact assessment criteria 10
Table 4.1 Surrounding residential receivers 12
Table 4.2 Details of representative meteorological station 13
Table 4.3 Annual meteorological statistics from BoM Trangie Research Station (no. 051049) automatic weather station (2015 to 2019) 14
Table 4.4 Summary of nearby air quality monitoring stations 18
Table 4.5 Data capture rates (per cent) for DPIE monitoring stations 19
Table 4.6 Summary of PM_{10} measurement statistics at DPIE Bathurst, Gunnedah and Orange 21
Table 4.7 Summary of $PM_{2.5}$ measurement statistics at DPIE Bathurst, Gunnedah and Orange 23
Table 4.8 Review of ratio of measured PM_{10} to TSP, Dubbo DustTrak 23
Table 4.9 Estimated annual TSP concentrations 24
Table 4.10 Summary of Cobbora Coal baseline deposited dust monitoring data (Environ Australia Pty Ltd, 2012) 24
Table 4.11 Adopted background air quality conditions 25
Table 5.1 Estimated emissions to air 26
Table 5.2 Emission control measures 27
Table 6.1 TAPM setup details 29
Table 6.2 CALMET setup details 30
Table 6.3 Source locations 32
Table 7.1 Predicted annual PM_{10} concentrations 33
Table 7.2 Review of change in number of days with PM_{10} concentrations exceeding 50 µg/m^3 34
Table 7.3 Predicted annual $PM_{2.5}$ concentrations 34
Table 7.4 Review of change in number of days with $PM_{2.5}$ concentrations exceeding 25 µg/m^3 35
Table 7.5 Predicted annual TSP concentrations (µg/m^3) 36
Table 7.6 Predicted deposited dust 37
Table 8.1 Dust management measures 38

Figure 2-1 Proposal setting 6
Figure 4-1 Three-dimensional schematic of Proposal setting 13
Figure 4-2 Annual and seasonal wind roses for Trangie Research Station, 2015 to 2019 17
Figure 4-3 Measured 24-hour average PM_{10} concentrations at DPIE Bathurst, Gunnedah and Orange, 2015 to 2019 20
Figure 4-4 Measured 24-hour average $PM_{2.5}$ concentrations at DPIE Bathurst, Gunnedah and Orange, 2015 to 2019 22
Figure 6-1 CALPUFF modelling source locations 31

Executive Summary

Background

Regional Quarries Australia Pty Ltd (Regional Hardrock) is seeking an approval to extend the extraction area, production rate, quarry life and disturbance footprint of the Berakee Quarry at 144 Ostlers Lane, Collie NSW (Lot 1 DP1265657). The Secretary's Environmental Assessment Requirements (SEARs) identified dust (particulate matter in the form of Total Suspended Particles [TSP], deposited dust, and fine particles (particles with an aerodynamic diameter less than 10 and 2.5 microns [PM_{10} and $PM_{2.5}$])) arising from construction activities, the operation of the quarry and/or road haulage as the primary air quality-related risk associated with the Proposal. Consistent with the SEARs, an assessment was completed in accordance with the 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW', (New South Wales Environment Protection Authority, 2016) to identify and evaluate the potential for dust-related impacts from the proposed activities, including the development of feasible mitigation and management measures.

Key features of the existing environment

A review of available information was completed to characterise key features of the existing environment. Aerial imagery was reviewed to identify sensitive receivers around the Proposal. The last five calendar years of meteorological data collected by the Bureau of Meteorology (BoM) at Trangie Research Station as well as air quality data collected at the nearest stations operated by the Department of Planning, Industry and Environment (DPIE) were reviewed to identify a representative assessment year.

From this review it was identified that 2018 was a representative meteorological year for the purpose of the assessment. However, in 2018, the inferred background $PM_{2.5}$ concentrations around the Proposal exceeded the NSW EPA's impact assessment criteria. Considering the elevated background levels, it was determined that the assessment would need to demonstrate "that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical" as per EPA (2016).

Estimation of emissions to air

The rate of dust emissions from sources and activities associated with the Proposal were estimated using emissions factors developed locally contained in "Emission Estimation Technique Manual for Mining" (NPI, 2012) and by the United States Environmental Protection Agency (United States Environment Protection Agency). Emissions were also estimated for existing operations so that potential changes in impacts could be quantified.

Assessment of impacts

The computer-based air dispersion model, known as CALPUFF, was used to predict potential changes in air quality as a result of the Proposal. The dispersion modelling accounted for meteorological conditions, land use and terrain information and used the dust emission estimates to predict changes in air quality at surrounding sensitive receivers.

For each air quality indicator and averaging time, the modelling showed that:

- Annually averaged PM_{10}, TSP and deposited dust: No exceedances of the EPA's impact assessment criteria are predicted at surrounding sensitive receivers;
- Annually averaged $PM_{2.5}$: A negligible (less than 1%) increases in annually averaged $PM_{2.5}$ is predicted at surrounding sensitive receivers as a result of the Proposal, with background concentrations noted to already exceed criteria; and
- Daily $PM_{2.5}$: No additional days of PM_{10} and $PM_{2.5}$ concentrations above the EPA's respective 50 $\mu g/m^3$ and 25 $\mu g/m^3$ impact assessment criteria.

Conclusion and recommended safeguards

The assessment found that, based on dispersion modelling carried out in accordance with regulatory guidelines, the Proposal would not result in unacceptable changes to local air quality. However, given that elevated particulate matter concentrations have historically occurred in the Proposal setting, best-practice controls were recommended, consistent with the Approved Methods. These controls included the use of watering during drilling, material hauling, loading and unloading and screening, as well as on exposed surface and stockpiles, and the use of enclosures and water sprays with dust suppressing additives during crushing. Additionally, it was recommended that weather forecasts be used to identify high-risk times of days for dust, with controls on the intensity of operations adjusted accordingly, and in particular for planned blasting.

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to quantify the potential air quality impacts for the Berakee Quarry Expansion Proposal in accordance with the scope of services set out in the contract between Jacobs and Umwelt (Australia) Pty Ltd (Umwelt). That scope of services, as described in this report, was developed with Umwelt.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by Umwelt and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

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1. Introduction

Regional Hardrock Gilgandra Unit Trust (Regional Hardrock) is seeking an approval to extend the extraction area, production rate, quarry life and disturbance footprint of the Berakee Quarry located on Lot 1 DP 1265657, near Collie NSW (the proposal). Regional Hardrock has engaged Umwelt (Australia) Pty Limited (Umwelt) to complete an Environmental Impact Statement (EIS) to assess these works. Umwelt has engaged Jacobs Group (Australia) Pty Ltd (Jacobs) to undertake an Air Quality Impact Assessment (AQIA) to support the EIS. The Secretary's Environmental Assessment Requirements (SEARs) (No. 1488) identify key environmental matters requiring assessment as part of the EIS. Dust and other emissions to air associated with construction and operations is identified as a key issue. The requirements for air quality assessment from the SEARs are the subject of this AQIA report. These requirements are reproduced below:

Table 1.1 SEARs air quality assessment requirements

Requirement of SEARs No. 1488
Air – including an assessment of the likely air quality impacts of the development in accordance with the 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW'. The assessment is to give particular attention to potential dust impacts on any nearby private receivers due to construction activities, the operation of the quarry and/or road haulage.

In meeting these requirements, the objectives of this assessment were to:

- Describe the Proposal setting, proposed activities and potential air quality issues (Section 2);
- Establish suitable air quality assessment criteria (Section 3);
- Describe the existing environment including surrounding receivers, terrain, meteorology and ambient air quality conditions (Section 4);
- Estimate emissions to air associated with the Proposal (Section 5);
- Explain the methods used to predict potential air quality impacts (Section 6);
- Present and discuss predicted potential impacts (Section 7); and
- Recommend mitigation and management measures (Section 8).

2. Proposal details

2.1 Site and surrounds

Regional Hardrock's Berakee Quarry is located at Lot 1 DP 1265657 off Ostlers Lane near Collie, NSW. The location and surrounds of the proposal is displayed in Figure 2-1 below.

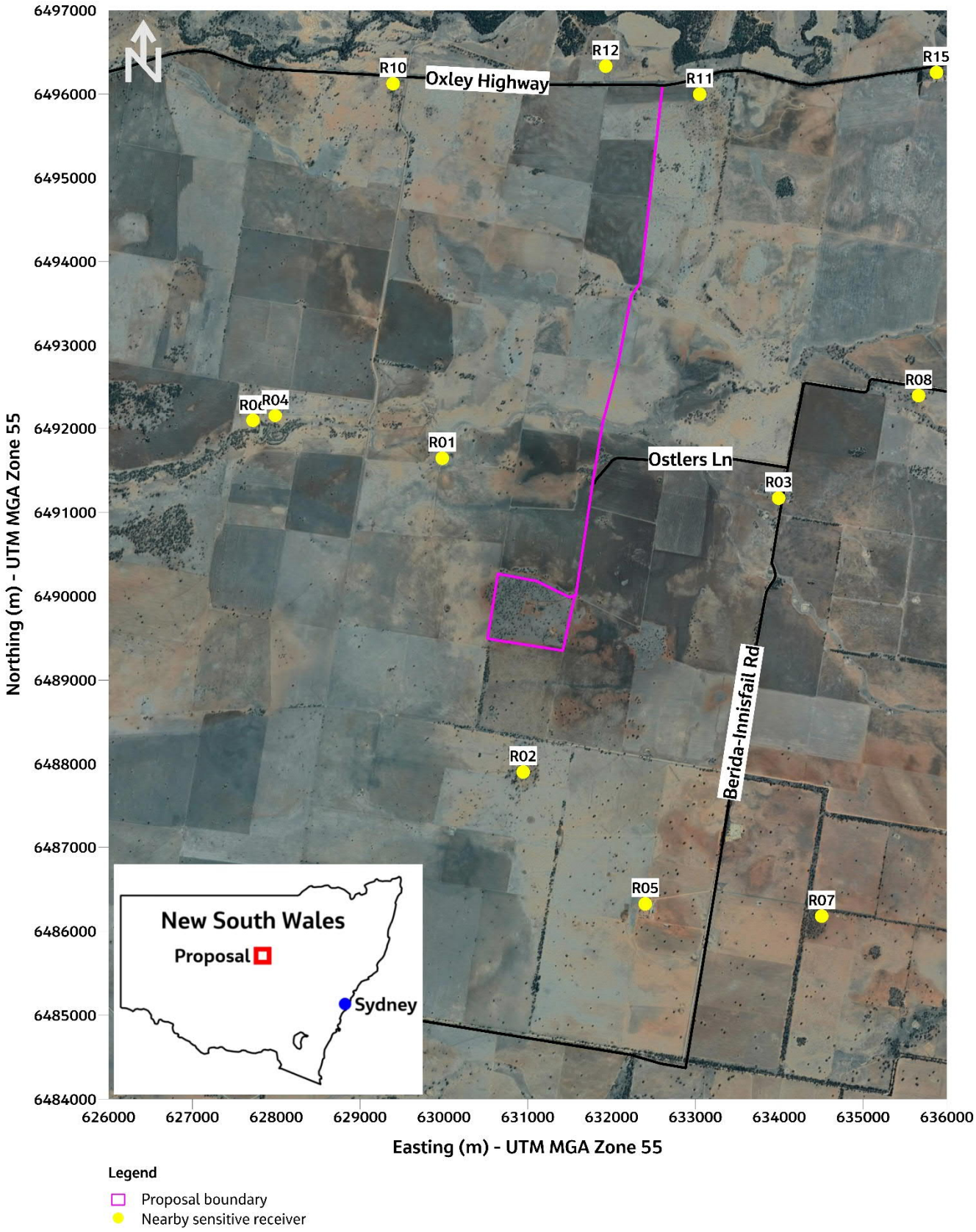


Figure 2-1 Proposal setting

2.2 Proposal overview

The extraction and transport of up to 80,000 tonnes per annum of basalt aggregates and construction materials presently takes place at Berakee Quarry in accordance with development consent DA 2017/218. The proposal involves increasing the maximum extraction rate at the site up to 490,000 tonnes per annum (tpa) (for years one to five reducing to 120,000 tpa for the remaining life of the Quarry), increasing in the extraction area and stockpiling areas, increasing haulage rates and extending the life of the Quarry. Key details of the Proposal, including how operations would change from existing activities are listed in Table 2.1.

Table 2.1 Key details of existing and proposed operations

Parameter	Existing approved operations under DA 2017/218	Proposed operations
Site location	Lot 1 DP 1265657, Lot 2 DP1265657 (formerly Lot 45 DP752563 at time of approval) Right of carriageway over Lot 52, DP45338	Lot 1 DP 1265657 Right of carriageway over Lot 2 DP1265657 and Lot 52, DP45338
Products	Basalt aggregates and construction materials	No change
Resource size	750,000 t	4,900,000 t
Production rate	Up to 30,000 m^3 (80,000 t) per annum	• Stage 1 – 2.3 Mt over 5 years i.e. 490,000 tpa. • Stage 2 – 2.4 Mt over 20 years i.e. 80,000 to 120,000 tpa.
Quarry life	8-12 years	30 years
Disturbance footprint	Up to 2 ha	Up to 25 ha
Extraction area	Up to 1.5 ha	Up to 8.4 ha. No change to current development consent maximum extraction depth of 240 m AHD.
Extraction design	Final floor elevation 240-242 m AHD Final face angle 75-85° Two faces 8-10 m high separated by a single bench 3-5 m wide	No change
Extraction methods	Drill and blast	No change
Processing and stockpiling area	Up to 0.5 ha (including material storage, crushing and roads) Small stockpiles maintained within the processing area and extraction area subject to available space	Primary crushing activities will be relocated into the extraction area as it expands. An increase in stockpiling area is planned to allow for up to 250,000 t of product to be stored at any one time (to provide sufficient capacity to supply the demands of the Inland Rail Project). The footprint of the processing and stockpiling area will be increased to 25 ha.
Processing operations	Mobile crushing unit, screening and stockpiling of in-situ materials only	On-site crushing, screening and stockpiling of in-situ materials only.
Transport routes	Road transport up to B-double arrangement via private haulage route to the Oxley Highway Use of Ostlers Lane and Berida-Innisfail Road up to 30 June 2020	Predominantly 38 t capacity Truck & Dog arrangements, however, approval for access by vehicles up to B-double arrangement to be retained.
Truck movements	Average truck movements (based on 30 t payload per truck): • Daily: 14 • Weekly: 100 • Annual: 5,000	Average truck movements (for Stage 1) (based on 38 t payload per truck): • Daily: 70 • Weekly: 496 • Annual: 25,000
Water usage	Dust suppression only	Dust suppression and processing

Parameter	Existing approved operations under DA 2017/218	Proposed operations
Hours of operation	Monday to Friday 7.00 am to 6.00 pm Saturday 7.00 am to 4.00 pm No work on Sundays or Public Holidays	Monday to Friday 6.00 am to 6.00 pm Saturday 6.00 am to 6.00 pm No work on Sundays or Public Holidays Possible extension of transport into morning (from 5.00 am) and evening (to 10.00 pm) shoulder
Blasting activities	Monday to Friday 9.00 am to 3.00 pm 3 blasts per annum	Monday to Friday 9.00 am to 5.00 pm During Stage 1, up to 12 blasts per annum
Rehabilitation activities	Final landform to provide livestock shelter and water storage for ongoing grazing	No change. Final void to be retained

2.3 Key air quality-related matters

Air quality issues can arise when emissions from an industry or activity lead to a deterioration in the ambient air quality. Changes in potential dust impacts at nearby residential receivers due to expanded operations at the quarry presents the key air quality-related risk for the Proposal.

Dust is often referred to as particulate matter and in the forms of:

- Total Suspended Particles (TSP);
- Deposited dust;
- Particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM_{10}); and
- Particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$).

The potential changes in dust impacts due to the Proposal are the focus of this AQIA.

3. Policy setting and assessment criteria

3.1 Overview

There are several statutes and guidelines that apply to the regulation of emissions to air from developments in NSW including:

- NSW Protection of the Environment Operations Act 1997 (POEO Act NSW).
- NSW Protection of the Environment Operations (Clean Air) Regulation 2010 (POEO Clean Air Regulation).
- 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW', (NSW Environment Protection Authority, 2016).
- 'Approved Methods for Sampling and Analysis of Air Pollutants in NSW', (NSW Department of Environment and Conservation [DEC], 2005).

Requirements relevant to the Proposal from each of these documents are outlined below.

3.1.1 Protection of the Environment Operations Act 1997

The NSW Protection of the Environment Operations Act 1997 (POEO Act NSW) is the primary piece of legislation for the regulation of potential pollution impacts associated with Scheduled operations or activities in NSW. Scheduled activities are those defined in Schedule 1 of the POEO Act. The Proposal is and would remain a Scheduled activity, operating in accordance with the requirements of Environment Protection Licence (EPL) No. 21093. EPL 21093 includes the conditions listed below in Table 3.1 regarding to the management of dust from the site

Table 3.1 EPL 21093 dust management requirements

EPL Condition	Requirement
O3 Dust	O3.1 Activities occurring at the premises must be carried out in a manner that will minimise emissions of dust from the premises. O3.2 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises. O3.3 Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading. O3.4 All dust control equipment must be operable at all times with exception of shutdowns required for maintenance.

These requirements would remain applicable for the Proposal.

3.1.2 Protection of the Environment Operations (Clean Air) Regulation 2010

The NSW Protection of the Environment Operations (Clean Air) Regulation 2010 (POEO Clean Air Regulation) contains provisions for the regulation of emissions to air from wood heaters, open burning, motor vehicles, fuels and industry. The Proposal does involve any activities listed Schedule 3 of the POEO Clean Air Regulation . As such the applicability of the POEO Clean Air Regulation to the Proposal is expected to be limited.

3.1.3 Approved Methods for the Modelling and Assessment of Air Pollutants in NSW

The Approved Methods (EPA, 2016) was published by the NSW EPA and outlines the approach to be applied for the modelling and assessment of air pollutants from stationary sources in NSW. The air pollutants most relevant to the Proposal are particulate matter emissions from extractive activities, blasting material handling, transport and processing activities; as well as from wind erosion of stored materials and exposed surfaces.

There are various classifications of particulate matter and the Environment Protection Authority (EPA) has developed assessment criteria for:

- TSP, to protect against nuisance amenity impacts;
- PM_{10}, to protect against health impacts;
- $PM_{2.5}$, to protect against health impacts; and
- Deposited dust, to protect against nuisance amenity impacts.

Most of the EPA criteria are drawn from national standards for air quality set by the National Environmental Protection Council of Australia (NEPC) as part of the National Environment Protection Measures (NEPM). To measure compliance with ambient air quality criteria, the former Office of Environment and Heritage (OEH) (now Department of Planning, Industry and Environment [DPIE]) has established a network of monitoring stations across the State and up-to-date records are published on DPIE's website.

Air quality impacts from a project are determined by the level of compliance with the air quality criteria set by the EPA as part of their 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' (Approved Methods), (EPA, 2016). These criteria are outlined in Table 3.2 and apply to existing and potential sensitive receivers such as such as residences, schools and hospitals.

Table 3.2 EPA impact assessment criteria

Substance	Averaging time	Criterion	Source
Particulate matter (PM_{10})	24-hour	50 µg/m^3	EPA (2016) / DoE (2016)
	Annual	25 µg/m^3	EPA (2016) / DoE (2016)
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m^3	EPA (2016) / DoE (2016)
	Annual	8 µg/m^3	EPA (2016) / DoE (2016)
Particulate matter (TSP)	Annual	90 µg/m^3	EPA (2016) / NHMRC (1996)
Deposited dust	Annual (maximum increase)	2 g/m^2/month	EPA (2016) / NERDDC (1998)
	Annual (maximum total)	4 g/m^2/month	EPA (2016) / NERDDC (1998)

The EPA air quality assessment criteria relate to the total concentration of air pollutant 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. Further discussion of background levels of the local setting is provided in Section 4.4.

In situations where background levels are elevated, the proponent must "demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical" (EPA, 2016).

The NSW Voluntary Land Acquisition and Mitigation Policy (VLAMP) (2018) includes 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. The current VLAMP (2018) brings the air quality criteria in line with the NEPM standards and EPA criteria. From this Policy, voluntary mitigation or acquisition rights may apply where, even with best practice management, the development contributes to exceedances of the criteria specified in VLAMP 2018. The applicability of the VLAMP has been reviewed in the context of the certainty of potential air quality risks of the proposed modification.

3.1.4 Approved Methods for Sampling and Analysis of Air Pollutants in NSW

The Approved Methods for Sampling and Analysis of Air Pollutants in NSW (DEC, 2005) provides guidance for the monitoring and analysis of air pollutants in NSW. This standard applies to the air quality monitors used to establish local background air quality conditions (see Section 4.4).

4. Existing environment

4.1 Surrounding receivers

Nearby sensitive receivers in the air quality study area around the Proposal are displayed above in Figure 2-1. Details of these locations are listed in Table 4.1 below. The receiver ID's listed are consistent with those used in the overall EIS.

Table 4.1 Surrounding residential receivers

Receiver ID	Approximate co-ordinates UTM MGA 55		Approximate elevation (m)	Approximate distance from the Proposal (quarry area) (m)	Approximate orientation from the Proposal (quarry area)	Affiliated with Proposal or permanently disused?
	Easting (m)	Northing (m)				
R01	629980	6491644	244	1,550	Northwest	No
R02	630946	6487905	250	1,500	South	No
R03	633993	6491169	251	2,750	Northeast	No
R04	627988	6492157	240	3,300	Northwest	No
R05	632402	6486326	251	3,200	Southeast	No
R06	627722	6492097	238	3,500	Northwest	No
R07	634507	6486179	269	4,400	Southeast	No
R08	635663	6492400	254	4,800	Northeast	No
R10	629394	6496124	241	5,900	Northwest	No
R11	633051	6495998	249	6,100	North	No
R12	631930	6496333	248	6,200	North	No
R15	635876	6496259	252	7,600	Northeast	No

As listed the nearest sensitive receiver (R01) is located approximately 1.5 kilometres from the Proposal quarry area.

4.2 Terrain

A three-dimensional schematic of terrain features around the Proposal is shown below in Figure 4-1.

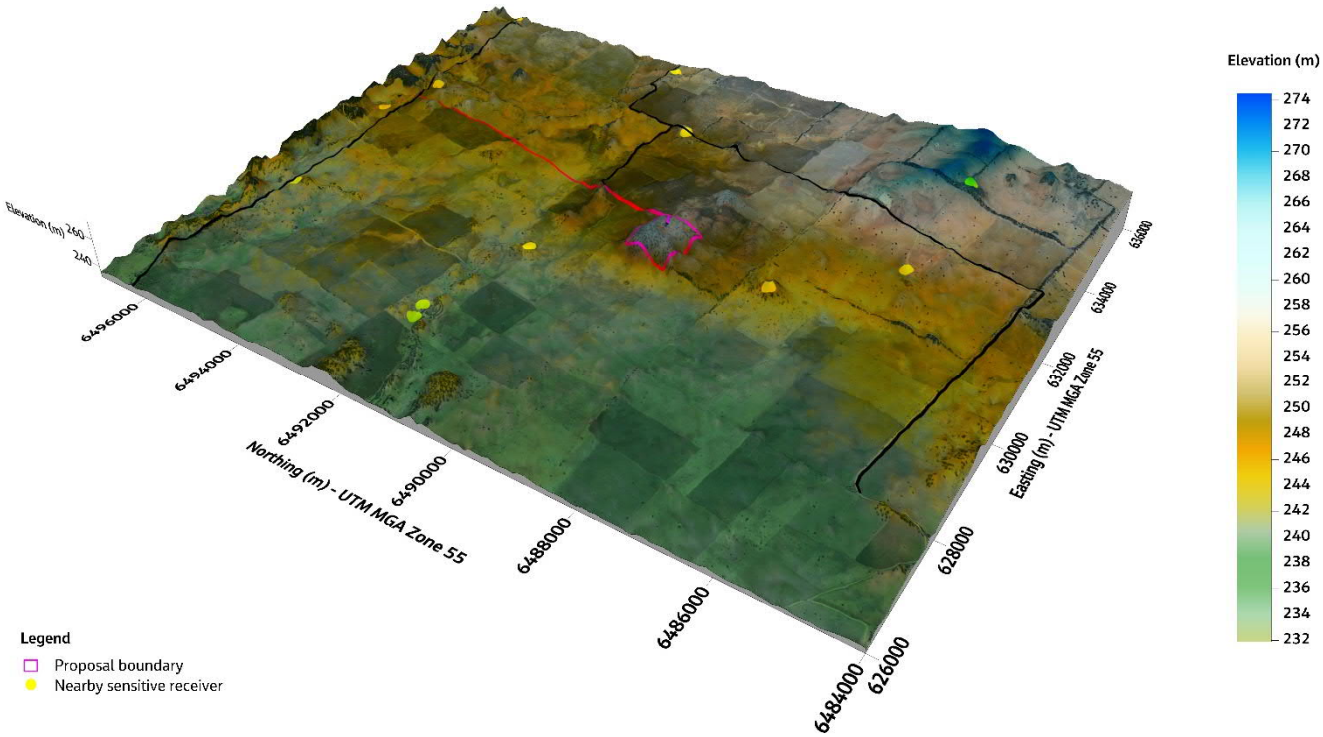


Figure 4-1 Three-dimensional schematic of Proposal setting

As displayed, elevations within the air quality study area range from around 230 to 270 m above sea level. Elevations at the Proposal site would range between approximately 240 and 260 m. As listed above in Table 4.1, the identified nearby receivers R01, R02, R03, R04, R05, R06, R08, R10, R11, R12 and R15 are at locations with approximately the same elevation as the Proposal site. Receiver R07 is around 10 m above the site.

4.3 Meteorology

Meteorological conditions are important for determining the direction and rate at which emissions from a source will disperse. The key meteorological requirements of air dispersion models are, typically, hourly records of wind speed, wind direction, temperature, atmospheric stability class and mixing layer height. For air quality assessments, a minimum one year of hourly data is usually required, which means that almost all possible meteorological conditions, including seasonal variations, are considered in the model simulations.

Although there is no on-site meteorological station at the Proposal, the Bureau of Meteorology (BoM) operates an automatic weather station near Trangie approximately 51 kilometres to the southwest. The Trangie Research Station (no. 051049) is the nearest meteorological station in relation to the site. It is considered to provide a reasonable point of reference for meteorological conditions around the Proposal given the similarities in terrain and land use at both locations. Details of this station are summarised below in Table 4.2.

Table 4.2 Details of representative meteorological station

Station	Operated by	Approximate co-ordinates UTM MGA 55		Elevation (m)	Approx. distance (km) and direction from the Proposal
		Easting (m)	Northing (m)		
Trangie Research Station (no. 051049)	BoM	589933 m E	6460277 m S	215 m	51 km to the southwest

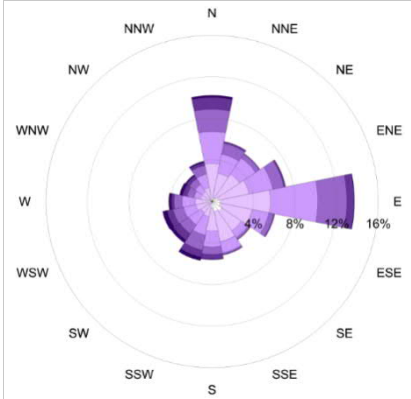
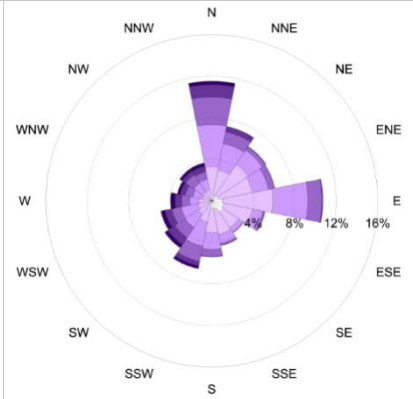
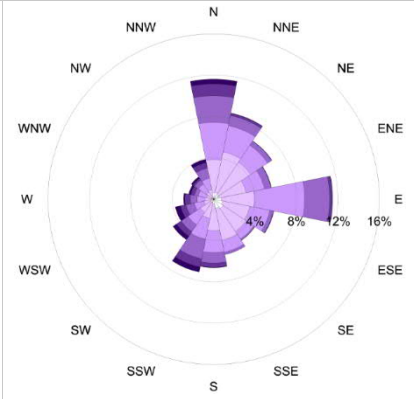
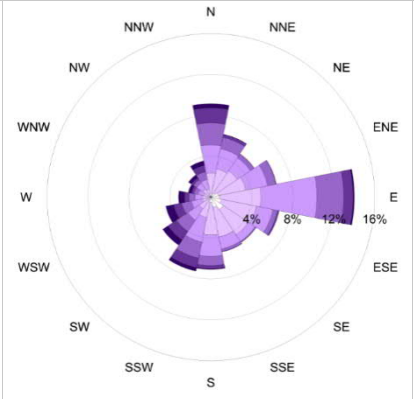
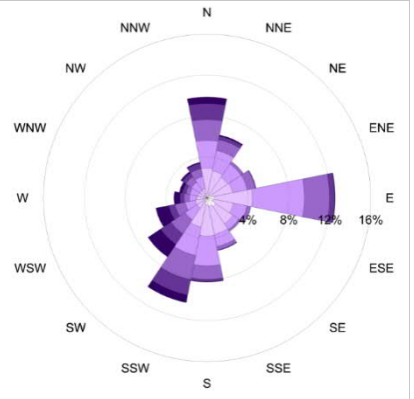
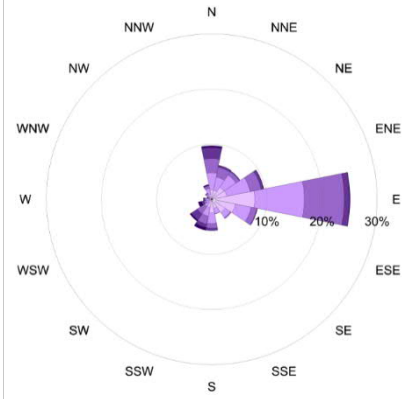
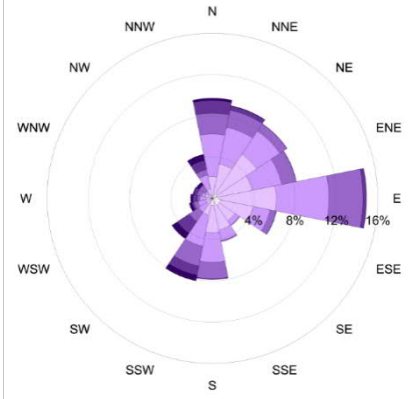
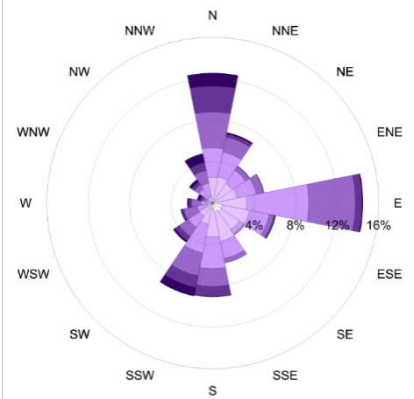
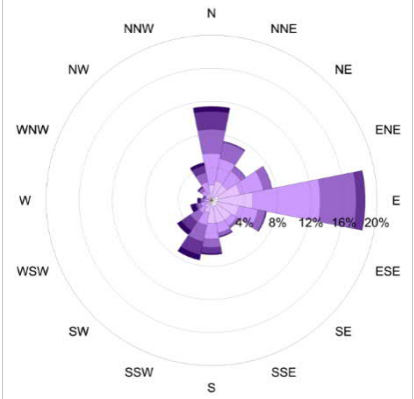
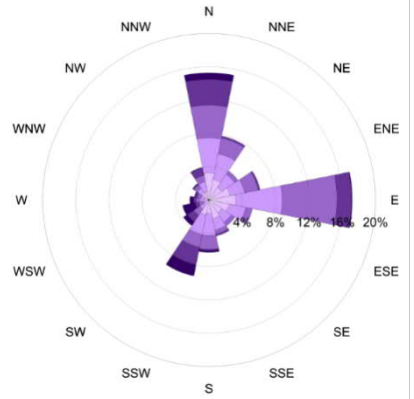
Meteorological data from five recent years (2015 to 2019) have been analysed to identify trends from year-to-year and to identify a representative year for use in the dispersion modelling. Table 4.3 shows the statistics reviewed as part of this analysis from the data collected at Trangie Research Station automatic weather station.

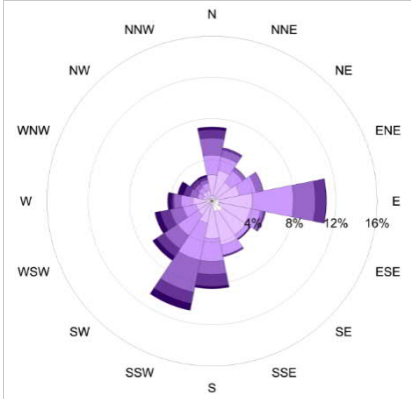
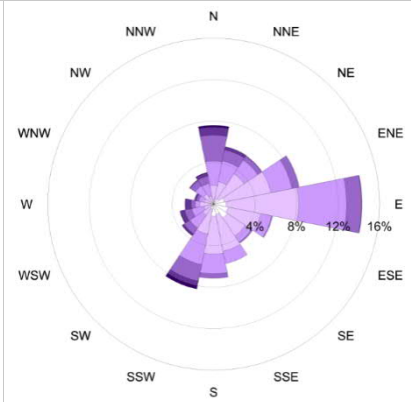
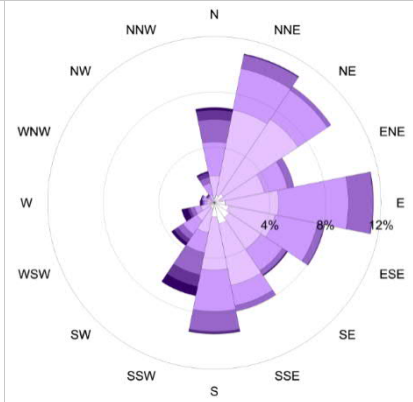
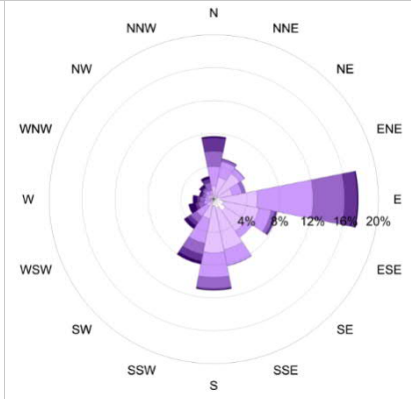
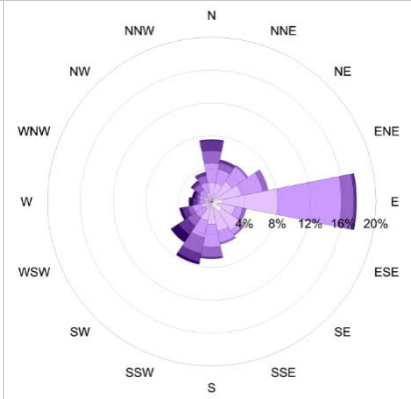
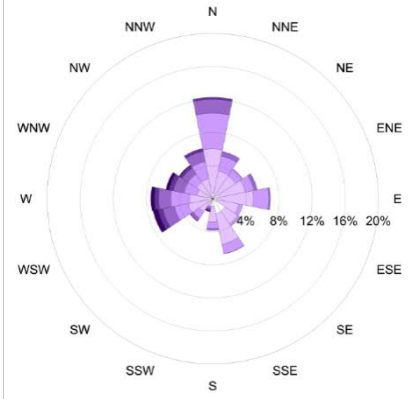
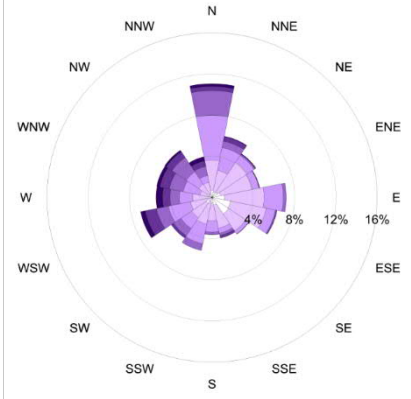
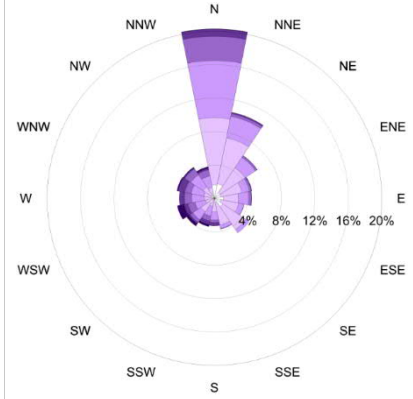
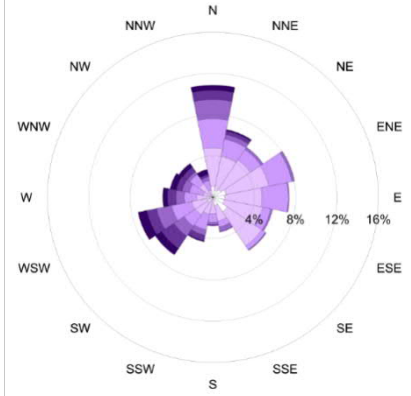
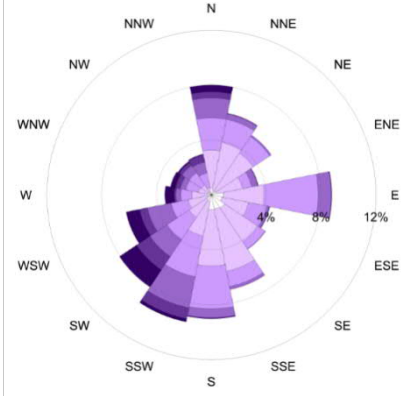
Table 4.3 Annual meteorological statistics from BoM Trangie Research Station (no. 051049) automatic weather station (2015 to 2019)

Statistic	2015	2016	2017	2018	2019
Percent complete (%)	99.1	99.9	100	99.9	99.9
Mean wind speed (m/s)	3.4	3.3	3.4	3.5	3.7
99th percentile wind speed (m/s)	8.2	8.7	8.9	9.4	9.8
Percentage of calms (%)	5.1	7.0	5.4	4.8	5.1
Percentage of winds >6 m/s (%)	8.6	8.8	8.6	11.7	13.4

As displayed in Table 4.3, over the years reviewed, the mean speed ranged from 3.3 to 3.7 m/s. The 99th percentile wind speeds (i.e. wind speeds only exceeded one percent of the time) were also consistent, ranging between 8.2 and 9.8 m/s. The percentage occurrence of calm conditions (i.e. when wind speeds were recorded less than 0.5 m/s) was similarly consistent, ranging from 5.1% to 7.0%.

Annual meteorological datasets used for the purpose of dispersion modelling in NSW are required to be contain records that are at least 90% complete. As listed in Table 4.3, the 90% data capture target was achieved at the Trangie Research Station automatic weather station for all five years reviewed. Annual and seasonal wind roses displayed below in Figure 4-2 were developed for further analysis to identify a representative year for modelling.

2015	2016	2017	2018	2019
Annual				
 Calms: 5.1%	 Calms: 7.0%	 Calms: 5.4%	 Calms: 4.8%	 Calms: 5.1%
Summer				
 Calms: 2.2%	 Calms: 2.1%	 Calms: 3.2%	 Calms: 3.8%	 Calms: 2.7%

2015	2016	2017	2018	2019
Autumn				
 Calms: 7.3%	 Calms: 9.2%	 Calms: 4.9%	 Calms: 3.6%	 Calms: 6.1%
Winter				
 Calms: 10.1%	 Calms: 9.9%	 Calms: 9.2%	 Calms: 8.6%	 Calms: 7.0%

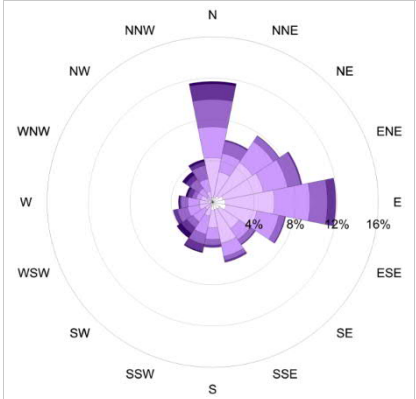
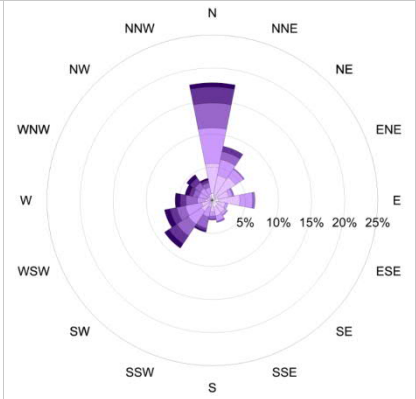
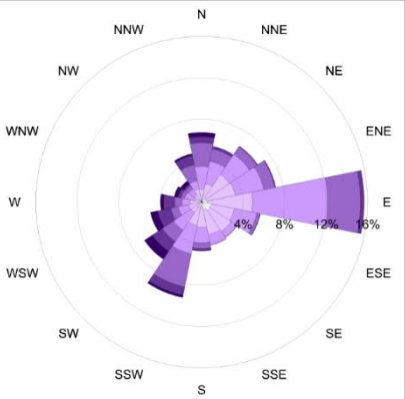
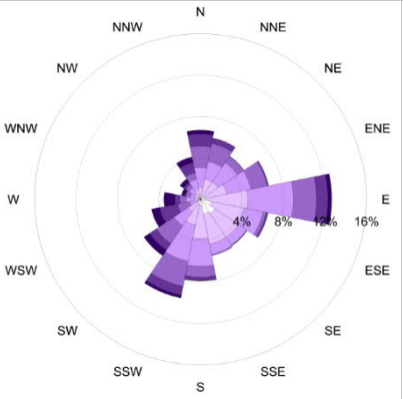
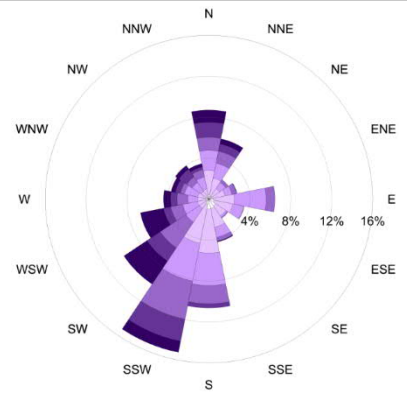
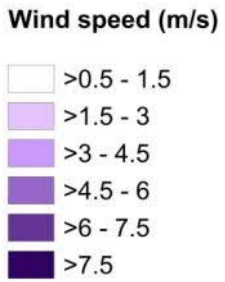
2015	2016	2017	2018	2019
Spring				
 Calms: 4.4%	 Calms: 7.7%	 Calms: 4.4%	 Calms: 4.4%	 Calms: 5.4%
Legend				
				

Figure 4-2 Annual and seasonal wind roses for Trangie Research Station, 2015 to 2019

As displayed in Figure 4-2, annual and seasonal wind roses were consistent across all five years with the following trends observed:

- Annual: Winds blowing from the north and east most common;
- Summer: Similar trends to those observed annually, with winds blowing from the south southwest also common;
- Autumn: Similar prevailing trends to those observed in summer;
- Winter: Winds blowing from the north most common with winds from the east and southwest also occurring frequently; and
- Spring: Similar trends to those observed in winter with a higher frequency of calm conditions.

Considering the consistency of observations, none of the five years were excluded as being an unsuitable representative meteorological year. Background air quality trends outlined below in Section 4.4 were therefore also reviewed to identify a suitable representative year for the purpose of the assessment.

4.4 Background air quality

4.4.1 Overview

To provide a comprehensive assessment of impacts against the relevant air quality criteria (see Section 3), it is necessary to have information or estimates of the existing air quality conditions. Although there is no air quality monitoring undertaken at or directly around the Proposal, there a number of regional monitors operated by DPIE which can be used to provide an indication of the air quality conditions in similar, rural environments. Details of these monitoring locations are listed in Table 4.4 below.

Table 4.4 Summary of nearby air quality monitoring stations

Station location	Operated by	Type	Approximate distance (km) and direction from the Proposal	Type	Pollutant(s) monitored
Gunnedah	DPIE	Regional air quality monitoring station	190 km to the northeast	TEOM, BAM	PM_{10}, $PM_{2.5}$
Bathurst	DPIE	Regional air quality monitoring station	220 km to the southeast	TEOM, BAM	PM_{10}, $PM_{2.5}$
Orange	DPIE	Regional air quality monitoring station	190 km to the southeast	TEOM, BAM	PM_{10}, $PM_{2.5}$
Dubbo	DPIE	Rural air quality monitor	60 km to the southeast	DustTrak	PM_{10}, $PM_{2.5}$ and TSP

TEOM = Tapered element oscillating microbalance and BAM = Beta attenuation monitor

As listed in Table 4.4, the nearest regional air quality monitoring stations operated by DPIE are at Orange and Gunnedah. However, these stations were only commissioned in January 2019 and December 2017 respectively. The next closest regional air quality monitoring station with long-term records is at Bathurst. A DustTrak monitor which is part of the rural air quality monitoring network (RAQMN) is also operated approximately 60 kilometres to the southeast of the Proposal at Dubbo. Data from RAQMN monitors do not comply with applicable Australian Standards listed in 'Approved Methods for the Sampling and Analysis of Air pollutants in New South Wales', (Department of Conservation, 2005) and provide indicative measurements only.

Historical PM_{10} and deposited dust monitoring undertaken approximately 80 kilometres to the southeast of the Proposal near Dunedoo, NSW as part of the Environmental Assessment prepared for the Cobbora Coal Project were also considered.

The quality or level of completeness is an important factor in determining whether data are suitable for the purpose of representing background air quality conditions in the environmental around a Proposal. Generally, a data capture rate of 90% or more is considered acceptable, taking into account periods of servicing, calibration and maintenance. Table 4.5 summarises the rate of data capture at each of the four monitors.

Table 4.5 Data capture rates (per cent) for DPIE monitoring stations

Year	DPIE Gunnedah (TEOM)	DPIE Bathurst (TEOM)	DPIE Orange (TEOM)	DPIE RAQMN Dubbo (DustTrak)
PM_{10}				
2015	ND	99.5	ND	76.8
2016	ND	93.2	ND	41.0
2017	ND	97.3	ND	70.0
2018	98.1	98.4	ND	83.9
2019	91.8	99.2	94.0	95.3
$PM_{2.5}$				
2015	ND	ND	ND	ND
2016	ND	64.7	ND	ND
2017	ND	97.3	ND	40.0
2018	98.1	98.6	ND	83.4
2019	94.2	98.6	94.0	91.7
TSP				
2015	ND	-	ND	92.1
2016	ND	-	ND	63.3
2017	-	-	ND	98.5
2018	-	-	ND	83.7
2019	-	-	-	94.9

'ND' = No data, station not yet commissioned; '-' = not measured at station; below 90% quality objective

PM_{10} and $PM_{2.5}$ capture rates higher than 90 per cent were met at the three DPIE TEOMs except for $PM_{2.5}$ at Bathurst in 2016 when the measurement of this pollutant commenced. Table 4.5 shows that less than 90 per cent of hours were available from the Dubbo DustTrak except in 2019. This indicates the suitability of the data from the DPIE TEOMs for the purpose of the assessment.

These data are discussed by classification of particulate matter in the following subsections.

4.4.2 Particulate matter as PM_{10}

Continuous PM_{10} measurements are collected at DPIE's Gunnedah, Orange and Bathurst stations. Time-series of daily (that is, 24-hour average) measurements from 2015 to 2019 is displayed below in Figure 4-3. The NSW EPA's daily impact assessment criterion of 50 $\mu g/m^3$ is also displayed.

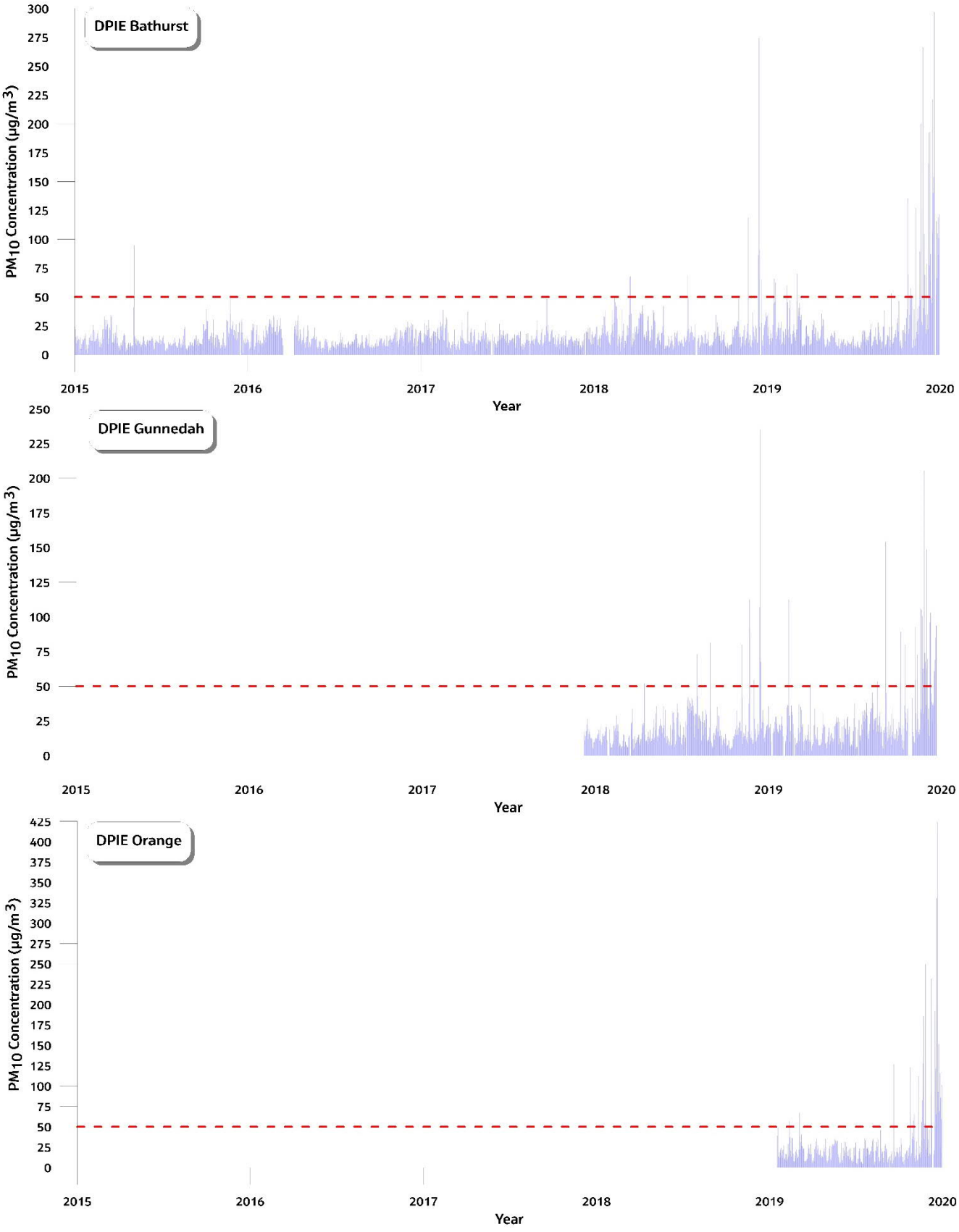


Figure 4-3 Measured 24-hour average PM_{10} concentrations at DPIE Bathurst, Gunnedah and Orange, 2015 to 2019

As shown in Figure 4-3, from 2015 to 2019 there were several instances where daily PM_{10} concentrations exceeded 50 µg/m^3. Table 4.6 summarises these results.

Table 4.6 Summary of PM_{10} measurement statistics at DPIE Bathurst, Gunnedah and Orange

Year	DPIE Gunnedah	DPIE Bathurst	DPIE Orange	Criterion
Maximum 24-hour average in µg/m^3				
2015	ND	94.6	ND	50
2016	ND	34.1	ND	
2017	ND	49.9	ND	
2018	235	274	ND	
2019	205	297	424	
Number of days above 24-hour average criteria (50 µg/m^3)				
2015	ND	2	ND	-
2016	ND	0	ND	
2017	ND	0	ND	
2018	10	8	ND	
2019	30	40	35	
Annual average in µg/m^3				
2015	ND	13.4	ND	30
2016	ND	13.3	ND	
2017	ND	14.1	ND	25 (applicable from 20 Jan 2017 onwards)
2018	18.9	18.8	ND	
2019	27.4	24.8	28.3	

As evident in Table 4.6 there was a higher frequency of exceedances in 2019 compared with previous years. A high number of these exceedances occurred in the fourth quarter, corresponding to an unprecedented fire season, causing a significant deterioration in air quality throughout Central and Eastern Australia. This is reflected in the higher annual average PM_{10} concentration at Bathurst and Gunnedah (25 µg/m^3 and 27 µg/m^3 respectively) compared with previous years.

Historical PM_{10} data collected for the Cobbora Coal Project between September 2009 and November 2011 recorded an annually averaged value of 16.8 µg/m^3. This value is generally consistent with the 2015 to 2018 values recorded at the DPIE Gunnedah and Bathurst Stations, suggesting that these data may be suitable for estimating local background PM_{10} conditions around the Proposal.

4.4.3 Particulate matter as $PM_{2.5}$

$PM_{2.5}$ is also monitored at the DPIE's Gunnedah, Orange and Bathurst stations. Like for PM_{10}, only limited years of data were available, particularly from the Gunnedah and Orange stations. Figure 4-4 shows a time-series of daily measurements collected from 2015 to 2019, with the 25 µg/m^3 NSW EPA daily impact assessment criterion also displayed.

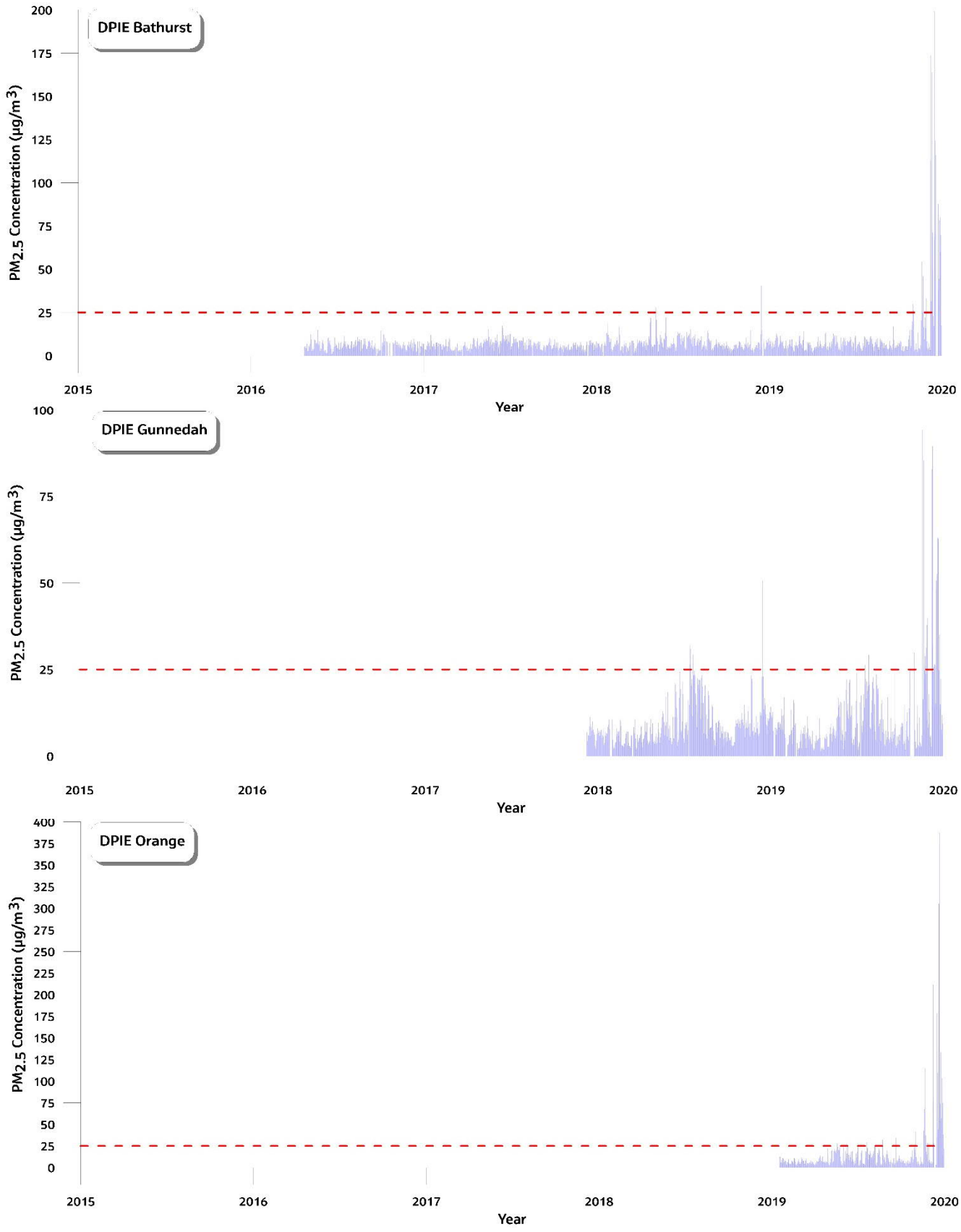


Figure 4-4 Measured 24-hour average $PM_{2.5}$ concentrations at DPIE Bathurst, Gunnedah and Orange, 2015 to 2019

As for PM_{10}, there were several days where $PM_{2.5}$ concentrations exceeded the NSW EPA's 25 µg/m^3 impact assessment criterion. Table 4.7 summarises these results.

Table 4.7 Summary of $PM_{2.5}$ measurement statistics at DPIE Bathurst, Gunnedah and Orange

Year	DPIE Gunnedah	DPIE Bathurst	DPIE Orange	Criterion
Maximum 24-hour average in µg/m^3				
2015	ND	ND	ND	-
2016	ND	15.0	ND	
2017	ND	17.5	ND	25 (applicable from 20 Jan 2017 onwards)
2018	50.7	40.5	ND	
2019	94	200	387	
Number of days above 24-hour average criteria (25 µg/m^3)				
2015	ND	ND	ND	-
2016	ND	0	ND	
2017	ND	0	ND	
2018	5	2	ND	
2019	24	24	15	
Annual average in µg/m^3				
2015	ND	ND	ND	-
2016	ND	5.9	ND	
2017	ND	6.1	ND	8 (applicable from 20 Jan 2017 onwards)
2018	9.0	7.0	ND	
2019	11.2	11.3	15.8	

As for PM_{10}, Table 4.7 shows how maximum daily $PM_{2.5}$ concentrations were recorded several times higher (up to 387 µg/m^3) than the EPA's impact assessment criterion (25 µg/m^3) during the 2019/20 Australian bushfires. Annual $PM_{2.5}$ concentrations exceeded 8 µg/m^3 at all three stations in 2019, as well as at the Gunnedah station in 2018.

4.4.4 Total suspended particulates (TSP)

TSP is not measured at the DPIE's Gunnedah, Orange and Bathurst stations. However, indicative measurements of TSP are collected at the RAQMN DustTrak operated at Dubbo. The Dubbo DustTrak also measures concurrent PM_{10}. Table 4.8 summarises the ratio of PM_{10} to TSP measurements recorded.

Table 4.8 Review of ratio of measured PM_{10} to TSP, Dubbo DustTrak

Year	Annual average PM_{10} (µg/m^3)	Annual average TSP (µg/m^3)	Dubbo DustTrak ratio of annual PM_{10} to TSP
2015	5.4	6.6	0.82
2016	4.9	9.2	0.53
2017	3.9	8.3	0.47
2018	11.8	11.9	0.99
2019	24.3	27.8	0.88
5 year average	10.3	12.9	0.80

As listed the measured ratio of PM_{10} to TSP ranged between 0.47 and 0.99. The NSW Minerals Council estimated that, in the NSW Hunter Valley, average PM_{10} concentrations are typically 40 per cent of TSP concentrations

(Minerals Council, 2000). The lower ratio of 0.47 measured at Dubbo in 2017 is consistent with this guidance. Considering this value (0.47) and the annual measured PM_{10} concentration above in Table 4.6, the annual TSP concentrations below in Table 4.9 were estimated.

Table 4.9 Estimated annual TSP concentrations

Year	DPIE Gunnedah	DPIE Bathurst	DPIE Orange	Criterion
Annual average in µg/m^3				
2015	ND	29	ND	90
2016	ND	28	ND	
2017	ND	30	ND	
2018	40	40	ND	
2019	58	53	60	

As shown in Table 4.9, using the approach above estimated local annually averaged TSP concentrations ranged between 29 µg/m^3 and 60 µg/m^3; below the EPA's 90 µg/m^3 impact assessment criterion.

4.4.5 Deposited dust

Deposited dust monitoring is not undertaken in the immediate surrounds around the Proposal, however historical monitoring was undertaken nearby as part of the Environmental Assessment prepared for the Cobbora Coal Project. This development was proposed approximately 80 kilometres to the southeast of the Proposal near Dunedoo, NSW. Results from two years of baseline monthly deposited dust measurements from six gauges around the Cobbora Coal Project site are presented in the report 'Air Quality and Greenhouse Gas Assessment for the Proposed Cobbora Coal Project', (Environ Australia Pty Ltd, 2012). These data have been summarised in Table 4.10 below.

Table 4.10 Summary of Cobbora Coal baseline deposited dust monitoring data (Environ Australia Pty Ltd, 2012)

Period	Annual measured dust deposition (g/m^2/month) by Cobbora Coal Project dust deposition monitor							Criterion (g/m^2/month)
	DM1	DM2	DM4	DM5	DM6	DM7	All gauges	
September 2009 to August 2010	1.9	1.4	2.6	2.1	1.8	1.9	1.9	4
September 2010 to August 2011	1.3	0.5	0.7	0.6	1.3	0.6	0.8	

As listed in Table 4.10, deposited dust levels collected as part of the baseline investigations for the Cobbora Coal Project were measured below the EPA's 4 g/m^2/month criterion.

4.5 Selection of a representative assessment year and establishment of background air quality conditions

As concluded in Section 4.3, none of the five years reviewed exhibited meteorological trends or were affected by dataset quality issues that would make them unsuitable for the purpose of the assessment. Available background air quality data was subsequently reviewed in Section 4.4 which identified that 2019 was unsuitable on the basis of conditions having been significantly affected by the Australian bushfires in the fourth quarter of the year.

Considering this, 2018 was selected as the representative assessment year, with the background air quality concentrations adopted as listed below in Table 4.11.

Table 4.11 Adopted background air quality conditions

Pollutant	Averaging time	Adopted value	Justification	NSW EPA impact assessment criterion
Particulate matter as PM_{10}	24-hour	2018 daily values, DPIE Gunnedah	Time-varying concentrations measured at DPIE Gunnedah for year of assessment	50 µg/m^3
	Annual	18.9 µg/m^3	Highest 2018 annual average of DPIE Gunnedah, Bathurst and Orange stations	25 µg/m^3
Particulate matter as $PM_{2.5}$	24-hour	2018 daily values, DPIE Gunnedah	Time-varying concentrations measured at DPIE Gunnedah for year of assessment	25 µg/m^3
	Annual	9.0 µg/m^3	Highest 2018 annual average of DPIE Gunnedah, Bathurst and Orange stations	8 µg/m^3
Particulate matter, TSP	Annual	40 µg/m^3	Highest 2018 estimated annual average of DPIE Gunnedah, Bathurst and Orange stations calculated by applying 0.47 annual PM_{10} to TSP ratio from data measured at Dubbo DustTrak, 2015 to 2019	90 µg/m^3
Deposited dust	Annual	2.6 g/m^2/ month	Highest annual average from all gauges deployed around the Cobbora Coal Project from September 2009 to August 2011	4 g/m^2/ month

As listed in Table 4.11, the adopted estimated local daily PM_{10} and $PM_{2.5}$ concentrations exceeded the NSW EPA's impact assessment criteria during the year of assessment (2018). Again, it the distance of the air quality monitors from the proposal is noted. Still, consistent with the Approved Methods, an assessment demonstrating "that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical" was identified as being required.

5. Emissions to air

5.1 Emissions inventory

As identified in Section 2.3, the most significant emission to air from the Proposal will be dust (particulate matter) from the increased area and rate of activities at the Quarry. Estimates of these emissions are required by the dispersion model. Total dust emissions have been estimated by analysing details of the Proposal and identifying the location and intensity of dust-generating activities. Operational parameters have been combined with emissions factors developed both locally and by the United States Environmental Protection Agency (US EPA).

The emission factors used for this assessment have been drawn largely from the following sources:

- 'Emission Estimation Technique Manual for Mining' (NPI, 2012); and
- AP 42 (US EPA, 1985 and updates).

Dust emission inventories were developed for two scenarios, existing and proposed operations. Proposed emissions were estimated for both Stage 1 (years 1 to 5) and Stage 2 (years 6 to 30). Table 5.1 below summarise the estimated annual TSP, PM_{10} and $PM_{2.5}$ emissions (in kg/y) for the assessment scenarios. Appendix A provides details of the dust emission calculations including the reference calculations applied, assumptions, emission controls and allocation of emissions to modelled locations.

Table 5.1 Estimated emissions to air

Source/activity	Estimated annual emissions (kg/y)								
	Existing operations			Proposed operations (Stage 1)			Proposed operations (Stage 2)		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Drilling	32	17	1	212	110	6	106	55	3
Blasting	19	10	1	75	39	2	37	19	1
Dozers on raw materials	669	162	70	4,184	1,011	439	2,008	485	211
Excavators loading raw materials to trucks	163	77	12	996	471	71	244	115	17
Hauling raw materials from pit to ROM	1,095	312	16	13,419	3,816	191	3,286	935	47
Unloading raw materials to ROM	480	172	24	2,940	1,054	147	720	258	36
Front end loader loading raw product to crushing and screening	81	38	4	498	235	25	122	58	6
Primary crushing	400	160	20	2,450	980	123	600	240	30
Secondary crushing	1,200	480	60	7,350	2,940	368	1,800	720	90
Tertiary crushing	1,200	400	60	7,350	2,450	368	1,800	600	90
Screening	500	172	25	3,063	1,054	153	750	258	38

Source/activity	Estimated annual emissions (kg/y)								
	Existing operations			Proposed operations (Stage 1)			Proposed operations (Stage 2)		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Front end loader loading product stockpiles	81	38	4	498	235	25	122	58	6
Wind erosion from ROM stockpiles	85	44	6	680	350	51	680	350	51
Wind erosion from product stockpiles	340	175	25	3,484	1,796	261	3,484	1,796	261
Wind erosion from exposed surfaces	637	329	48	6,458	3,329	484	6,458	3,329	484
Excavators loading product to trucks	163	77	8	996	471	50	244	115	12
Hauling product off-site	48,115	13,682	684	258,775	73,586	3,679	63,373	18,021	901
Overall total	55,260	16,344	1,068	313,426	93,927	6,443	85,835	27,413	2,285

The main intent of the inventories is to capture the most significant emission sources that may affect off-site air quality. Not every source will be captured, however, the contribution of emissions from sources not identified will be captured in the assumed background levels and these data have been added to the predicted contributions. Still, noting that emissions from drilling and blasting; collection, transport and storage of raw materials; processing; storage and transport of product; and from wind erosion of stockpiles and exposed areas are captured above in Table 5.1, it is considered that emissions from the most significant sources have been captured.

5.2 Emission controls

In consultation with Regional Hardrock, the controls listed in Table 5.2 were applied in the existing and proposed emissions inventories. Control efficiency values were applied consistent with guidance presented in Table 4 of NPI, 2012.

Table 5.2 Emission control measures

Source/activity	Control measure	Control efficiency (%)	Reference
Drilling	Water sprays	70%	(NPI, 2012), Table 4
Hauling raw materials from pit to ROM	Watering of haulage routes	50%	(NPI, 2012), Table 4
Unloading raw materials to ROM	Water sprays	50%	(NPI, 2012), Table 4
Front end loader loading raw product to crushing and screening	Water sprays	50%	(NPI, 2012), Table 4
Primary crushing	Water sprays	50%	(NPI, 2012), Table 4
Secondary crushing	Water sprays	50%	(NPI, 2012), Table 4
Tertiary crushing	Water sprays	50%	(NPI, 2012), Table 4
Screening	Water sprays	50%	(NPI, 2012), Table 4
Front end loader loading product stockpiles	Water sprays	50%	(NPI, 2012), Table 4
Wind erosion from ROM stockpiles	Watering of stockpiles	50%	(NPI, 2012), Table 4
Wind erosion from product stockpiles	Watering of stockpiles	50%	(NPI, 2012), Table 4

Source/activity	Control measure	Control efficiency (%)	Reference
Wind erosion from exposed surfaces	Watering of exposed surfaces	50%	(NPI, 2012), Table 4
Hauling product off-site	Watering of haulage routes	50%	(NPI, 2012), Table 4

6. Assessment approach

6.1 Overview

This assessment has followed the EPA's Approved Methods which specifies how assessments based on the use of air dispersion models should be undertaken. The Approved Methods include guidelines for the preparation of meteorological data, reporting requirements and air quality assessment criteria to assess the significance of dispersion model predictions.

The CALPUFF computer-based air dispersion model has been used to predict ground-level concentrations and deposition levels due to the identified emission sources, and the model predictions have been compared with relevant air quality criteria. The choice of model has considered the expected transport distances for the emissions, as well as the potential for temporally and spatially varying flow fields due to influences of the locally complex terrain, non-uniform land use, and potential for stagnation conditions characterised by calm or very low wind speeds with variable wind directions.

The CALPUFF model, through the CALMET meteorological pre-processor, simulates complex meteorological patterns that exist in a particular region. The effects of local topography and changes in land surface characteristics are accounted for by this model. The model comprises meteorological modelling as well as dispersion modelling, both of which are described below.

6.2 Meteorological modelling

The air dispersion model used for this assessment, CALPUFF, requires information on the meteorological conditions in the modelled region. This information is typically generated by the meteorological pre-processor, CALMET, using surface observation data from local weather stations and upper air data from radio-sondes or numerical models, such as the CSIRO's prognostic model known as TAPM (The Air Pollution Model). CALMET also requires information on the local land-use and terrain. The result of a CALMET simulation is a year-long, three-dimensional output of meteorological conditions that can be used as input to the CALPUFF air dispersion model.

Meteorological data collected in 2018 from the Trangie Research surface station and upper air data generated by TAPM at this location were used to initialise the CALMET model. CALMET was then set up with one surface observation station (BoM Trangie Research Station) and one upper air station (BoM Trangie Research Station), based on TAPM output at that location. The meteorological modelling followed the guidance of TRC (2011) and adopted the "observations" mode. Key setup details for TAPM and CALMET are listed in Table 6.1 and Table 6.2 respectively.

Table 6.1 TAPM setup details

Aspect	Value(s)
Model version	4.0.5
Number of grids (spacing)	4 (30 km, 10 km, 3 km, 1 km)
Number of grids point	35 x 35 x 25
Year(s) of analysis	2018, with one "spin-up" day.
Centre of analysis	31°43' S, 148°23' E
Terrain data source	Shuttle Research Topography Mission (SRTM), 90 m resolution
Land use data source	Default
Meteorological data assimilation	BoM Trangie Research Station Radius of influence = 5 km. Number of vertical levels for assimilation = 4. Quality factor = 1

Table 6.2 CALMET setup details

Aspect	Value(s)
Model version	6.334
Run mode	“observations” mode
Terrain data source(s)	NASA SRTM 3 second 90 metre resolution dataset
Land-use data source(s)	Digitized from aerial imagery and classified as ‘agricultural’ as specified in “CALPUFF Modeling System Version 6 User Instructions”, (TRC, 2011).
Meteorological grid domain	10 km x 10 km
Meteorological grid resolution	0.1 km
Meteorological grid dimensions	101 x 101 x 11
Meteorological grid origin	0625950 m E, 6484750 m S. MGA Zone 55
Surface meteorological inputs	BoM Trangie Research Station for observations of wind speed and wind direction. TAPM for temperature, relative humidity, air pressure, ceiling height and cloud cover.
Upper air meteorological inputs	Upper air data file for the location of BoM Trangie Research Station derived by TAPM Biased towards surface observations (-1, -0.8, -0.8, -0.4, -0.2, 0, 1, 1, 1, 1, 1)
Simulation length	8760 hours (1 Jan 2018 to 31 Dec 2018)
R1, R2	0.1, 0.5
RMAX1, RMAX2	5, 20
TERRAD	3

6.3 Dispersion modelling

Ground-level concentration and deposition levels due to the identified emission sources have been predicted using the air dispersion model known as CALPUFF (Version 6.42). CALPUFF is a Lagrangian dispersion model that simulates the dispersion of pollutants within a turbulent atmosphere by representing emissions as a series of puffs emitted sequentially. Provided the rate at which the puffs are emitted is sufficiently rapid, the puffs overlap, and the serial release is representative of a continuous release.

The CALPUFF model differs from traditional Gaussian plume models (such as AUSPLUME and ISCST3) in that it can model spatially varying wind and turbulence fields that are important in complex terrain, long-range transport and near calm conditions. CALPUFF has the ability to model the effect of emissions entrained into the thermal internal boundary layer that forms over land, both through fumigation and plume trapping. CALPUFF is an air dispersion model which has been approved by the EPA for these types of assessments (EPA, 2016).

The modelling was performed using the emission estimates from Section 5 and using the meteorological information provided by the CALMET model, described in Section 6.2. Predictions were made at 650 discrete receivers (including the 12 nearby sensitive receivers shown in Figure 2-1) to allow for contouring of results. The locations of the model receivers are shown in Appendix B.

Sources of emissions for existing and proposed operations listed above in Table 5.1 were represented by a series of volume sources. These sources were positioned at the locations shown in Figure 6-1 as identified below in Table 6.3.

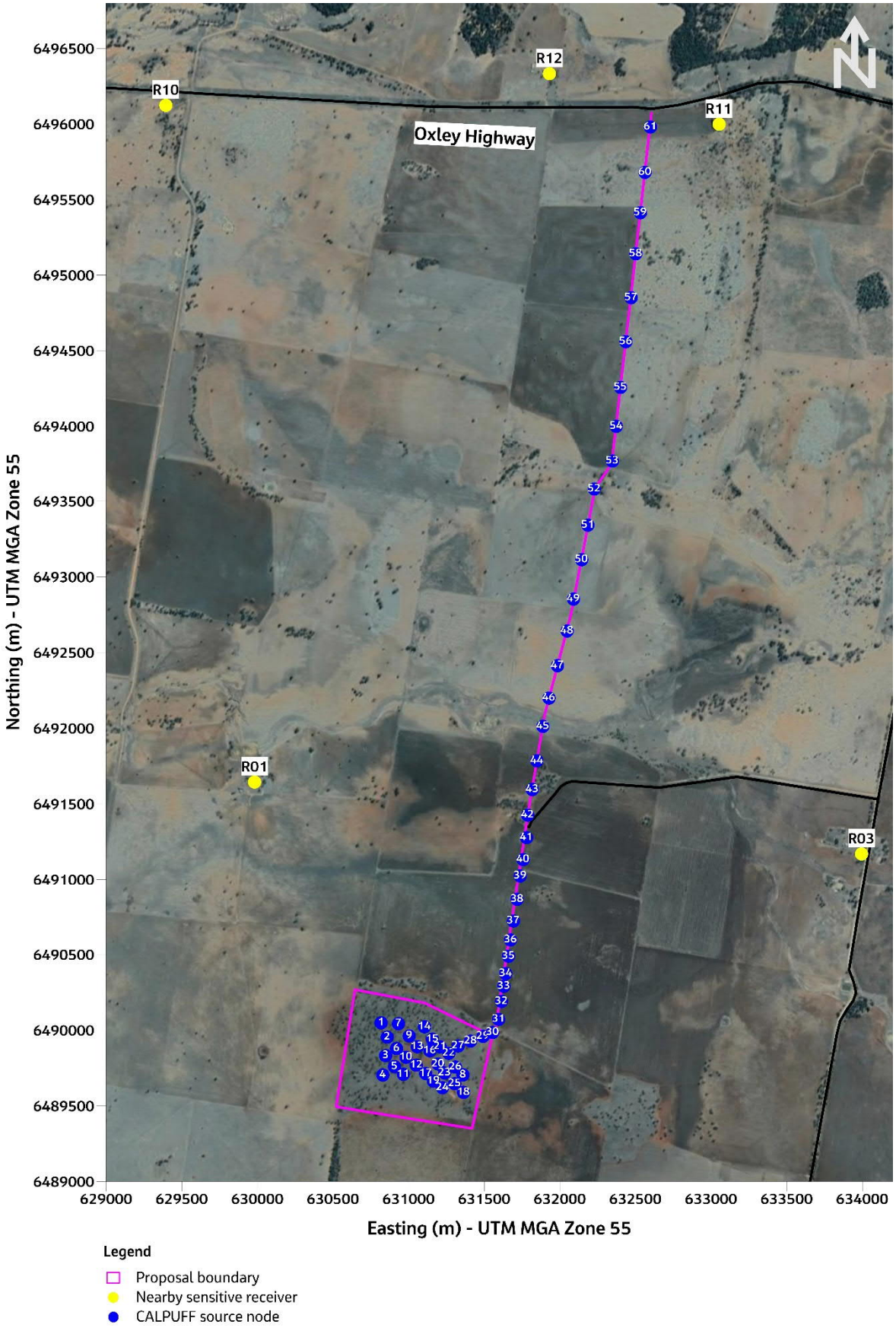


Figure 6-1 CALPUFF modelling source locations

Table 6.3 Source locations

Source/activity	Locations where activities were modelled		
	Existing operations	Proposed operations (Stage 1)	Proposed operations (Stage 2)
Drilling	5 and 6, 9 and 10	1 to 7, 9 to 14	1 to 7, 9 to 14
Blasting	5 and 6, 9 and 10	1 to 7, 9 to 14	1 to 7, 9 to 14
Dozers on raw materials	5 and 6, 9 and 10	1 to 7, 9 to 14	1 to 7, 9 to 14
Excavators loading raw materials to trucks	5 and 6, 9 and 10	1 to 7, 9 to 14	1 to 7, 9 to 14
Hauling raw materials from pit to ROM	5 and 6, 9 and 10, 13	6, 10, 13, 16, 20, 23	6, 10, 13, 16, 20, 23
Unloading raw materials to ROM	13	8, 17, 19	8, 17, 19
Front end loader loading raw product to crushing and screening	12	8, 16, 21	8, 16, 21
Primary crushing	12	16, 21	16, 21
Secondary crushing	12	16, 21	16, 21
Tertiary crushing	12	16, 21	16, 21
Screening	12	16, 21	16, 21
Front end loader loading product stockpiles	16, 20	8, 15, 17 to 20, 22 to 26	8, 15, 17 to 20, 22 to 26
Wind erosion from ROM stockpiles	13	17, 19	17, 19
Wind erosion from product stockpiles	16, 20	8, 15, 18, 20, 22 to 26	8, 15, 18, 20, 22 to 26
Wind erosion from exposed surfaces	5 and 6, 9 and 10, 12, 21 and 22, 28 to 41	1 to 7, 9 to 14, 16, 21, 27 to 41	1 to 7, 9 to 14, 16, 21, 27 to 41
Excavators loading product to trucks	16,20	8, 15, 18, 20, 22 to 26	8, 15, 18, 20, 22 to 26
Hauling product off-site	16, 20 to 22, 28 to 61	20, 22 and 23, 27 to 61	20, 22 and 23, 27 to 61

7. Assessment of impacts

7.1 Overview

This section presents and discusses the results of the assessment by classification of particulate matter. Since Berakee Quarry is an existing facility, it will likely be contributing to the local air quality. Considering this, additional impacts as a result of the Proposal have been determined as the change in predicted contribution between proposed and existing operations. The significance of the predictions was assessed by evaluating the cumulative (i.e. background plus change as a result of the Proposal) concentrations and levels against the criteria and guidance from the EPA's Approved Methods presented in Section 3.

7.2 Particulate matter as PM_{10}

Table 7.1 below lists the predicted annual contributions from existing and proposed operations and the resulting cumulative concentration at each of the nearby sensitive receivers identified in Figure 2-1. As outlined above, since quarry operations are an existing feature and are therefore considered to contribute to background concentrations, the change as a result of the Proposal is the change in predicted contribution between proposed and existing operations. This change was added to the established background concentration to estimate resulting cumulative concentrations with the Proposal.

Table 7.1 Predicted annual PM_{10} concentrations

Receiver	Due to quarry (µg/m^3)			Change as a result of the Proposal (µg/m^3)		Background (µg/m^3)	Cumulative (µg/m^3)		Criterion (µg/m^3)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R01	0.1	0.5	0.1	0.4	0.1	18.9	19.3	19.0	25
R02	<0.1	0.3	0.1	0.3	0.1		19.2	19.0	
R03	<0.1	0.1	<0.1	0.1	<0.1		19.0	18.9	
R04	<0.1	0.2	0.1	0.2	<0.1		19.1	18.9	
R05	<0.1	0.1	<0.1	0.1	<0.1		19.0	18.9	
R06	<0.1	0.2	0.1	0.1	<0.1		19.0	18.9	
R07	<0.1	<0.1	<0.1	<0.1	<0.1		18.9	18.9	
R08	<0.1	0.1	<0.1	<0.1	<0.1		18.9	18.9	
R10	<0.1	0.1	<0.1	0.1	<0.1		19.0	18.9	
R11	<0.1	0.2	0.1	0.2	<0.1		19.1	18.9	
R12	<0.1	0.3	0.1	0.2	<0.1		19.1	18.9	
R15	<0.1	<0.1	<0.1	<0.1	<0.1		18.9	18.9	

As Table 7.1 below lists the predicted annual contributions from existing and proposed operations and the resulting cumulative concentration at each of the nearby sensitive receivers identified in Figure 2-1. As outlined above, since quarry operations are an existing feature and are therefore considered to contribute to background concentrations, the change as a result of the Proposal is the change in predicted contribution between proposed and existing operations. This change was added to the established background concentration to estimate resulting cumulative concentrations with the Proposal.

Table 7.1 shows, during stages 1 and 2 of the Proposal, cumulative annually averaged PM_{10} concentrations were predicted to remain below the EPA's criterion of 25 µg/m^3.

Regarding daily averaged PM_{10}, there were 10 instances where background concentrations exceeded the EPA's criteria at the DPIE Gunnedah station in 2018 (see Table 4.6). Consistent with guidance presented in the Approved Methods it was reviewed whether the Proposal would cause additional days of exceedance at surrounding sensitive receivers. This review including maximum 24-hour PM_{10} contributions from existing and proposed operations at sensitive receivers, and whether the number of exceedances per year would change is presented below in Table 7.2.

Table 7.2 Review of change in number of days with PM_{10} concentrations exceeding 50 µg/m^3

Receiver	Maximum 24-hour contribution due to existing quarry operations (µg/m^3)	Number of exceedances per year (existing)	Maximum 24-hour contribution due to proposed quarry operations (µg/m^3)		Number of exceedances per year (Proposed)		Change in number of exceedances per year	
			Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
R01	0.37	10	3.16	0.81	10	10	0	0
R02	0.51		3.24	0.95	10	10	0	0
R03	0.25		1.83	0.51	10	10	0	0
R04	0.22		1.78	0.48	10	10	0	0
R05	0.14		0.99	0.27	10	10	0	0
R06	0.21		1.65	0.45	10	10	0	0
R07	0.08		0.54	0.14	10	10	0	0
R08	0.08		0.74	0.20	10	10	0	0
R10	0.11		0.83	0.22	10	10	0	0
R11	0.27		1.94	0.51	10	10	0	0
R12	0.31		1.97	0.53	10	10	0	0
R15	0.06		0.38	0.10	10	10	0	0

As Table 7.2 lists, it was predicted that the Proposal would not result in any additional days where PM_{10} concentrations were above 50 µg/m^3. Maximum daily and annual PM_{10} contributions from existing and proposed operations are presented as contour plots in Appendix C.

7.3 Particulate matter as $PM_{2.5}$

Predicted annual $PM_{2.5}$ contributions from existing and proposed operations and the resulting cumulative concentration at the identified nearby sensitive receivers are summarised below in Table 7.3.

Table 7.3 Predicted annual $PM_{2.5}$ concentrations

Receiver	Due to quarry (µg/m^3)			Change as a result of the proposal (µg/m^3)		Background (µg/m^3)	Cumulative (µg/m^3)		Criterion (µg/m^3)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R01	<0.01	0.04	0.01	0.03	0.01	9	9.03	9.01	8
R02	<0.01	0.03	0.01	0.03	0.01		9.03	<9.01	

Receiver	Due to quarry (µg/m^3)			Change as a result of the proposal (µg/m^3)		Background (µg/m^3)	Cumulative (µg/m^3)		Criterion (µg/m^3)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R03	<0.01	0.01	<0.01	0.01	<0.01		9.01	<9.01	
R04	<0.01	0.02	0.01	0.01	<0.01		9.01	<9.01	
R05	<0.01	0.01	<0.01	0.01	<0.01		9.01	<9.01	
R06	<0.01	0.01	<0.01	0.01	<0.01		9.015	<9.01	
R07	<0.01	<0.01	<0.01	<0.01	<0.01		<9.01	<9.01	
R08	<0.01	<0.01	<0.01	<0.01	<0.01		<9.01	<9.01	
R10	<0.01	0.01	<0.01	0.01	<0.01		9.01	<9.01	
R11	<0.01	0.02	<0.01	0.01	<0.01		9.01	<9.01	
R12	<0.01	0.02	0.01	0.01	<0.01		9.01	<9.01	
R15	<0.01	<0.01	<0.01	<0.01	<0.01		<9.01	<9.01	

Noting that the adopted annual $PM_{2.5}$ concentration (9 µg/m^3) already exceeds the EPA's 8 µg/m^3 criterion, Table 7.3 shows very low predicted increases (i.e. less than 1%) at the identified surrounding sensitive receivers as a result of the Proposal.

As identified above in Section 4.4.3, there were five instances in 2018 when daily $PM_{2.5}$ concentrations exceeded 25 µg/m^3 at the DPIE Gunnedah monitoring station. As such it was reviewed whether the Proposal could result in additional days of exceedance at surrounding sensitive receivers, in the same air quality conditions existed in the vicinity of the proposal. This review including the maximum daily $PM_{2.5}$ contribution from existing and proposed operations at the quarry, and whether the number of exceedances per year at sensitive receivers would change is presented below in Table 7.4.

Table 7.4 Review of change in number of days with $PM_{2.5}$ concentrations exceeding 25 µg/m^3

Receiver	Maximum 24-hour contribution due to existing quarry operations (µg/m^3)	Number of exceedances per year (existing)	Maximum 24-hour contribution due to proposed quarry operations (µg/m^3)		Number of exceedances per year (Proposed)		Change in number of exceedances per year	
			Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
R01	0.04	5	0.30	0.09	5	5	0	0
R02	0.05		0.32	0.10	5	5	0	0
R03	0.03		0.18	0.05	5	5	0	0
R04	0.02		0.18	0.06	5	5	0	0
R05	0.01		0.11	0.03	5	5	0	0
R06	0.02		0.18	0.06	5	5	0	0
R07	0.01		0.06	0.02	5	5	0	0
R08	0.01		0.06	0.02	5	5	0	0
R10	0.01		0.07	0.02	5	5	0	0

Receiver	Maximum 24-hour contribution due to existing quarry operations (µg/m^3)	Number of exceedances per year (existing)	Maximum 24-hour contribution due to proposed quarry operations (µg/m^3)		Number of exceedances per year (Proposed)		Change in number of exceedances per year	
			Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
R11	0.02		0.13	0.04	5	5	0	0
R12	0.02		0.14	0.05	5	5	0	0
R15	<0.01		0.03	0.01	5	5	0	0

As Table 7.4 shows, the number of exceedances of the EPA's daily criterion (25 µg/m^3) was not predicted to change as a result of the Proposal.

Maximum daily and annual $PM_{2.5}$ contributions from existing and proposed quarrying operations are shown as contour plots in Appendix C.

7.4 Total suspended particulates (TSP)

Predicted changes in annual TSP from existing and proposed operations at the identified surrounding receivers are summarised below in Table 7.5. As displayed, it was predicted that the Proposal would not cause cumulative annual TSP concentrations exceeding the EPA's 90 µg/m^3 impact assessment criterion.

Table 7.5 Predicted annual TSP concentrations (µg/m^3)

Receiver	Due to quarry (µg/m^3)			Change as a result of the Proposal (µg/m^3)		Background (µg/m^3)	Cumulative (µg/m^3)		Criterion (µg/m^3)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R01	0.1	0.7	0.2	0.6	0.1	40	40.6	40.1	90
R02	0.1	0.5	0.2	0.5	0.1		40.5	40.1	
R03	<0.1	0.2	0.1	0.2	<0.1		40.2	<40.1	
R04	<0.1	0.2	0.1	0.2	<0.1		40.2	<40.1	
R05	<0.1	0.2	<0.1	0.1	<0.1		40.1	<40.1	
R06	<0.1	0.2	0.1	0.2	<0.1		40.2	<40.1	
R07	<0.1	0.1	<0.1	0.0	<0.1		<40.1	<40.1	
R08	<0.1	0.1	<0.1	0.1	<0.1		40.1	<40.1	
R10	<0.1	0.1	<0.1	0.1	<0.1		40.1	<40.1	
R11	0.1	0.4	0.1	0.4	<0.1		40.4	<40.1	
R12	0.1	0.7	0.2	0.5	0.1		40.5	40.1	
R15	<0.1	0.1	<0.1	0.1	<0.1		<40.1	<40.1	

Annual TSP contributions from existing and proposed quarrying operations are displayed as contour plots in Appendix C.

7.5 Deposited dust

Predicted changes in annually averaged deposited dust levels at the surrounding receivers are summarised in Table 7.6. As shown, it was predicted that the cumulative levels would remain below the EPA's the 4 g/m^2/month impact assessment criterion at all of the identified nearby sensitive receivers.

Table 7.6 Predicted deposited dust

Receiver	Due to quarry (g/m^2/month)			Change as a result of the Proposal (g/m^2/month)		Background (g/m^2/month)	Cumulative (g/m^2/month)		Criterion (g/m^2/month)
	Existing	Proposed							
		Stage 1	Stage 2	Stage 1	Stage 2		Stage 1	Stage 2	
R01	0.01	0.09	0.02	0.07	0.01	2.6	2.67	2.61	4
R02	0.01	0.09	0.03	0.07	0.01		2.67	2.61	
R03	0.01	0.04	0.01	0.04	<0.01		2.64	<2.61	
R04	0.01	0.03	0.01	0.03	<0.01		2.63	<2.61	
R05	0.01	0.03	0.01	0.03	<0.01		2.63	<2.61	
R06	<0.01	0.03	0.01	0.02	<0.01		2.62	<2.61	
R07	<0.01	0.01	<0.01	0.01	<0.01		2.61	<2.61	
R08	<0.01	0.02	0.01	0.02	<0.01		2.62	<2.61	
R10	<0.01	0.02	<0.01	0.01	<0.01		2.61	<2.61	
R11	0.01	0.05	0.01	0.04	<0.01		2.64	<2.61	
R12	0.02	0.12	0.03	0.10	0.01		2.70	2.61	
R15	<0.01	0.01	<0.01	0.01	<0.01		2.61	<2.61	

Annual deposited dust contributions from existing and proposed site operations are displayed as contour plots in Appendix C.

8. Safeguards and monitoring

As presented in Section 7, the assessment found that the EPA's impact assessment criteria for annually averaged PM_{10}, TSP and deposited dust would be met. Negligible (less than 3%) increases in annually averaged $PM_{2.5}$ were predicted at surrounding sensitive receivers, with background concentrations noted to already exceed criteria. As a result of the Proposal there were also no additional days where PM_{10} and $PM_{2.5}$ concentrations were predicted to exceed the EPA's respective 50 µg/m^3 and 25 µg/m^3 impact assessment criteria.

Consistent with Section 5.1.3 of the Approved Methods, for environments were background air quality conditions are already elevated and where it has been demonstrated that there would be no attributable additional exceedances of the EPA's impact assessment criteria, best practice management practices are to be implemented to "minimise emissions of air pollutants as far as practical". As identified in Table 5.2 above in Section 5.2, measures to control emissions would be applied to all sources of emissions to air associated with the Proposal. The implementation of these controls is considered reasonable best-practice. These have been reproduced below in Table 8.1.

Table 8.1 Dust management measures

Source/activity	Recommended and committed control measure	Timing	Responsibility
Drilling for blasting	Water sprays	Prior to, during and post-drilling	Site operator
Hauling of materials in trucks	Watering of haul route	Regularly when in-use	Site operator
Loading and unloading of materials	Water sprays	During loading and unloading activities	Site operator
Primary, secondary and tertiary crushing	Water sprays with dust supressing additives, enclosure of dust-generating components	During crushing	Site operator
Screening	Water sprays with dust supressing additives	During screening	Site operator
Wind erosion from exposed surfaces and stockpiled materials	Watering	Regular watering during operations	Site operator

Controls should be scaled to the intensity of operations, as well as meteorological and background air quality conditions. Additionally, five to seven-day weather forecasts available from BoM should be used to identify and appropriately plan for potentially high-risk times of days for dust, and in particular for planned blasting. Finally, consistent with the requirements of EPL 21093, trucks entering and leaving the premises that are carrying loads are to be covered at all times, except during loading and unloading, the premises is to be maintained in a condition which minimises or prevents the emission of dust from the premises, and dust control equipment must be operable at all times with exception of shutdowns required for maintenance.

9. Conclusions

An assessment was completed to evaluate potential changes in air quality from a Proposal to expand operations at Berakee Quarry. Consistent with the requirements of the SEAR's, this assessment was undertaken in accordance with the guidance presented in the EPA's Approved Methods, and considered emissions arising from changes in operations, including road haulage activities.

As part of the assessment, key features of the existing environment were determined including the identification of surrounding sensitive receivers; prevailing meteorology; and background local air quality conditions. Twelve residential receivers were identified within the vicinity of the Proposal. Meteorological and ambient air quality data collected at monitors operated by BoM, DPIE and for the Cobbora Coal Project were reviewed and conditions in 2018 were identified as being representative of the long-term conditions. It is noted that there are no ambient air quality monitors nearby, so background air quality conditions around the Proposal were estimated based on data from surrounding regional monitors operated by DPIE and from the Cobbora Coal in similar, rural environments.

Emission rates were estimated from local and international factors in combination with the proposed activities. Modelling was then carried out with these emissions to predict the potential for air quality impacts as a result of the Proposal. This assessment determined that the Proposal would not result in unacceptable changes to local air quality. Specifically, it was predicted that:

- The EPA's impact assessment criteria for annually averaged PM_{10}, TSP and deposited dust would be met;
- There would be a negligible (less than 3%) increases in annually averaged $PM_{2.5}$ at surrounding sensitive receivers, with background concentrations noted to already exceed criterion;
- There would be no additional days where PM_{10} and $PM_{2.5}$ concentrations exceeded the EPA's respective 50 $\mu g/m^3$ and 25 $\mu g/m^3$ impact assessment criteria.

Measures consistent with best-practice were recommended to control emissions to air including the use of watering during drilling, material hauling, loading and unloading and screening, as well as on exposed surface and stockpiles, and the use of enclosures and water sprays with dust suppressing additives during crushing. Additionally, it was recommended that weather forecasts should be used to identify high-risk times of days for dust, with controls and the intensity of operations adjusted accordingly.

10. References

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Appendix A. Emissions calculations

Emission estimates, controls factors, emission factors and input variables

Existing operations:

Emission calculations																							
Berakee Quarry - Existing																							
	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables										
Activity	**TSP**	**PM10**	**PM2.5**	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	t/truck	km/trip	Silt (%)	Reference				
Drilling	32	17	1	70	180	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.8				
Blasting	19	10	1	0	3	blasts/y	6.2	kg/blast	3.2	kg/blast	0.2	kg/blast	930	-	-	-	-	-	EETM Mining (2012), Section 1.1.9				
Dozers on raw materials	669	162	70	0	40	h/y	16.7	kg/h	4.04419	kg/h	1.757	kg/h	-	-	2	-	-	10	EETM Mining (2012), Section 1.1.5				
Excavators loading raw materials to trucks	163	77	12	0	80000	t/y	0.00203	kg/t	0.00096	kg/t	0.0001	kg/t	-	1.72	2	-	-	-	EETM Mining (2012), Section 1.1.2, AP42-13.2.4				
Hauling raw materials from pit to ROM	1095	312	16	50	533	VKT/y	4.10793	kg/VKT	1.16815	kg/VKT	0.058	kg/VKT	-	-	-	60	0.4	8.3	EETM Mining (2012), Section 1.1.11, AP42-13.2.2-1				
Unloading raw materials to ROM	480	172	24	50	80000	t/y	0.01200	kg/t	0.0043	kg/t	0.001	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.6				
FEL loading raw product to crushing and screening	81	38	4	50	80000	t/y	0.00203	kg/t	0.00096	kg/t	0.000	kg/t	-	1.72	2	-	-	-	EETM Mining (2012), Section 1.1.2, AP42-13.2.4				
Primary crushing	400	160	20	50	80000	t/y	0.01	kg/t	0.004	kg/t	0.001	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2				
Secondary crushing	1200	480	60	50	80000	t/y	0.03	kg/t	0.012	kg/t	0.002	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2				
Tertiary crushing	1200	400	60	50	80000	t/y	0.03	kg/t	0.01	kg/t	0.002	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2				
Screening	500	172	25	50	80000	t/y	0.0125	kg/t	0.0043	kg/t	0.001	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2, AP42-11.19.2-1				
FEL loading product stockpiles	81	38	4	50	80000	t/y	0.00203	kg/t	0.00096	kg/t	0.000	kg/t	-	1.72	2	-	-	-	EETM Mining, Section 1.1.2, AP42-13.2.4				
Wind erosion from ROM stockpiles	85	44	6	50	0.2	ha	849.7	kg/ha/y	438.0	kg/ha/y	63.7	kg/ha/y	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.18, AP42				
Wind erosion from product stockpiles	340	175	25	50	0.8	ha	849.7	kg/ha/y	438.0	kg/ha/y	63.7	kg/ha/y	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.18, AP42				
Wind erosion from exposed surfaces	637	329	48	50	1.5	ha	849.7	kg/ha/y	438.0	kg/ha/y	63.7	kg/ha/y	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.18, AP42				
Excavators loading product to trucks	163	77	8	0	80000	t/y	0.00203	kg/t	0.00096	kg/t	0.000	kg/t	-	1.72	2	-	-	-	EETM Mining (2012), Section 1.1.2, AP42-13.2.4				
Hauling product off-site	48115	13682	684	50	32000	VKT/y	3.00718	kg/VKT	0.85513	kg/VKT	0.043	kg/VKT	-	-	-	30	12	8.3	EETM Mining (2012), Section 1.1.11, AP42-13.2.2-1				
Total	**55260**	**16344**	**1068**																				

Where blasting area (m^2) = default blast area (Section 1.1.8, EETM Mining, 2012); moisture content (%) = default value (Section 1.1.5, EETM Mining, 2012); silt content (%) exposed areas = default value (Section 1.1.5, EETM Mining, 2012); silt content (%) haulage areas = default value (Section 1.1.11, AP42-13.2.2-1); Wind speed and precipitation variables (m/s and mm/y) = (BoM Trangie, 2018); Haulage distances (m) = measured; dump and haulage truck loaded weights (t) = supplied; controls (%) = default values (Table 4 EETM Mining, 2012); activity intensities = supplied.

Proposed operations, stage 1:

Emission calculations																							
Berakee Quarry - Proposed Stage 1																							
	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables										
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	t/truck	km/trip	Silt (%)	Reference				
Drilling	212	110	6	70	1200	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.8				
Blasting	75	39	2	0	12	blasts/y	6.2	kg/blast	3.2	kg/blast	0.2	kg/blast	930	-	-	-	-	-	EETM Mining (2012), Section 1.1.9				
Dozers on raw materials	4184	1011	439	0	250	h/y	16.7	kg/h	4.04419	kg/h	1.757	kg/h	-	-	2	-	-	10	EETM Mining (2012), Section 1.1.5				
Excavators loading raw materials to trucks	996	471	71	0	490000	t/y	0.00203	kg/t	0.00096	kg/t	0.0001	kg/t	-	1.72	2	-	-	-	EETM Mining (2012), Section 1.1.2, AP42-13.2.4				
Hauling raw materials from pit to ROM	13419	3816	191	50	6533	VKT/y	4.10793	kg/VKT	1.16815	kg/VKT	0.058	kg/VKT	-	-	-	60	0.8	8.3	EETM Mining (2012), Section 1.1.11, AP42-13.2.2-1				
Unloading raw materials to ROM	2940	1054	147	50	490000	t/y	0.01200	kg/t	0.0043	kg/t	0.001	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.6				
FEL loading raw product to crushing and screening	498	235	25	50	490000	t/y	0.00203	kg/t	0.00096	kg/t	0.000	kg/t	-	1.72	2	-	-	-	EETM Mining (2012), Section 1.1.2, AP42-13.2.4				
Primary crushing	2450	980	123	50	490000	t/y	0.01	kg/t	0.004	kg/t	0.001	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2				
Secondary crushing	7350	2940	368	50	490000	t/y	0.03	kg/t	0.012	kg/t	0.002	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2				
Tertiary crushing	7350	2450	368	50	490000	t/y	0.03	kg/t	0.01	kg/t	0.002	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2				
Screening	3063	1054	153	50	490000	t/y	0.0125	kg/t	0.0043	kg/t	0.001	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2, AP42-11.19.2-1				
FEL loading product stockpiles	498	235	25	50	490000	t/y	0.00203	kg/t	0.00096	kg/t	0.000	kg/t	-	1.72	2	-	-	-	EETM Mining, Section 1.1.2, AP42-13.2.4				
Wind erosion from ROM stockpiles	680	350	51	50	1.6	ha	849.7	kg/ha/y	438.0	kg/ha/y	63.7	kg/ha/y	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.18, AP42				
Wind erosion from product stockpiles	3484	1796	261	50	8.2	ha	849.7	kg/ha/y	438.0	kg/ha/y	63.7	kg/ha/y	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.18, AP42				
Wind erosion from exposed surfaces	6458	3329	484	50	15.2	ha	849.7	kg/ha/y	438.0	kg/ha/y	63.7	kg/ha/y	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.18, AP42				
Excavators loading product to trucks	996	471	50	0	490000	t/y	0.00203	kg/t	0.00096	kg/t	0.000	kg/t	-	1.72	2	-	-	-	EETM Mining (2012), Section 1.1.2, AP42-13.2.4				
Hauling product off-site	258775	73586	3679	50	154737	VKT/y	3.34471	kg/VKT	0.95111	kg/VKT	0.048	kg/VKT	-	-	-	38	12	8.3	EETM Mining (2012), Section 1.1.11, AP42-13.2.2-1				
Total	**313426**	**93927**	**6443**																				

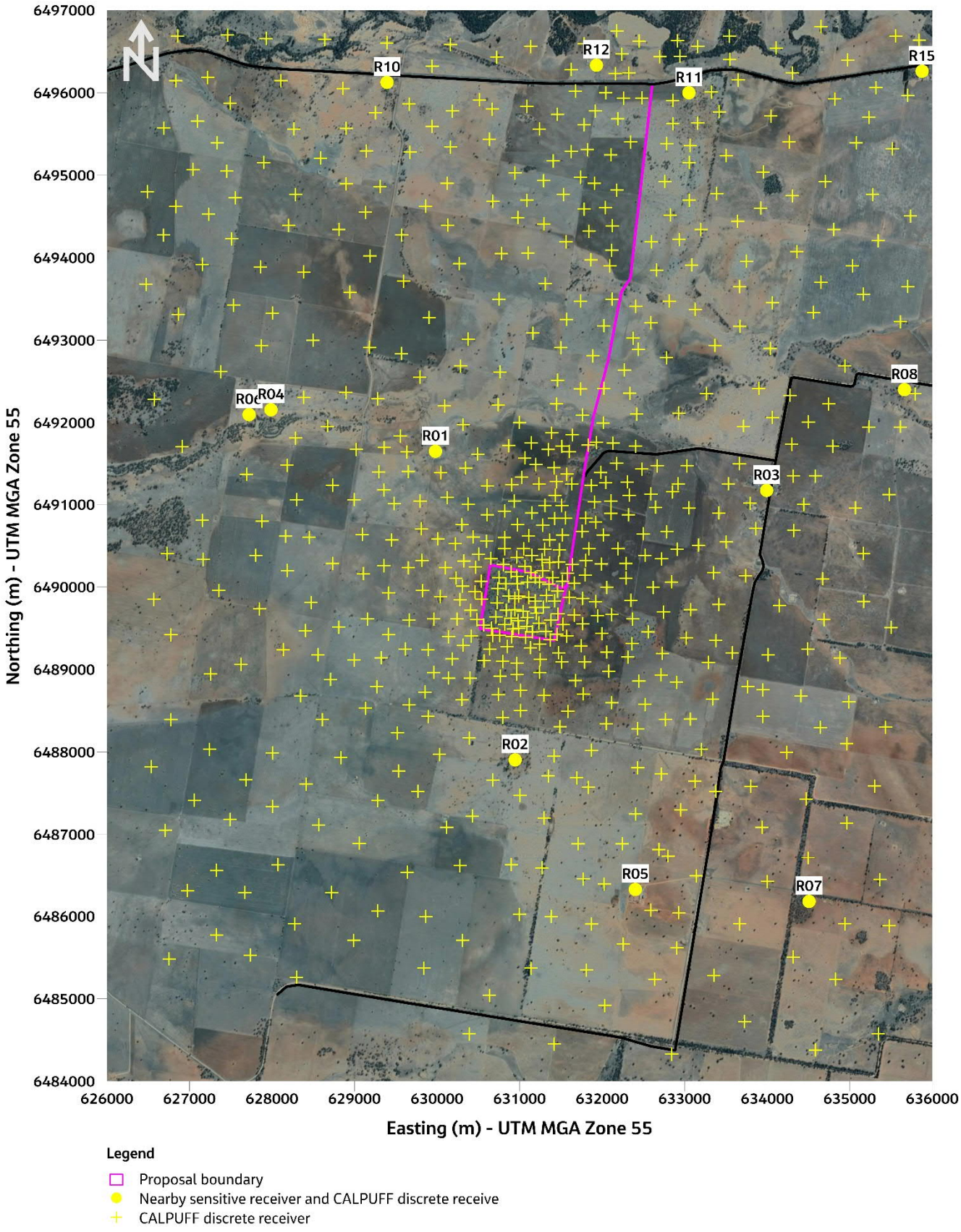
Where blasting area (m^2) = default blast area (Section 1.1.8, EETM Mining, 2012); moisture content (%) = default value (Section 1.1.5, EETM Mining, 2012); silt content (%) exposed areas = default value (Section 1.1.5, EETM Mining, 2012); silt content (%) haulage areas = default value (Section 1.1.11, AP42-13.2.2-1); Wind speed and precipitation variables (m/s and mm/y) = (BoM Trangie, 2018); Haulage distances (m) = measured; dump and haulage truck loaded weights (t) = supplied; controls (%) = default values (Table 4 EETM Mining, 2012); activity intensities = supplied.

Proposed operations, stage 2:

Emission calculations																							
Berakee Quarry - Proposed Stage 2																							
	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables										
Activity	**TSP**	**PM10**	**PM2.5**	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	t/truck	km/trip	Silt (%)	Reference				
Drilling	106	55	3	70	600	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.8				
Blasting	37	19	1	0	6	blasts/y	6.2	kg/blast	3.2	kg/blast	0.2	kg/blast	930	-	-	-	-	-	EETM Mining (2012), Section 1.1.9				
Dozers on raw materials	2008	485	211	0	120	h/y	16.7	kg/h	4.04419	kg/h	1.757	kg/h	-	-	2	-	-	10	EETM Mining (2012), Section 1.1.5				
Excavators loading raw materials to trucks	244	115	17	0	120000	t/y	0.00203	kg/t	0.00096	kg/t	0.0001	kg/t	-	1.72	2	-	-	-	EETM Mining (2012), Section 1.1.2, AP42-13.2.4				
Hauling raw materials from pit to ROM	3286	935	47	50	1600	VKT/y	4.10793	kg/VKT	1.16815	kg/VKT	0.058	kg/VKT	-	-	-	60	0.8	8.3	EETM Mining (2012), Section 1.1.11, AP42-13.2.2-1				
Unloading raw materials to ROM	720	258	36	50	120000	t/y	0.01200	kg/t	0.0043	kg/t	0.001	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.6				
FEL loading raw product to crushing and screening	122	58	6	50	120000	t/y	0.00203	kg/t	0.00096	kg/t	0.000	kg/t	-	1.72	2	-	-	-	EETM Mining (2012), Section 1.1.2, AP42-13.2.4				
Primary crushing	600	240	30	50	120000	t/y	0.01	kg/t	0.004	kg/t	0.001	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2				
Secondary crushing	1800	720	90	50	120000	t/y	0.03	kg/t	0.012	kg/t	0.002	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2				
Tertiary crushing	1800	600	90	50	120000	t/y	0.03	kg/t	0.01	kg/t	0.002	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2				
Screening	750	258	38	50	120000	t/y	0.0125	kg/t	0.0043	kg/t	0.001	kg/t	-	-	-	-	-	-	EETM Mining (2012), Section 5.2.2, AP42-11.19.2-1				
FEL loading product stockpiles	122	58	6	50	120000	t/y	0.00203	kg/t	0.00096	kg/t	0.000	kg/t	-	1.72	2	-	-	-	EETM Mining, Section 1.1.2, AP42-13.2.4				
Wind erosion from ROM stockpiles	680	350	51	50	1.6	ha	849.7	kg/ha/y	438.0	kg/ha/y	63.7	kg/ha/y	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.18, AP42				
Wind erosion from product stockpiles	3484	1796	261	50	8.2	ha	849.7	kg/ha/y	438.0	kg/ha/y	63.7	kg/ha/y	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.18, AP42				
Wind erosion from exposed surfaces	6458	3329	484	50	15.2	ha	849.7	kg/ha/y	438.0	kg/ha/y	63.7	kg/ha/y	-	-	-	-	-	-	EETM Mining (2012), Section 1.1.18, AP42				
Excavators loading product to trucks	244	115	12	0	120000	t/y	0.00203	kg/t	0.00096	kg/t	0.000	kg/t	-	1.72	2	-	-	-	EETM Mining (2012), Section 1.1.2, AP42-13.2.4				
Hauling product off-site	63373	18021	901	50	37895	VKT/y	3.34471	kg/VKT	0.95111	kg/VKT	0.048	kg/VKT	-	-	-	38	12	8.3	EETM Mining (2012), Section 1.1.11, AP42-13.2.2-1				
Total	**85835**	**27413**	**2285**																				

Where blasting area (m^2) = default blast area (Section 1.1.8, EETM Mining, 2012); moisture content (%) = default value (Section 1.1.5, EETM Mining, 2012); silt content (%) exposed areas = default value (Section 1.1.5, EETM Mining, 2012); silt content (%) haulage areas = default value (Section 1.1.11, AP42-13.2.2-1); Wind speed and precipitation variables (m/s and mm/y) = (BoM Trangie, 2018); Haulage distances (m) = measured; dump and haulage truck loaded weights (t) = supplied; controls (%) = default values (Table 4 EETM Mining, 2012); activity intensities = supplied.

Appendix B. CALPUFF discrete receiver locations


6497000
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Northing (m) - UTM MGA Zone 55
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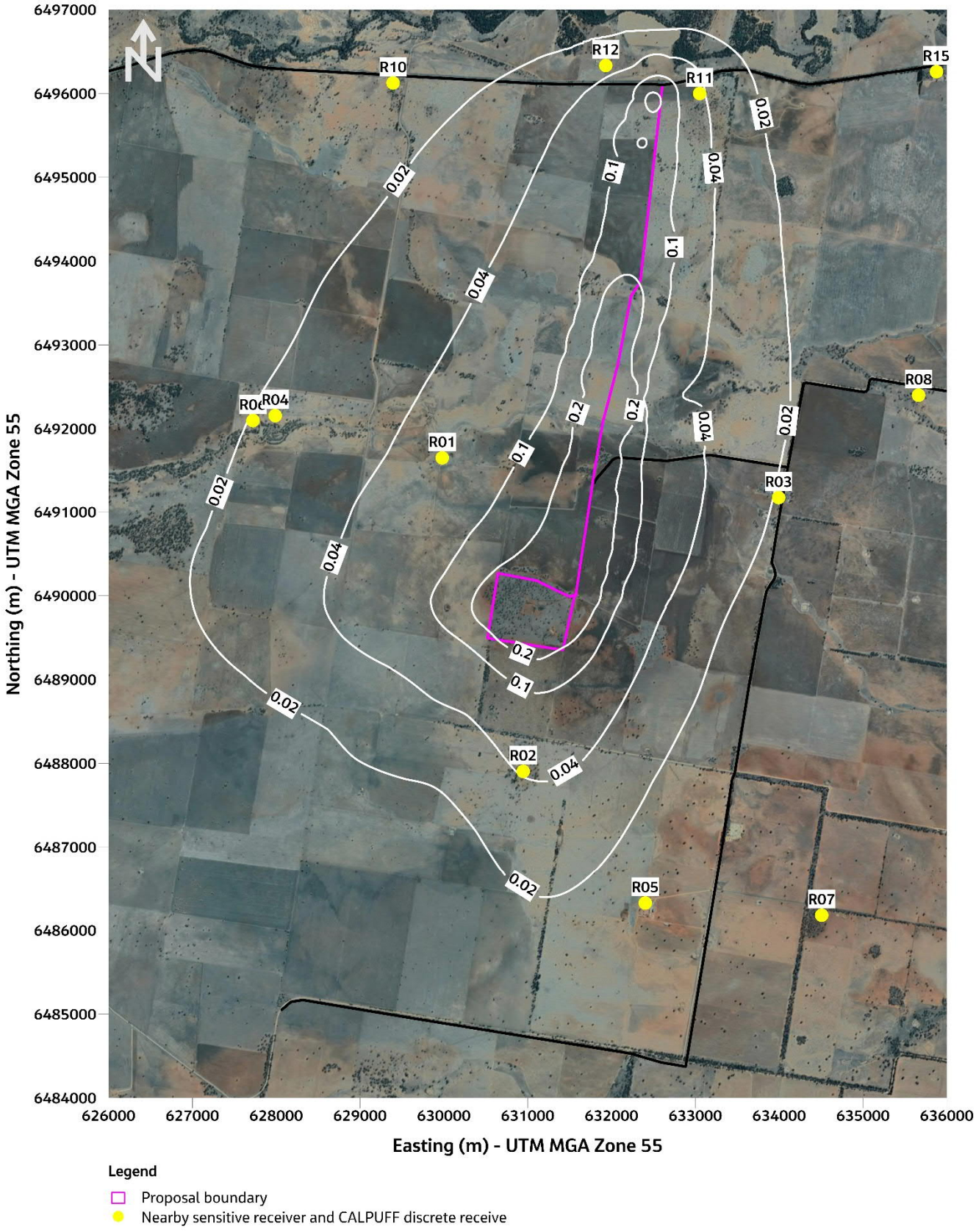
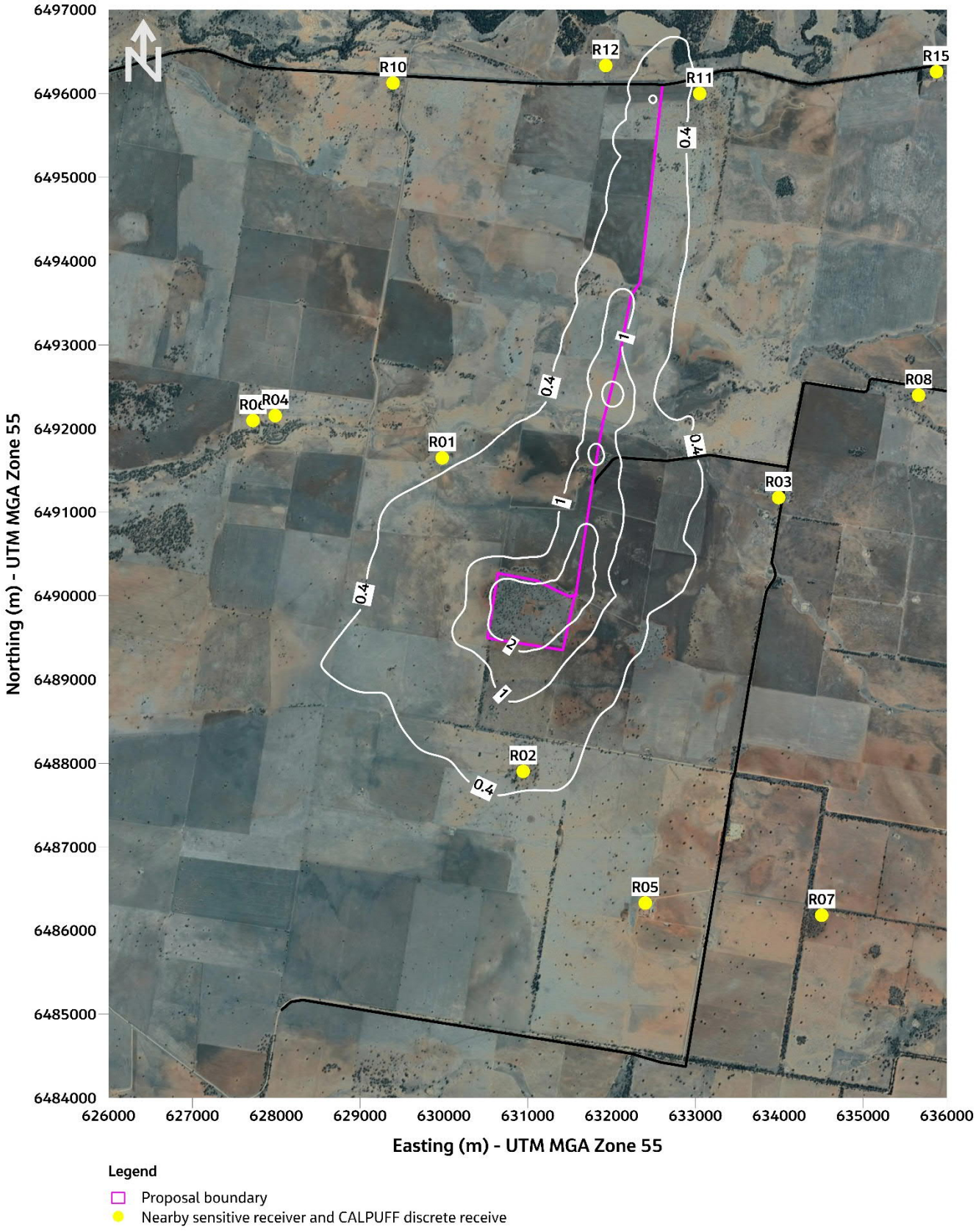
630000
631000
632000
633000
634000
635000
636000
Easting (m) - UTM MGA Zone 55
R10
R12
R11
R15
R08
R04
R01
R03
R02
R05
R07
Legend
Proposal boundary
Nearby sensitive receiver and CALPUFF discrete receive
CALPUFF discrete receiver

Appendix C. Incremental contour plots

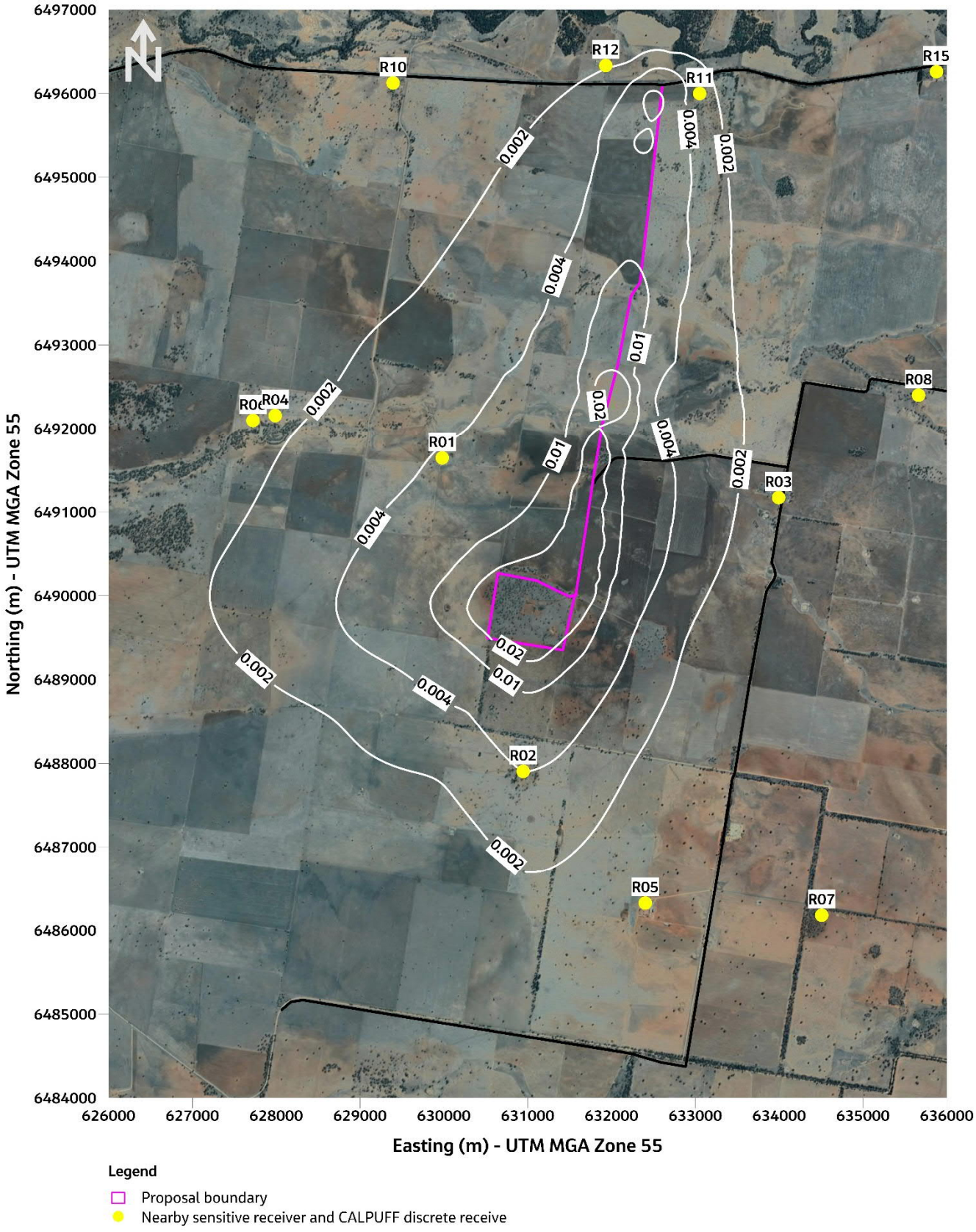
Existing operations: Annual PM_{10} ($\mu g/m^3$)



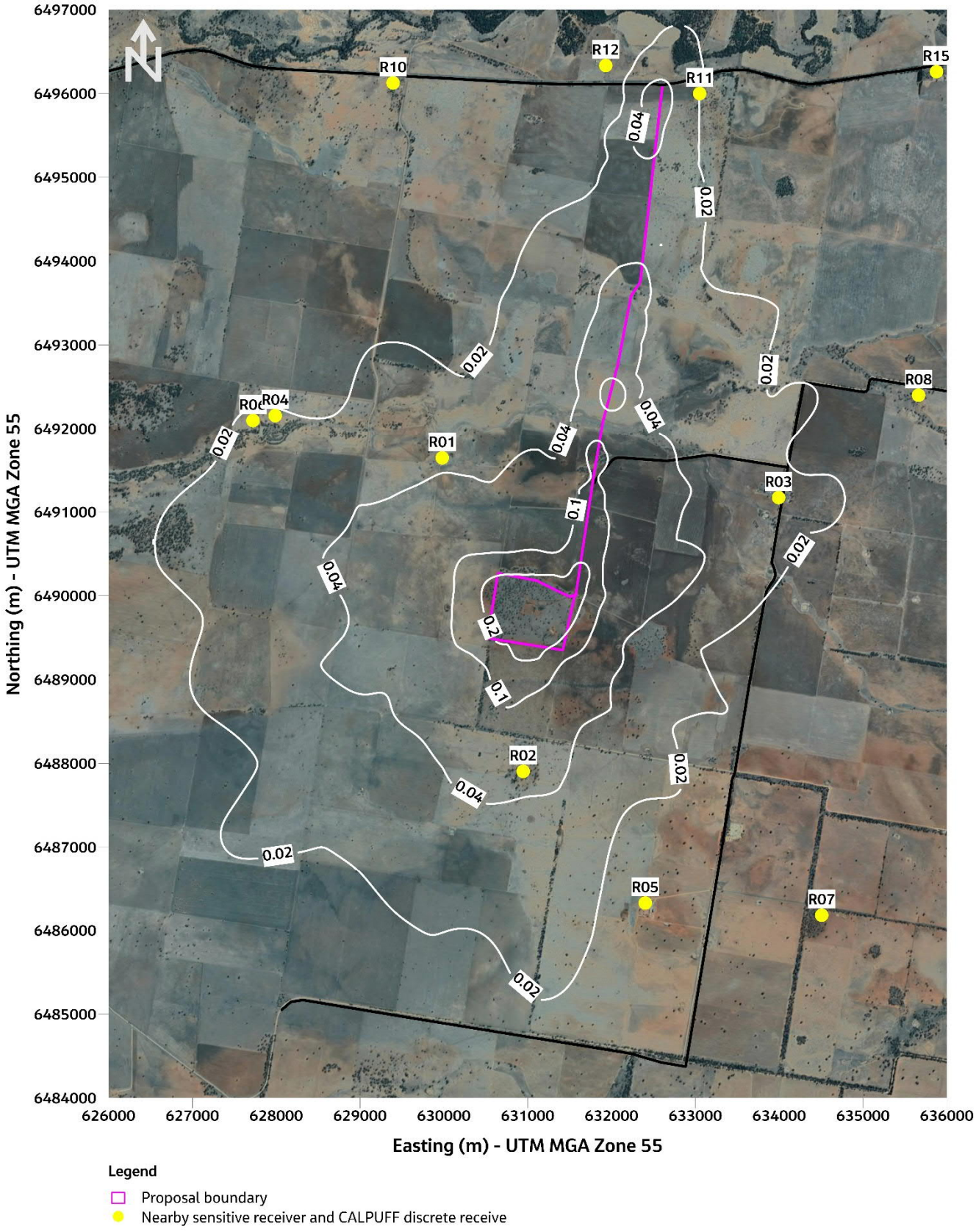
Existing operations: 100th percentile, 24-hour PM_{10} (µg/m^3)



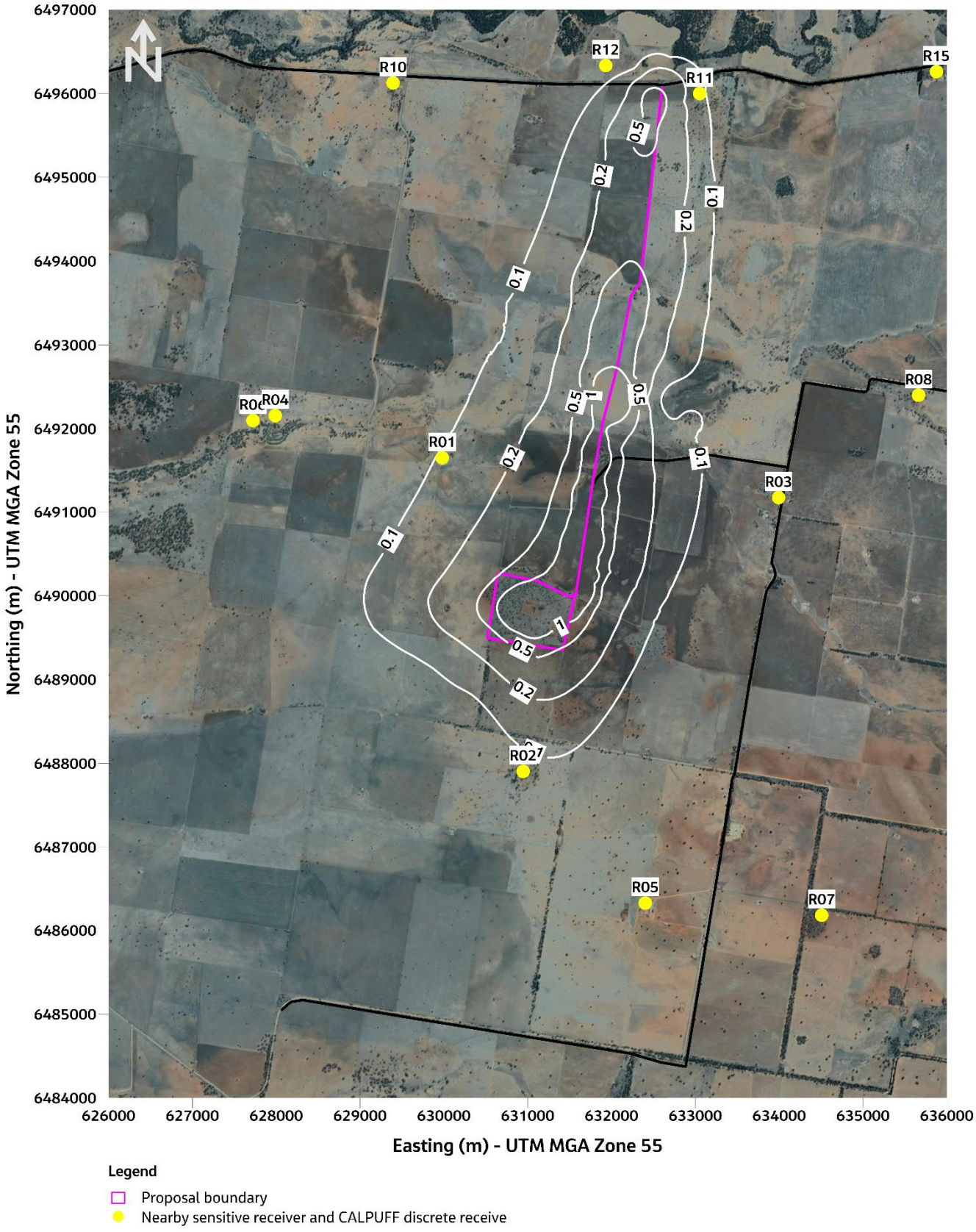
Existing operations: Annual $PM_{2.5}$ ($\mu g/m^3$)



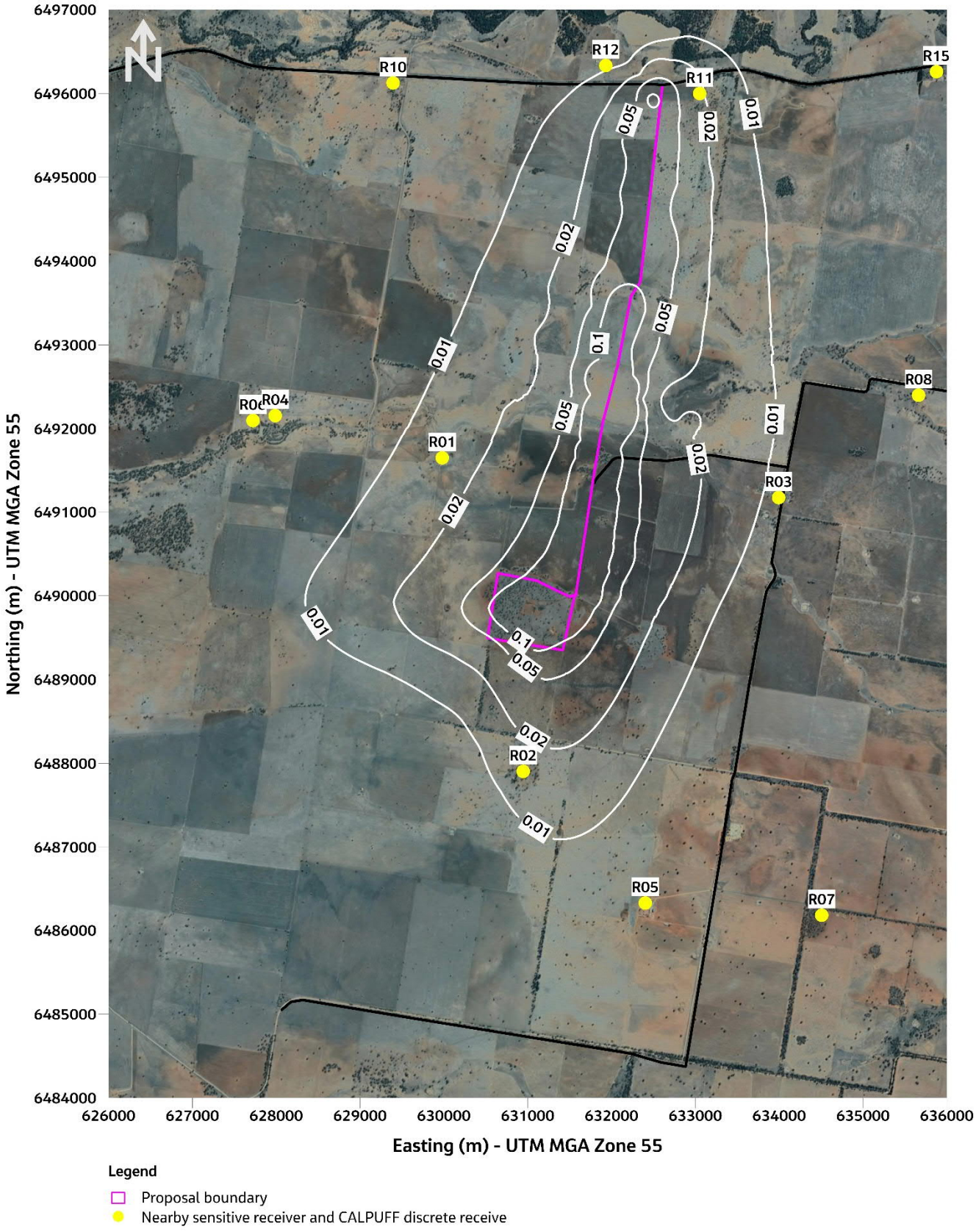
Existing operations: 100th percentile, 24-hour $PM_{2.5}$ ($\mu g/m^3$)



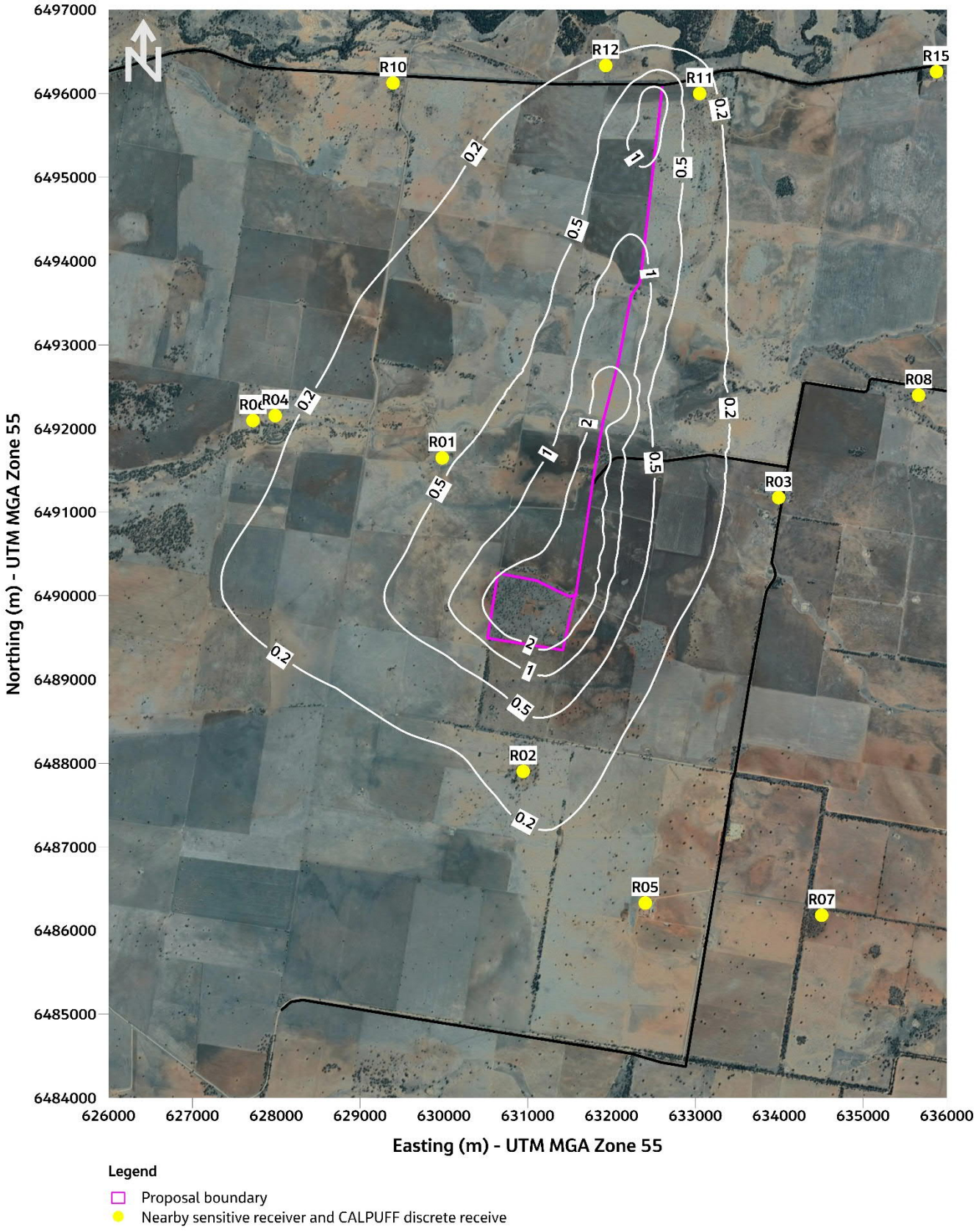
Existing operations: Annual TSP (µg/m^3)



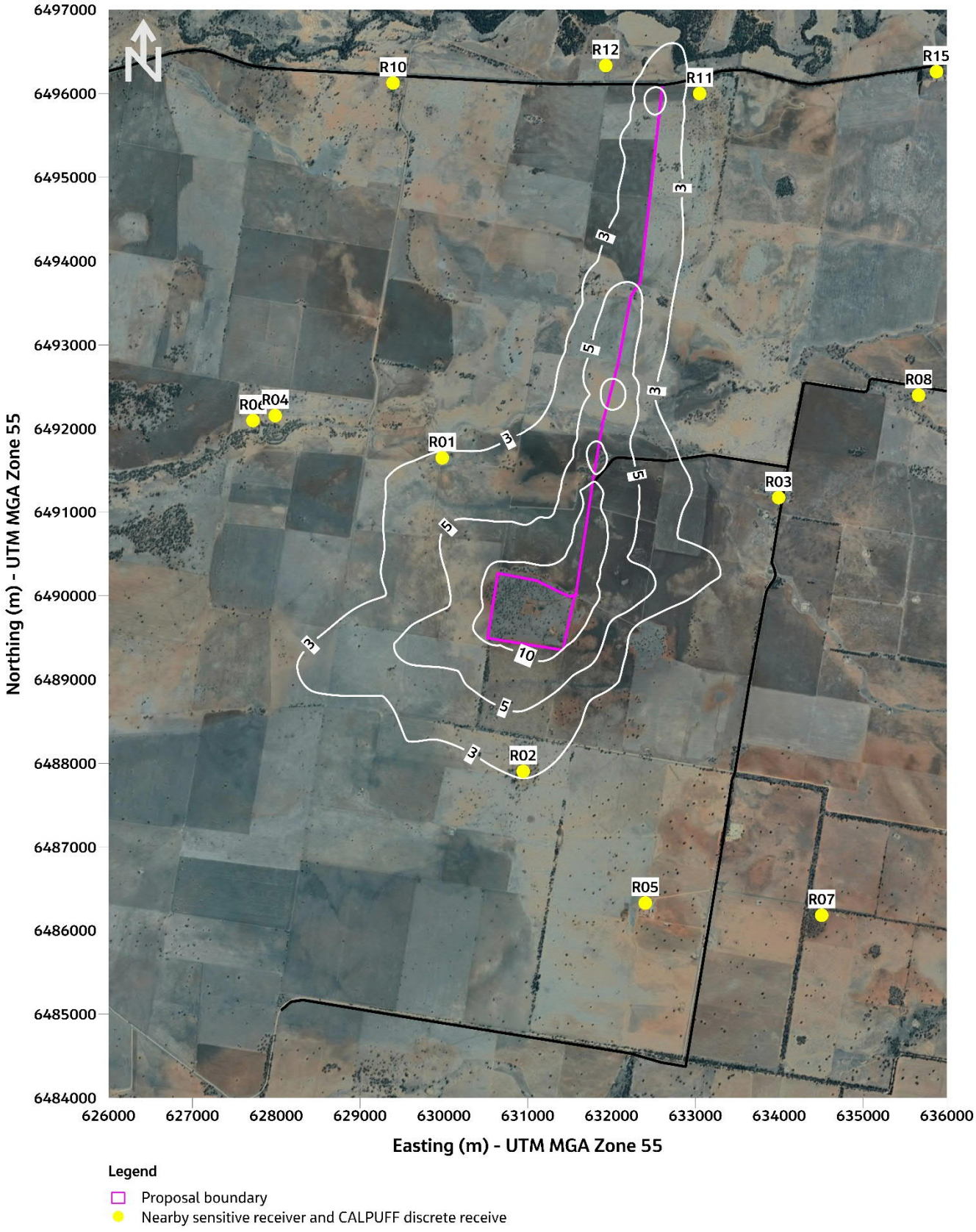
Existing operations: Deposited dust (g/m^2/month)



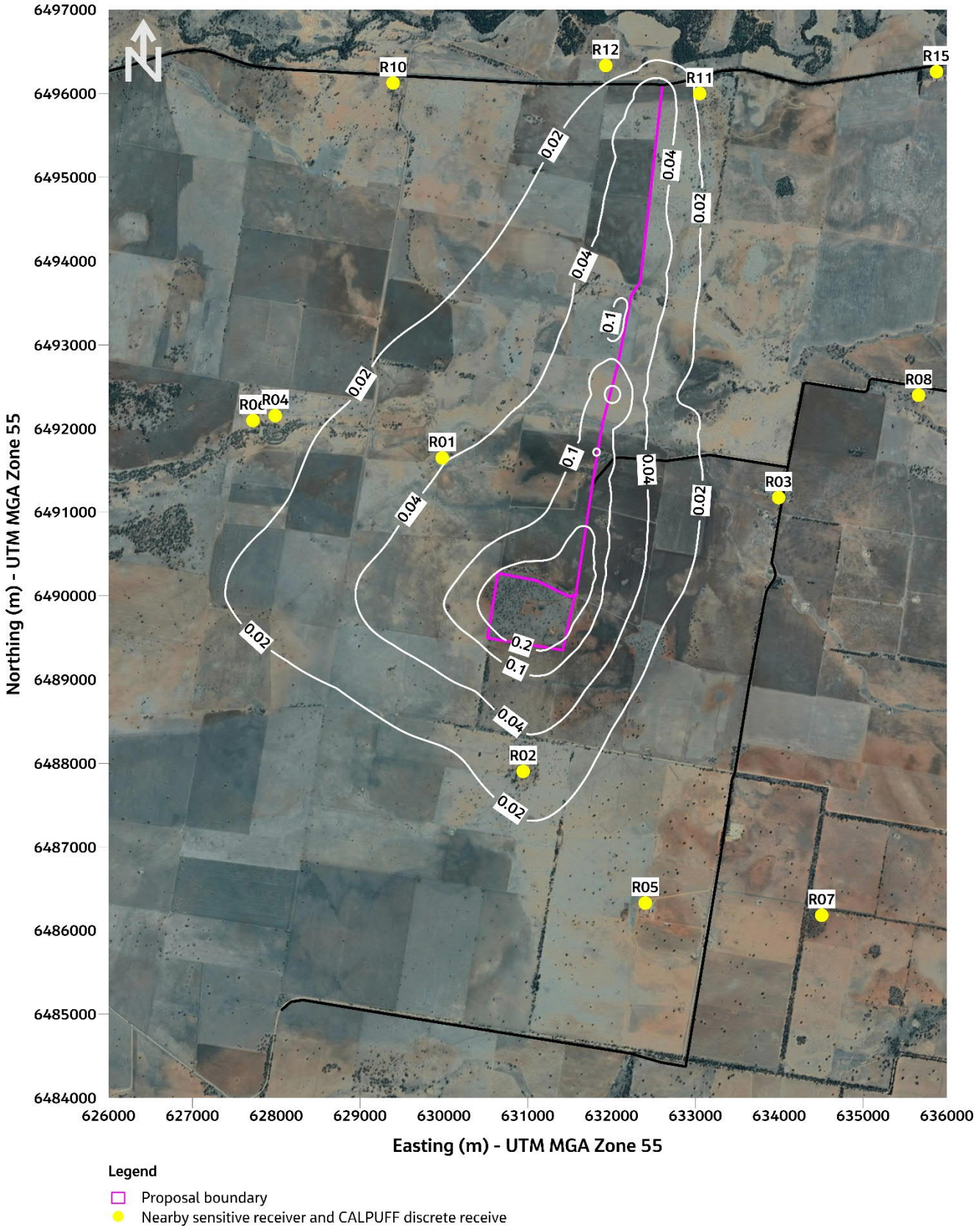
Proposed operations, stage 1: Annual PM_{10} ($\mu g/m^3$)



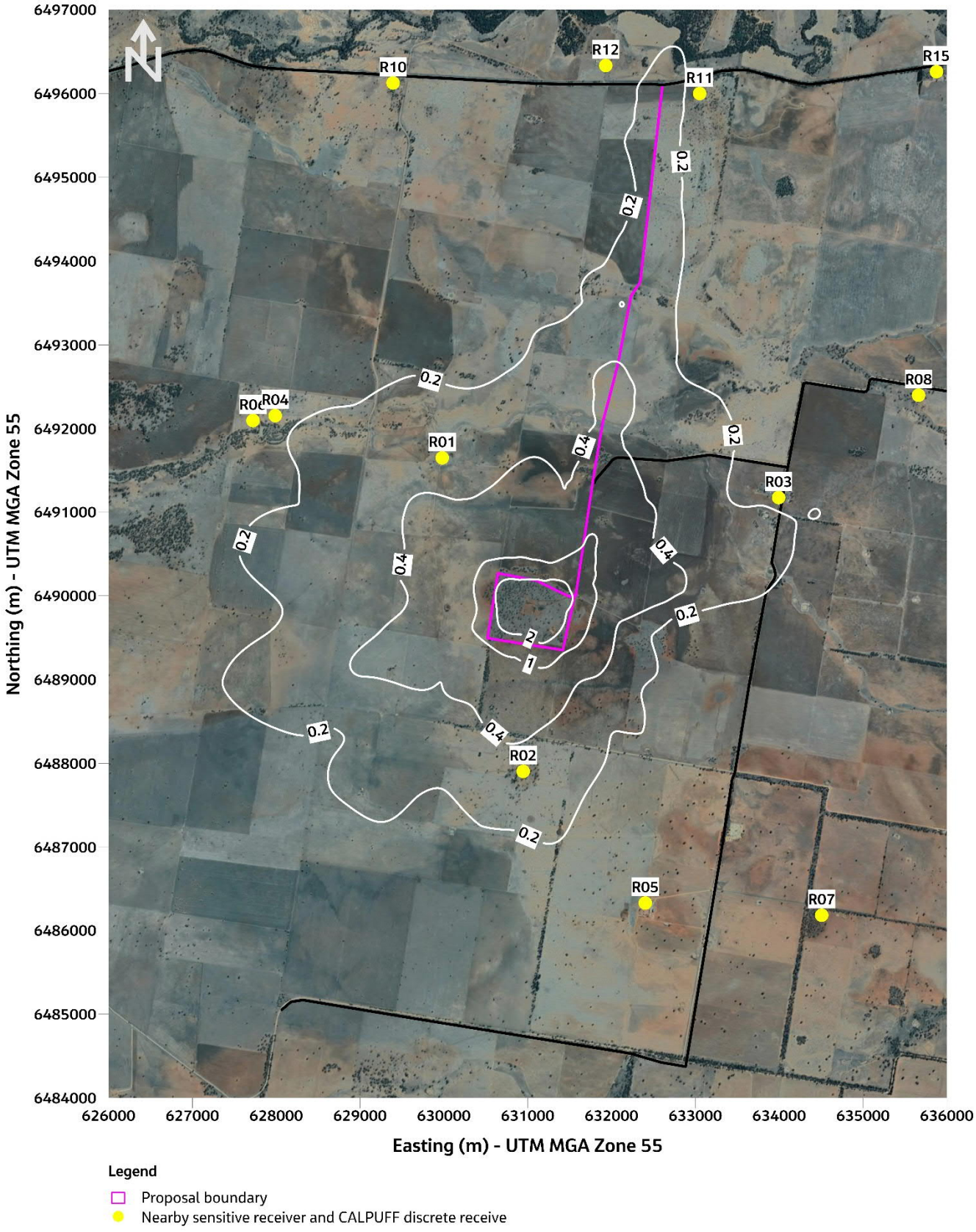
Proposed operations, stage 1: 100th percentile, 24-hour PM_{10} ($\mu g/m^3$)



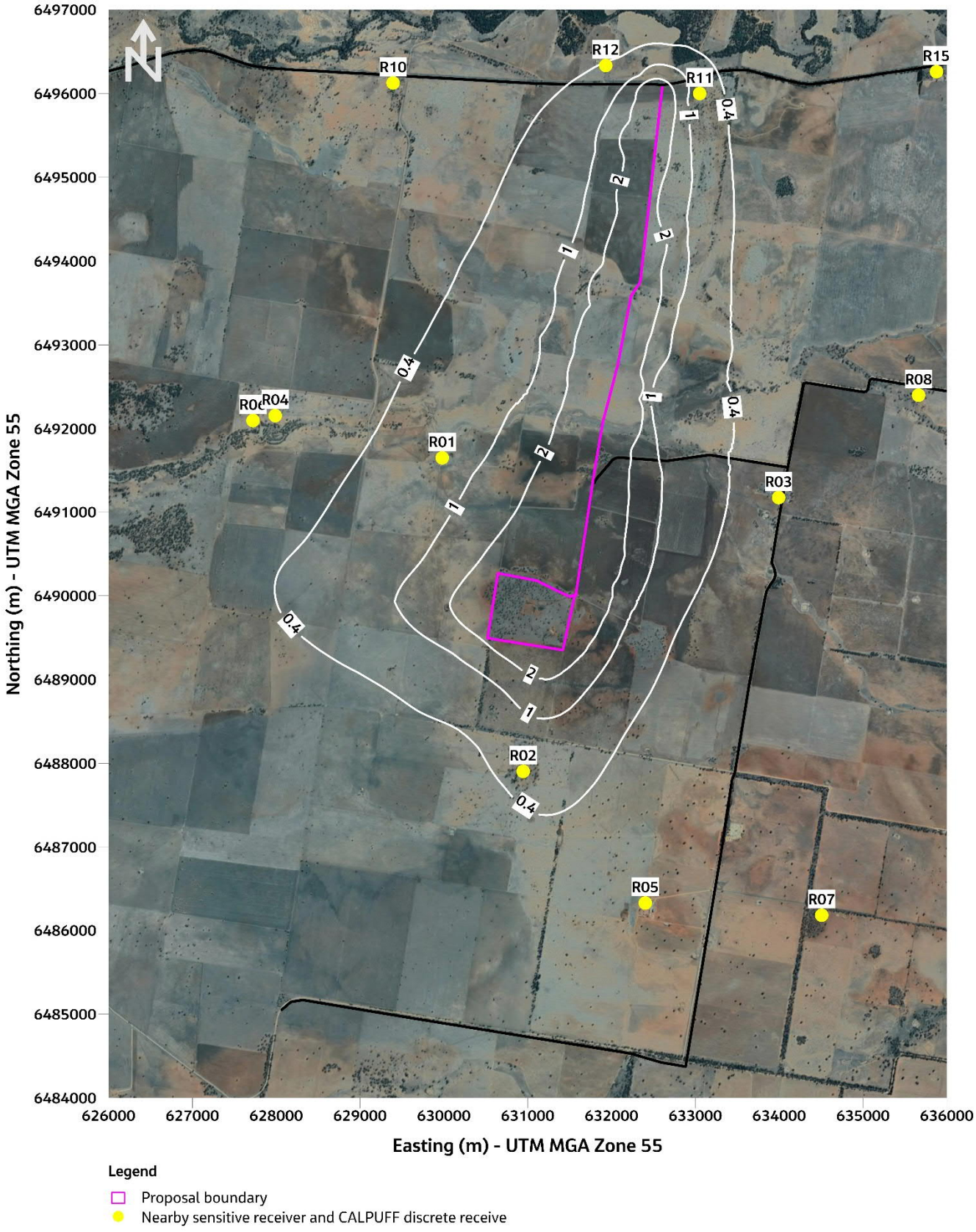
Proposed operations, stage 1: Annual $PM_{2.5}$ ($\mu g/m^3$)



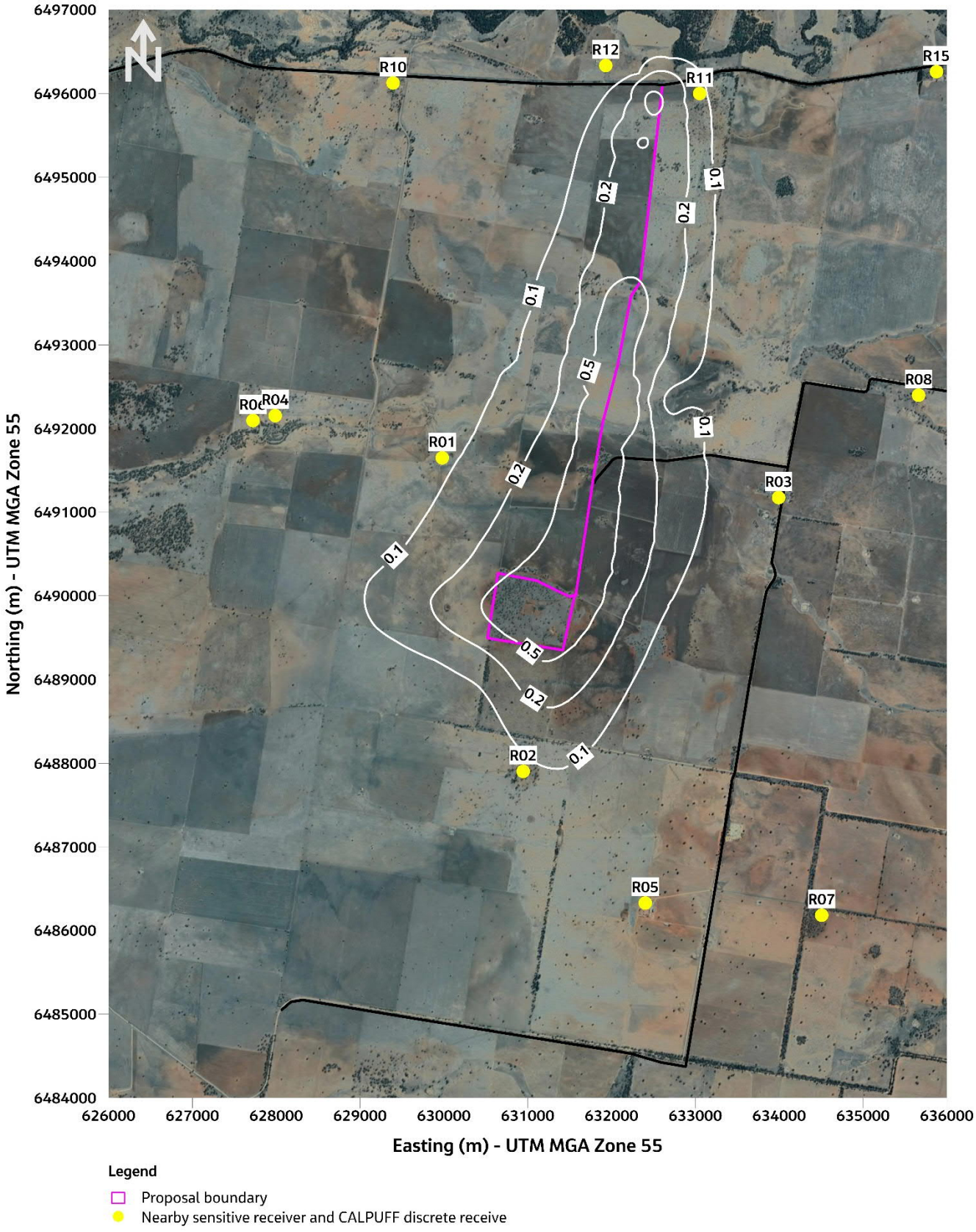
Proposed operations, stage 1: 100th percentile, 24-hour $PM_{2.5}$ ($\mu g/m^3$)



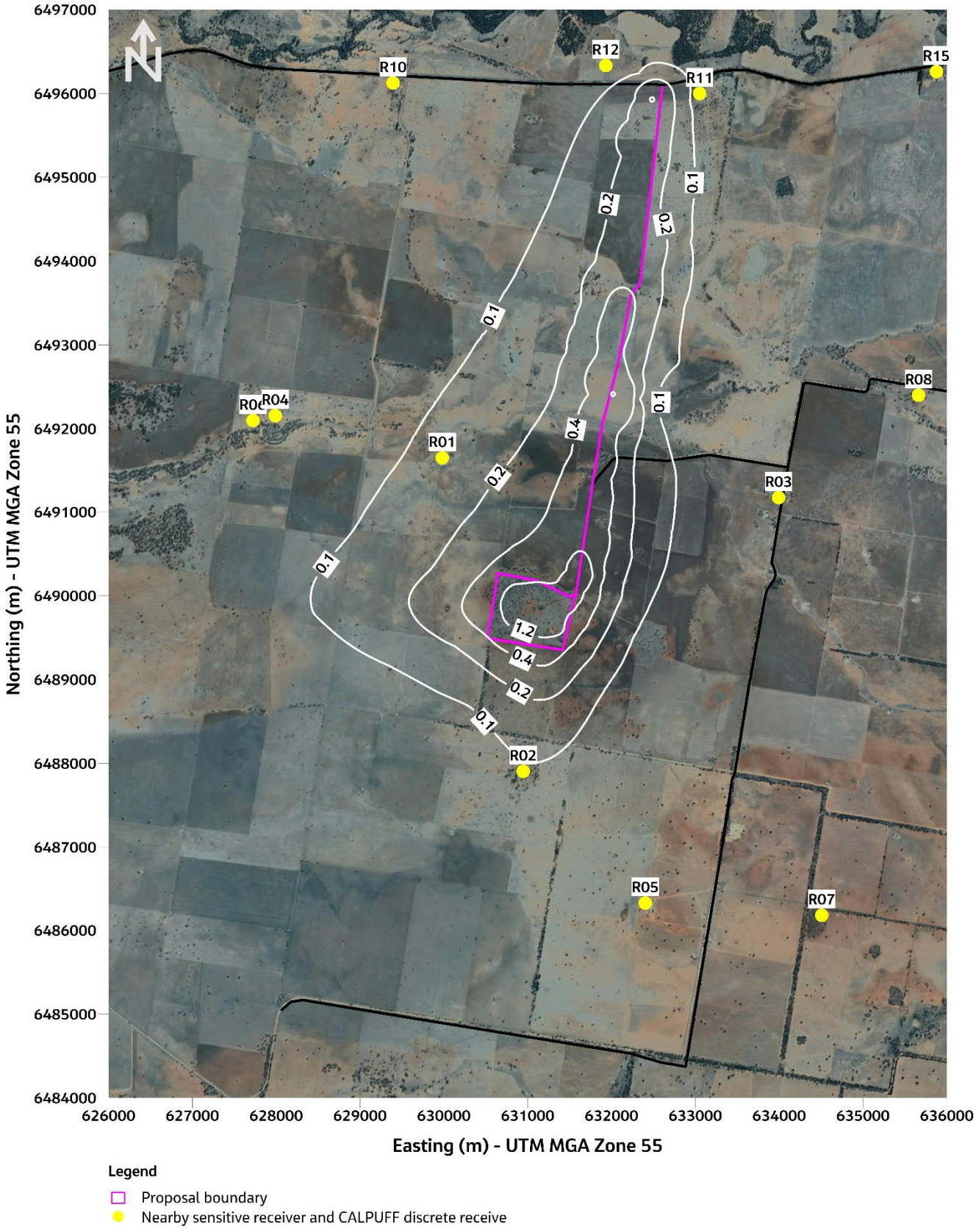
Proposed operations, stage 1: Annual TSP (µg/m^3)



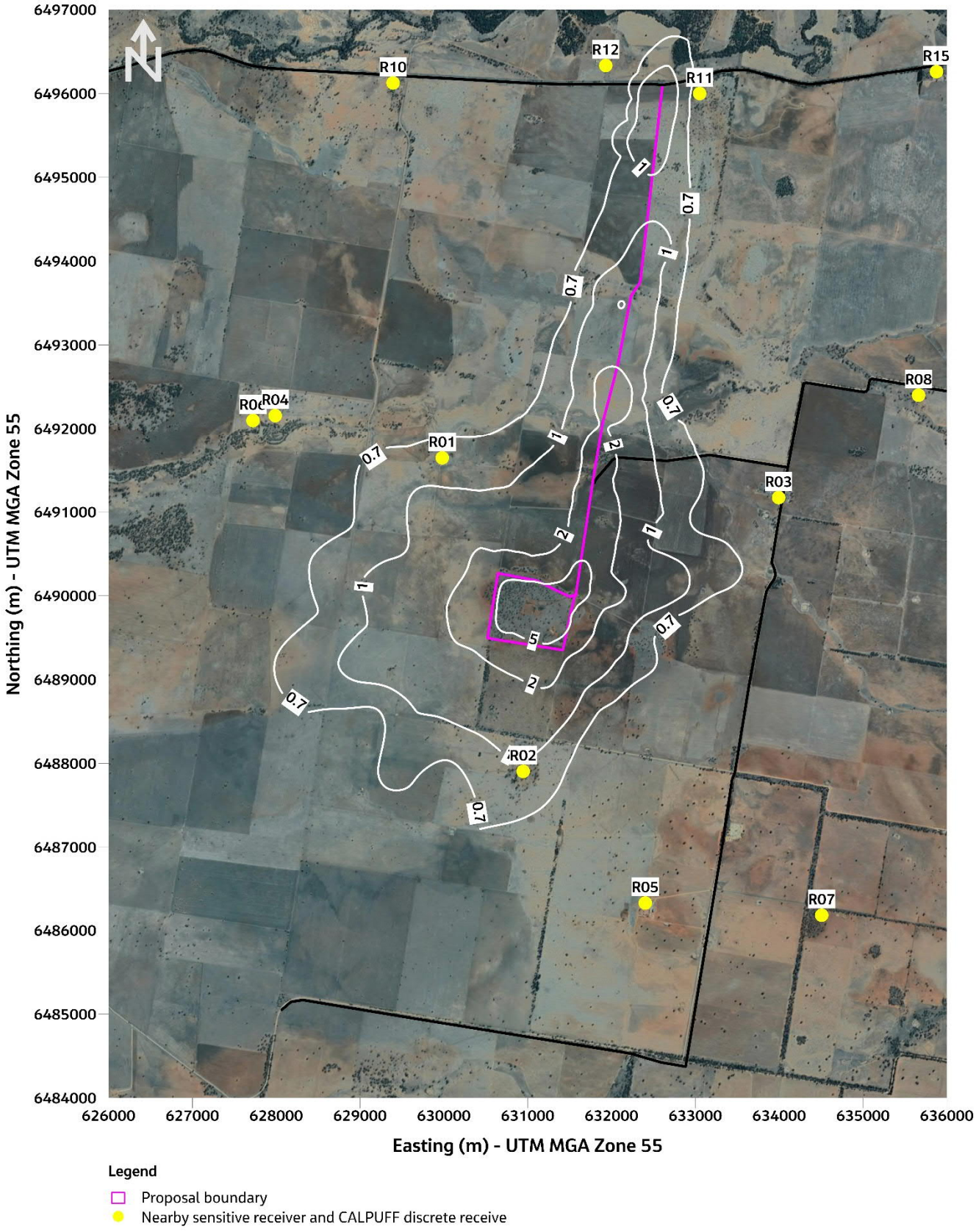
Proposed operations, stage 1: Deposited dust (g/m^2/month)



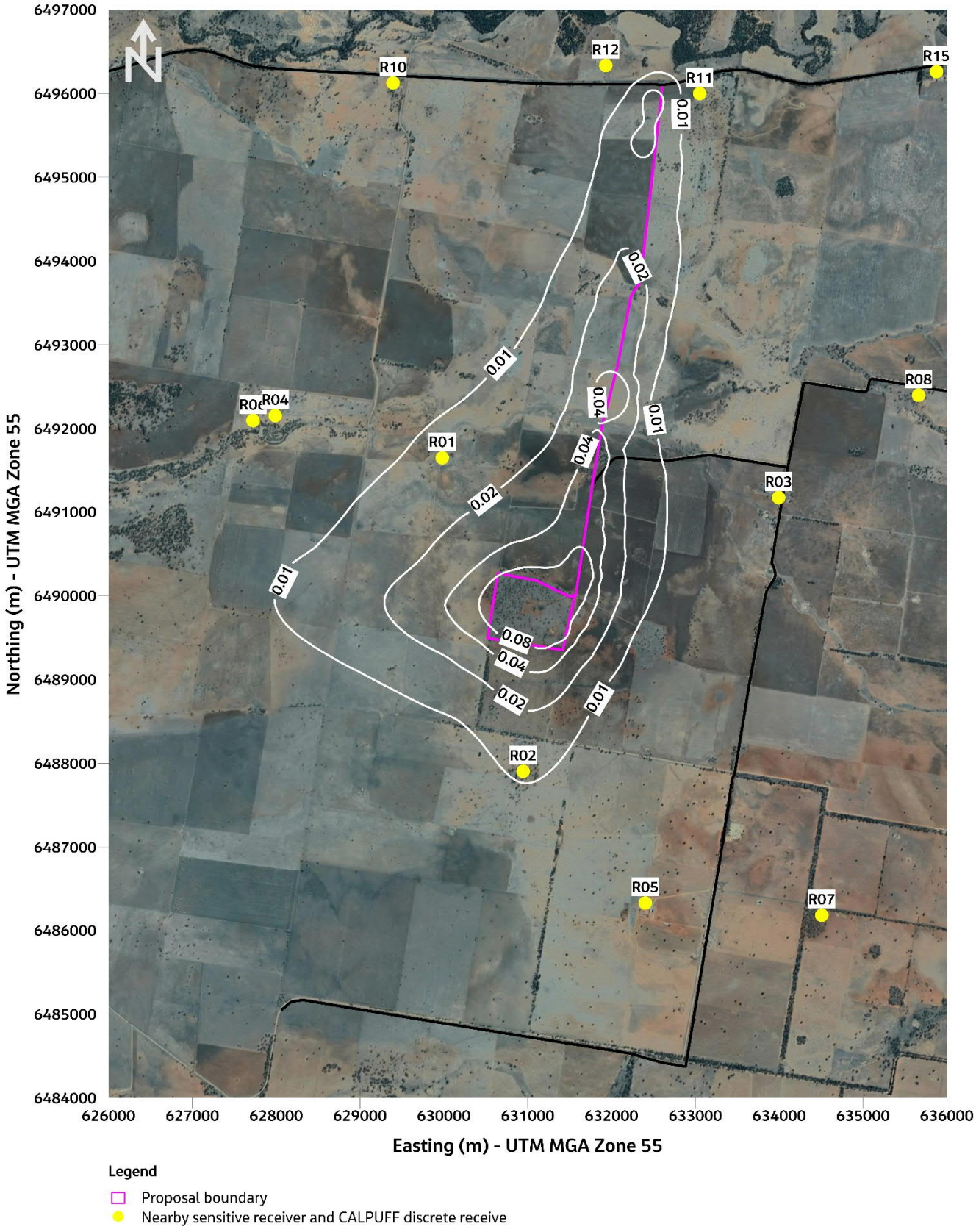
Existing operations, stage 2: Annual PM_{10} ($\mu g/m^3$)



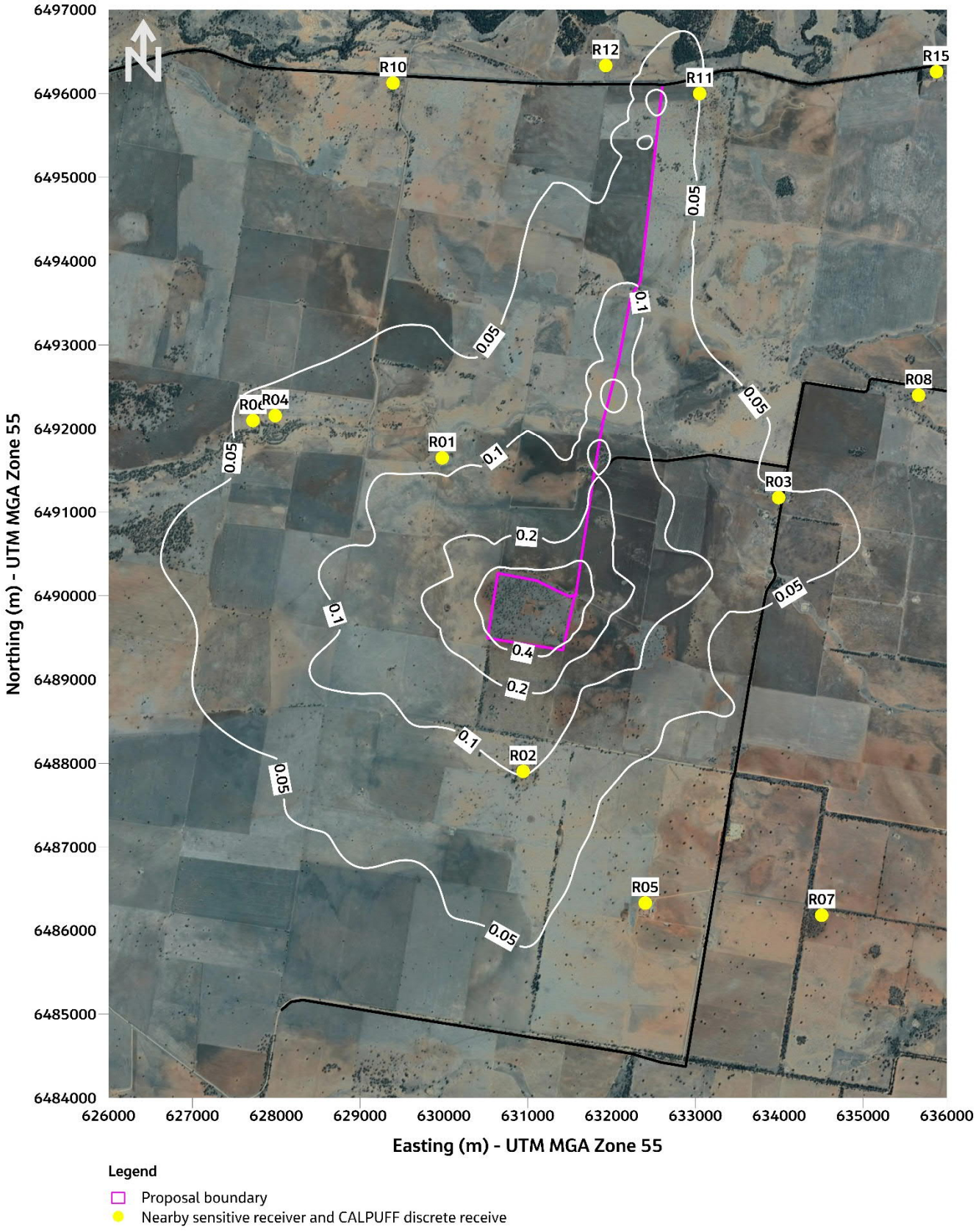
Proposed operations, stage 2: 100th percentile, 24-hour PM_{10} ($\mu g/m^3$)



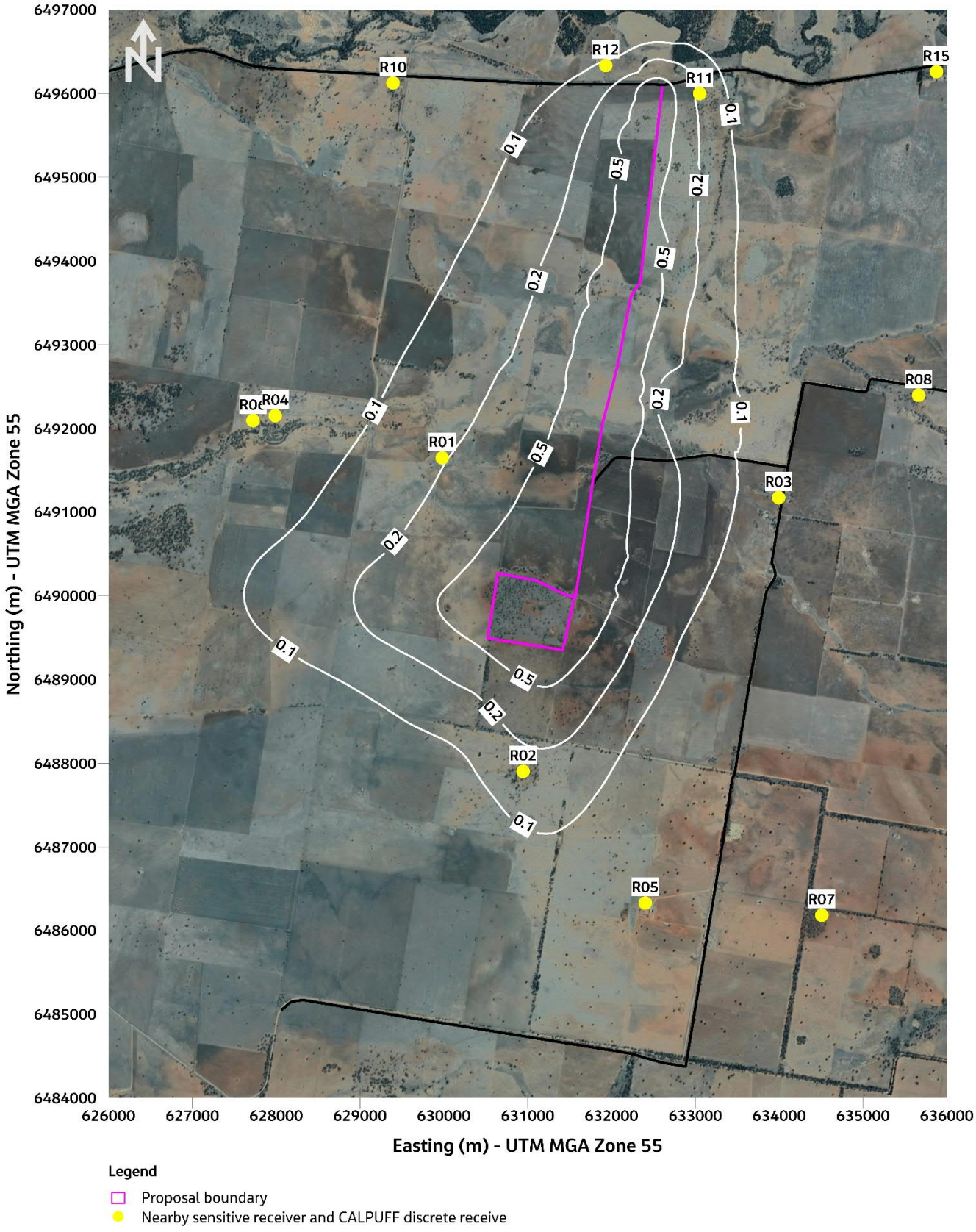
Proposed operations, stage 2: Annual $PM_{2.5}$ ($\mu g/m^3$)



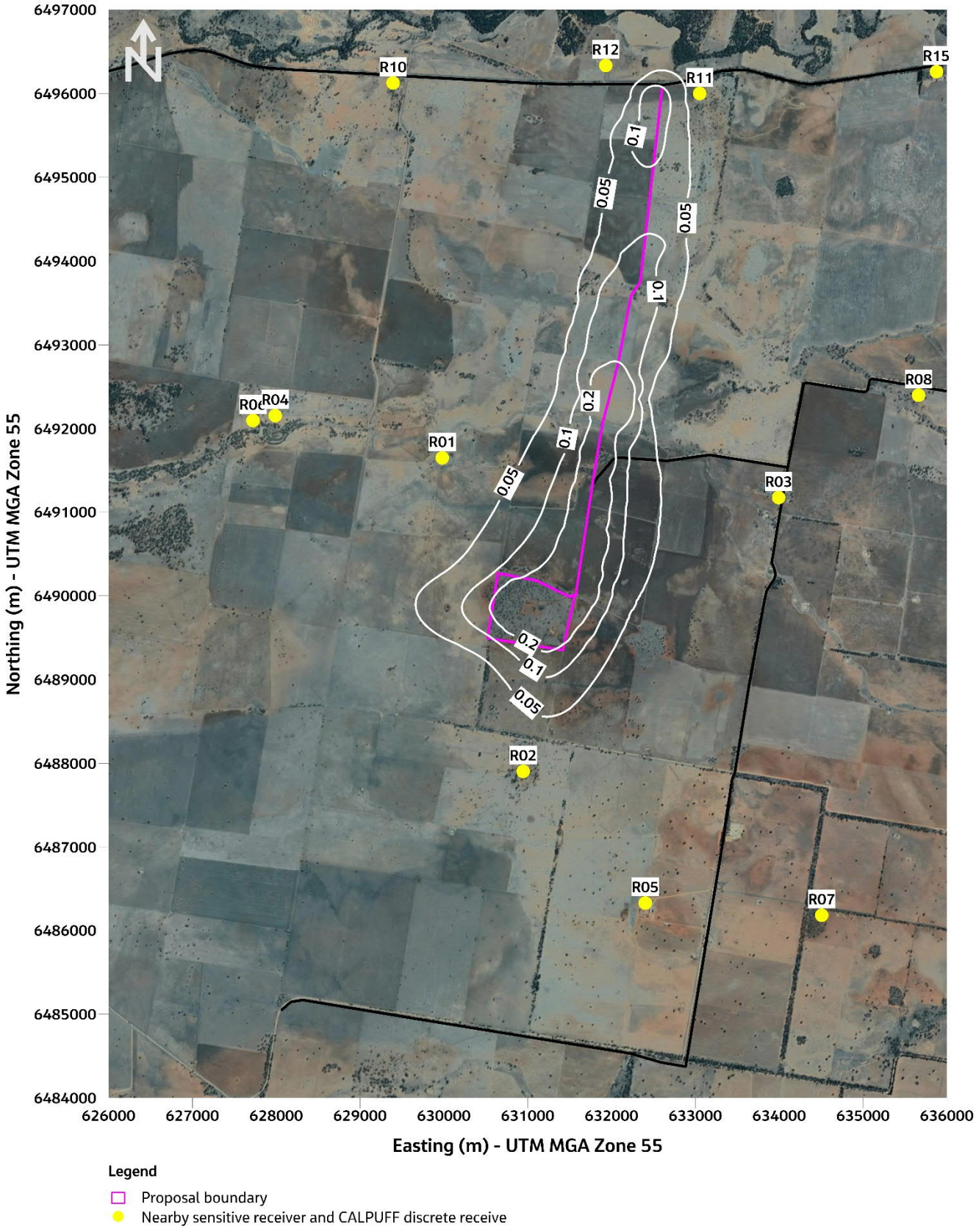
Proposed operations, stage 2: 100th percentile, 24-hour $PM_{2.5}$ ($\mu g/m^3$)

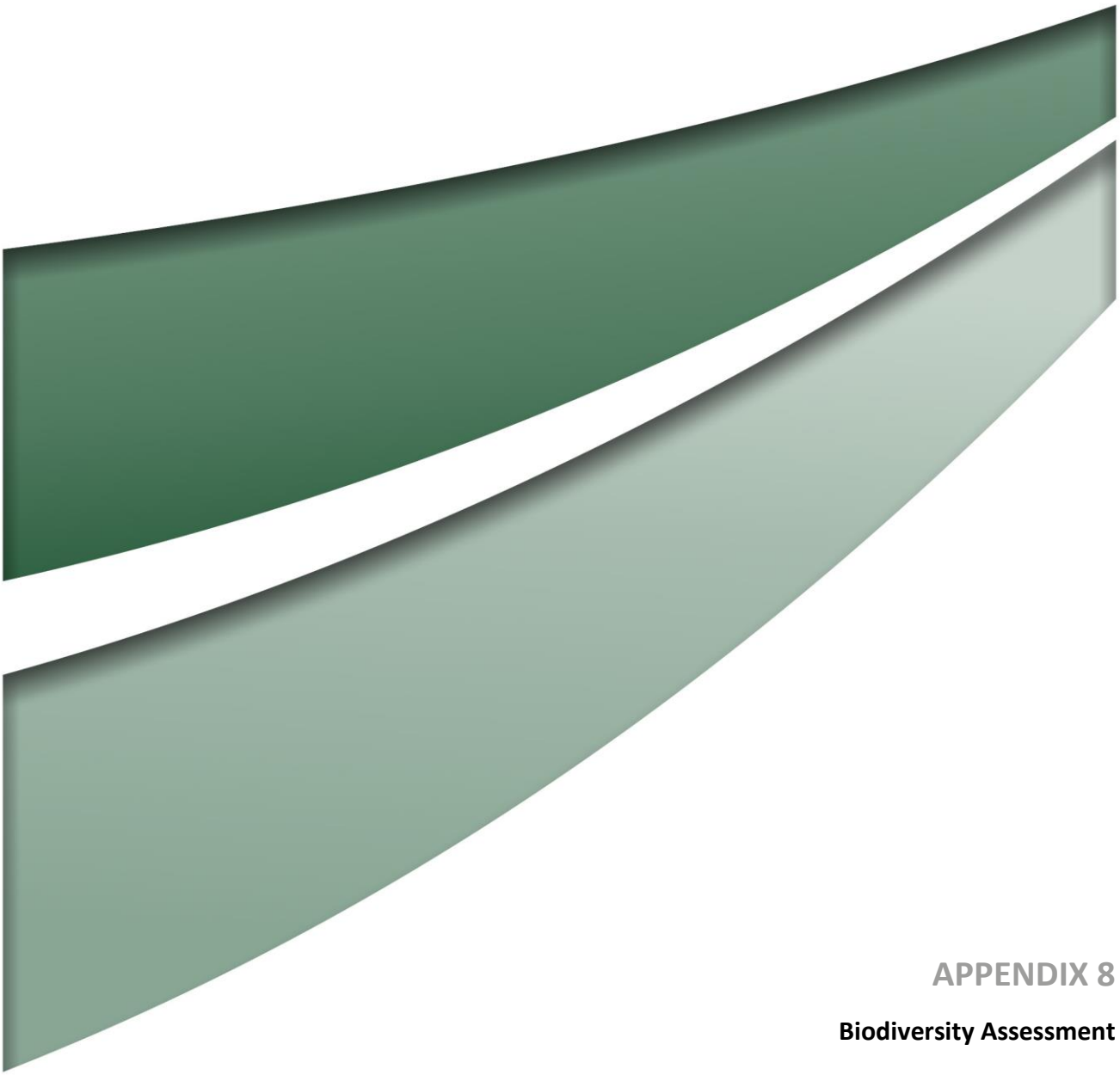


Proposed operations, stage 2: Annual TSP (µg/m^3)



Proposed operations, stage 2: Deposited dust (g/m^2/month)





APPENDIX 8

Biodiversity Assessment

umwelt
Environmental & Social Consultants

Inspired People
Dedicated Team
Quality Outcomes

Our Ref: 20112/R01/PF/10122020

10 December 2020

Richard Tomkins
Regional Hardrock Gilgandra Unit Trust
Regional Group Australia
20L Sheraton Road
Dubbo NSW 2830

Email: Richard@regionalgroupaustralia.com.au

Dear Richard

Re: Berakee Quarry Ecological Assessment

1.0 Introduction

Umwelt (Australia) Pty Ltd (Umwelt) has been engaged by Regional Hardrock Gilgandra Unit Trust (Regional Hardrock) to prepare an Ecological Assessment for a proposed expansion to the Berakee Quarry, located at 2697 Oxley Highway, Collie.

Regional Hardrock proposes to extend the extraction area, production rate, quarry life and disturbance footprint (18.2 ha) of the Berakee Quarry, located on Lot 1 DP1265657, near Collie NSW within the Gilgandra Shire Local Government Area (LGA). The subject site is shown in **Figure 1.1** and identifies the disturbance footprint of the extended extraction and stockpiling areas.

The quarry extension is to provide for the extraction of up to 4.7 million tonnes (Mt) of basalt resource and sufficient stockpiling areas to hold up to 250,000 t of product. The increased production limit and stockpiling requirements are to satisfy supply requirements for the construction of the Inland Rail Project which traverses the Warren, Gilgandra and Warrumbungles LGAs in close proximity to the Quarry.

To achieve these increases, several associated changes to activities and infrastructure on the subject site would be required including additional extraction equipment and changes to processing equipment, truck movements, water usage, blasting frequency and employment. *Section 3.0* of the Environmental Impact Statement to which this Ecological Assessment is appended provides further detail on the proposed activities.

The project is proposing the removal of 0.8 ha of native vegetation. Therefore, the Biodiversity Offset Scheme (BOS) is not triggered, as the minimum area for triggering the BOS is 1 ha of native vegetation removal, in an area with a minimum lot size of 500 ha. This ecological assessment has therefore had no further consideration of the Biodiversity Assessment Method (BAM), aside from conducting floristic plots in accordance with the BAM.

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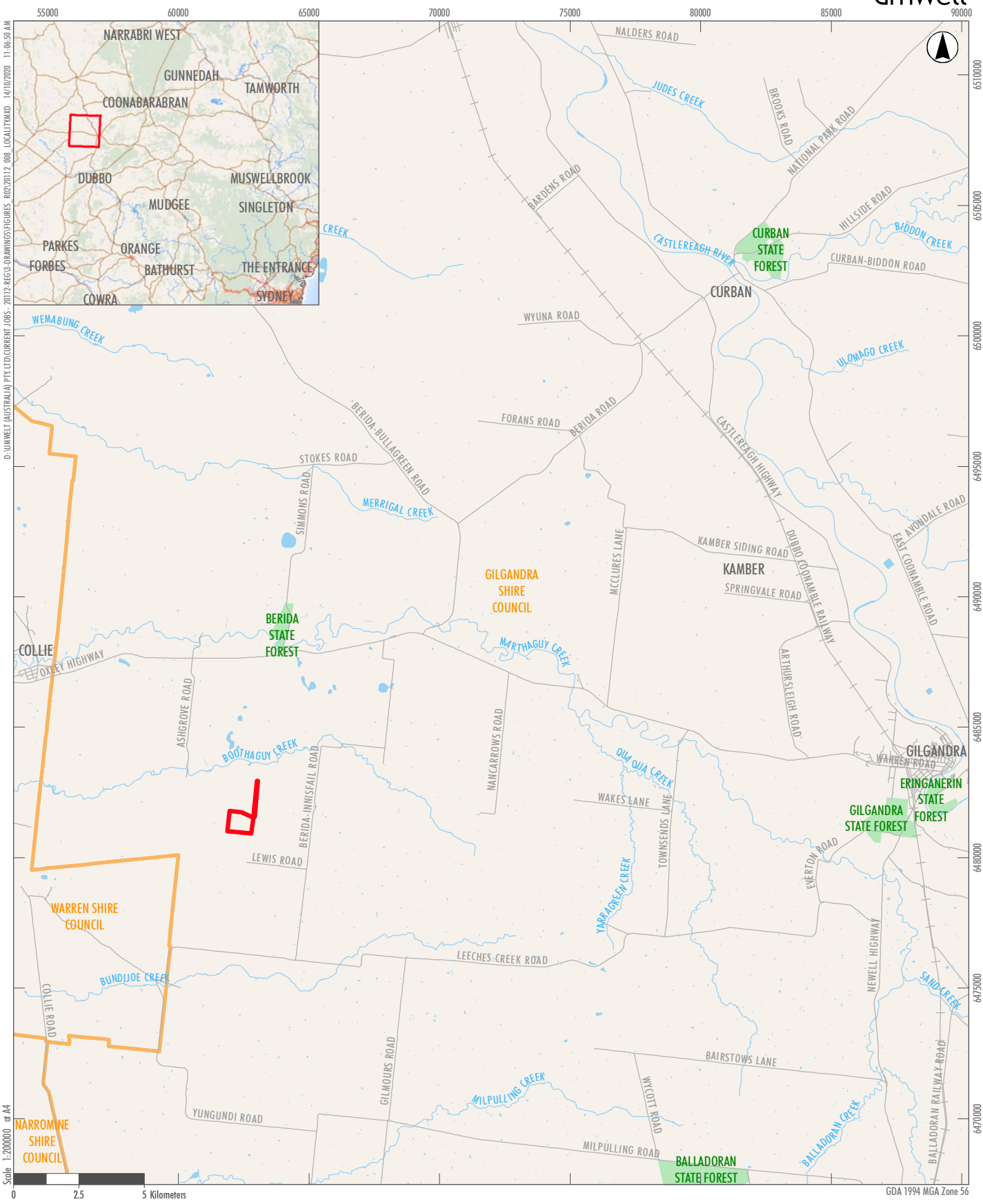
Umwelt (Australia) Pty Limited
ABN 18 059 519 041



Legend

- Approved Quarry Site
- Local Government Boundary
- National Parks (NPWS Estate)
- State Forest
- Road
- Drainage Line
- Railway Line

FIGURE 1.1

Locality Plan

Image Source: Data source: Geoscience Australia; Forestry Corporation of NSW (2019); DSFI (2017); NPWS Estate (2019)

2.0 Methods

2.1 Desktop Assessment

A detailed literature review of all relevant and available information pertaining to the ecological values of the subject site was undertaken prior to field surveys. The following reports and databases were reviewed in order to determine the likely vegetation communities occurring within the subject site and the suite of threatened and migratory species with potential habitat in the subject site (**Appendix 1** and **2**). The literature review included consideration of the following:

- A search of the Department of Planning, Industry and Environment (DPIE) Atlas of NSW Wildlife, Department of Agriculture, Water and Environment (DAWE) Protected Matters Database and Biodiversity Assessment Method (BAM) Calculator, within a 10 kilometre radius of the subject site to identify threatened and migratory species, endangered populations and TECs previously recorded within the locality listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- A review of the Berakee Quarry Ecological Assessment completed by OzArk Environment and Heritage (OzArk 2017), and
- A review of the Central West Lachlan State Vegetation Map (OEH 2016).

2.2 Site Inspection

A site inspection was completed by Umwelt Ecologist Joe Brennan on 27 February 2020. Surveys were conducted in accordance with the BAM (OEH 2017) and included a Vegetation Integrity plot with full floristics, rapid vegetation assessments, targeted searches for key threatened species identified through the desktop assessment, and identification of key fauna habitat features present.

Both prior to and following the site inspection, vegetation clearing on site undertaken by the previous landowner (as allowable clearing activities under Schedule 5A of the *Local Land Services Act 2013)*, has greatly reduced the occurrence and condition of native vegetation on the subject site.

3.0 Results

3.1 Plant Community Types

During the site inspection, one BAM floristic plot and seven rapid flora assessments were completed to provide data on the floristics of the subject site (refer to **Figure 2.1**).

OzArk (2017) mapped the subject site as containing PCT 98 Poplar Box – White Cypress Pine – Wilga – Ironwood shrubby woodland on red sandy-loam soils in the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion. Inspection of the site confirmed the presence of this PCT in a degraded form, where trees are present. Where the canopy has been removed, the area conforms to exotic/disturbed vegetation and is dominated by introduced species.

The subject site represents a degraded form of PCT 98, with mature/senescent poplar box (*Eucalyptus populnea* subsp. *bimbil*) dominating the overstorey. White cypress pine (*Callitris glaucophylla*) is co-dominant and scattered kurrajong (*Brachychiton populneus*) and western rosewood (*Alectryon oleifolius*) are also present.

Commonly recorded low shrubs included galvanized burr (*Sclerolaena birchii*), while scattered black rolypoly (*Sclerolaena muricata*) and soft roly-poly (*Salsola australis*) were also present.

Ground cover was dominated by exotic catheads (*Tribulus terrestris*), Paterson's curse (*Echium plantagineum*) and native keeled goosefoot (*Dysphania carinata*). Occasional native groundcovers

were present including quena (*Solanum esuriale*), blue storksbill (*Erodium crinitum*) and wiregrass (*Aristida* species).

Native groundcover diversity has been reduced by historic livestock grazing and current clearing, and the site continues to be grazed by kangaroos.

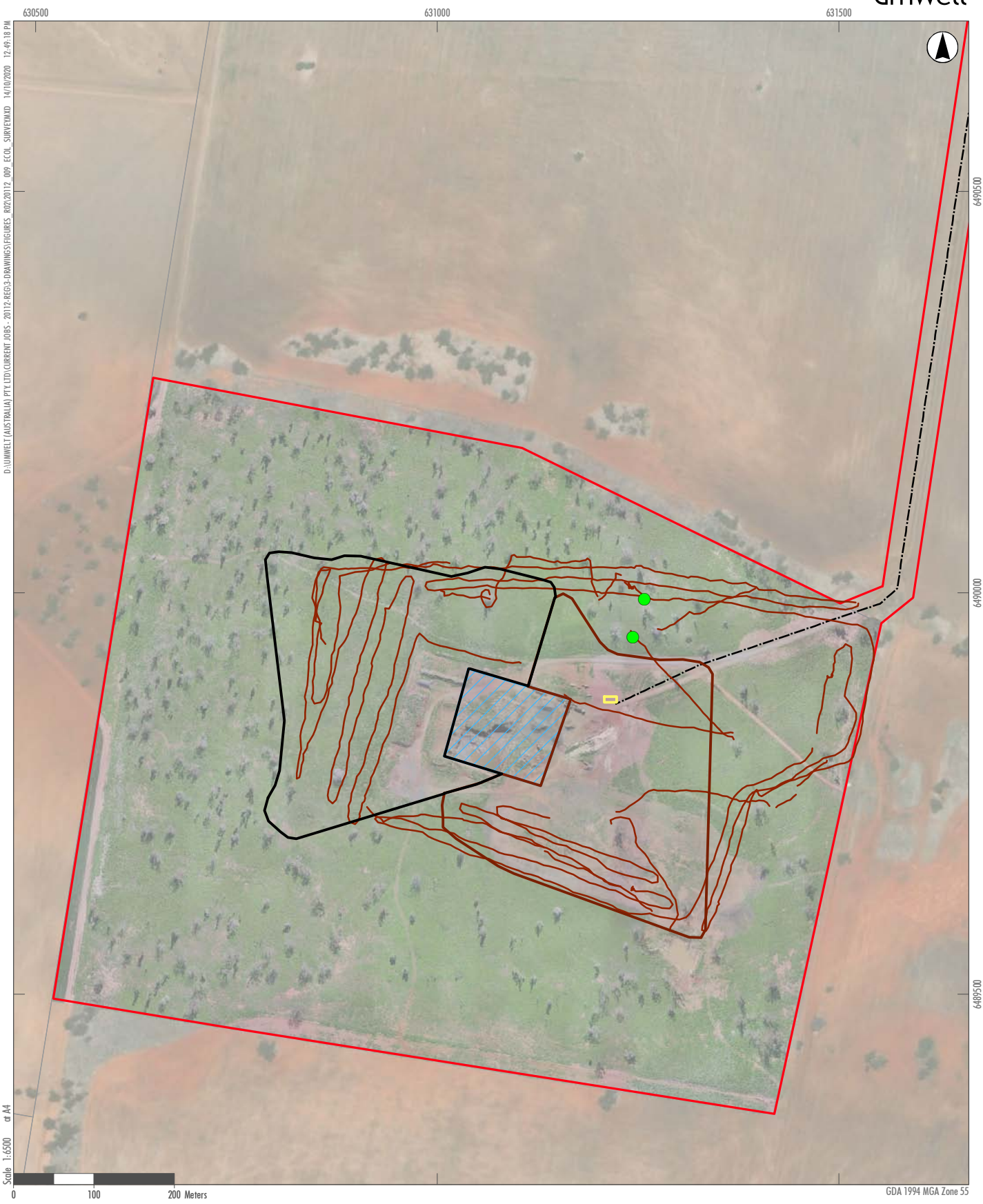


FIGURE 2.1

Ecological Survey Effort

Image Source: ESRI (2020) Data source: NSW LPI (2020)

3.2 Threatened and Migratory Species and Ecological Communities

Opportunistic records of fauna were made during the site inspection. Thirteen species (11 birds, one reptile and one mammal) were observed within or surrounding the subject site. All species recorded are common species classed as habitat generalists and are shown in **Table 3.1.**

Table 3.1 Non- threatened fauna species detected within the subject site

Family	Common Name	Scientific Name
Aves	galah	*Eolophus rosiecapilla*
Aves	pied butcherbird	*Cracticus nigrogularis*
Aves	cockatiel	*Nymphicus hollandicus*
Aves	Australian Magpie	*Cracticus tibicen*
Aves	eastern rosella	*Platycercus eximius*
Aves	noisy miner	*Manorina melanocephala*
Aves	little corella	*Cacatua sanguinea*
Aves	little raven	*Corvus mellori*
Aves	wedge- tailed eagle	*Aquila audax*
Aves	crested pigeon	*Ocyphaps lophotes*
Aves	wood duck	*Chenonetta jubata*
Reptilia	Eastern bearded dragon	*Pogona barbata*
Mammalia	eastern grey kangaroo	*Macropus giganteus*

Searches of the DPIE Atlas, DAWE Protected Matters Database and BAM Calculator identified six threatened ecological communities (TECs) and 36 threatened and migratory species as potentially occurring within or surrounding the subject site, as shown in **Table 3.2**.

Table 3.2 Threatened species with potential to occur in the Subject site

Common Name	Scientific Name	BC Act	EPBC Act	Likelihood of Occurrence
Threatened Ecological Communities				
Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions		EEC	E	Not Present
Grey Box (*Eucalyptus microcarpa*) Grassy Woodland and Derived Native Grasslands of South-eastern Australia		EEC	E	Not Present
Natural Grasslands on Basalt and fine textured alluvial plains of Northern New South Wales and southern Queensland		-	CEEC	Not Present
Poplar Box Grassy Woodland on Alluvial Plains		-	E	Not Present
Weeping Myall Woodlands		EEC	E	Not Present
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		EEC	CEEC	Not Present
Plants				
-	*Austrostipa wakoolica*	E	E	Low
-	*Homoranthus darwinioides*	V	V	Low
Leek Orchid	*Prasophyllum* sp. Wybong	E	CE	Low
Slender Darling Pea	*Swainsona murrayana*	V	V	Not Present

Common Name	Scientific Name	BC Act	EPBC Act	Likelihood of Occurrence
-	*Tylophora linearis*	V	E	Not Present
Belson's Panic	*Homopholis belsonii*	E	V	Targeted. Not detected
Shrub Sida	*Sida rohlenae*	E	-	Targeted. Not detected
Birds				
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Low
Australasian Bittern	*Botaurus poiciloptilus*	E	E	Nil
Curlew Sandpiper	*Callidris ferruginea*	E	CE	Nil
Painted Honeyeater	*Grantiella picta*	V	V	Low
White-throated Needletail	*Hirundapus caudacutus*		V	Nil
Swift Parrot	*Lathamus discolor*	E	CE	Low
Malleefowl	*Leipoa ocellata*	E	V	Nil
Superb Parrot	*Polytelis swainsonii*	V	V	Moderate
Australian Painted Snipe	*Rostratula australis*	E	E	Nil
Speckled Warbler	*Chthonicola sagittata*	V	-	Low
Scarlet Robin	*Petroica boodang*	V	-	Low
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis*	V	-	Moderate
Diamond Firetail	*Stagonopleura guttata*	V	-	Low
Australian Bustard	*Ardeotis australis*	E	-	Low
Bush Stone-curlew	*Burhinus grallarius*	E	-	Low
Squatter Pigeon (southern subspecies)	*Geophaps scripta*	CE	V	Low
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	-	Moderate
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	-	Low
Black-breasted Buzzard	*Hamirostra melanosternon*	V	-	Low
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V	-	Moderate
Barking Owl	*Ninox connivens*	V	-	Moderate
Fish				
Murray Cod	*Maccullochella peelii*	-	V	Nil
Macquarie Perch	*Macquaria australasica*	-	E	Nil
Mammals				
Large-eared Pied-bat	*Chalinolobus dwyeri*	V	V	Low
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	Low
Corben's long-eared Bat	*Nyctophilus corbeni*	V	V	Low
Koala	*Phascolarctos cinereus*	V	V	Low
Grey-headed Flying Fox	*Pteropus poliocephalus*	V	V	Low

Common Name	Scientific Name	BC Act	EPBC Act	Likelihood of Occurrence
Reptiles				
Pink-tailed Worm Lizard	*Aprasia parapulchella*	V	V	Low

V = Vulnerable, E = Endangered, CE = Critically Endangered, EEC = Endangered Ecological Community, CEEC = Critically Endangered Ecological Community

Belson's panic (*Homopholis belsonii*) and shrub sida (*Sida rohlenae*) were considered to have a moderate likelihood of occurring in the subject site and require surveys to be undertaken during specific seasons (December – April and September – February). To address this, systematic (approximate 10 metre spacing) transects were walked throughout the subject site to search for these species (refer to **Figure 2.1**). These species were not detected.

3.3 Key Habitat Features

Several key habitat features were detected during the initial site visit and consist of:

- Scattered standing and fallen dead timber throughout site
- Hollow-bearing trees present (however many of these have since been cleared)
- Belah (*Casuarina cristata*) in wider area providing feeding resources for glossy black- cockatoo, and
- Key feed tree for koala present being poplar box (*Eucalyptus populnea*) (however many of these have since been cleared).

A total of 24 habitat trees were recorded during field surveys (refer to **Figure 3.1**). Within the subject site, only four now remain, with three on the northern boundary and one in the south east corner. A further two habitat trees exist on the edge of the proposed sediment basin. These trees are all poplar box (*Eucalyptus populnea* subsp. *bimbil*). These are mature individuals and contain hollows of multiple sizes at various heights. These hollows would be suitable for a range of species for roosting/nesting; however, the habitat connectivity is very poor as the site is totally isolated from other native vegetation, and no fresh water is available. This greatly reduces the likelihood of native fauna species occurring on site. Very few foraging resources are present.

3.4 Threatened Species

No threatened flora or fauna species were recorded in the subject site during targeted surveys. Four species identified during the desktop assessment are considered to have a moderate likelihood of occurring within the subject site. These are superb parrot, glossy-black cockatoo, major Mitchell's cockatoo and barking owl, which are all listed as vulnerable under the NSW BC Act.

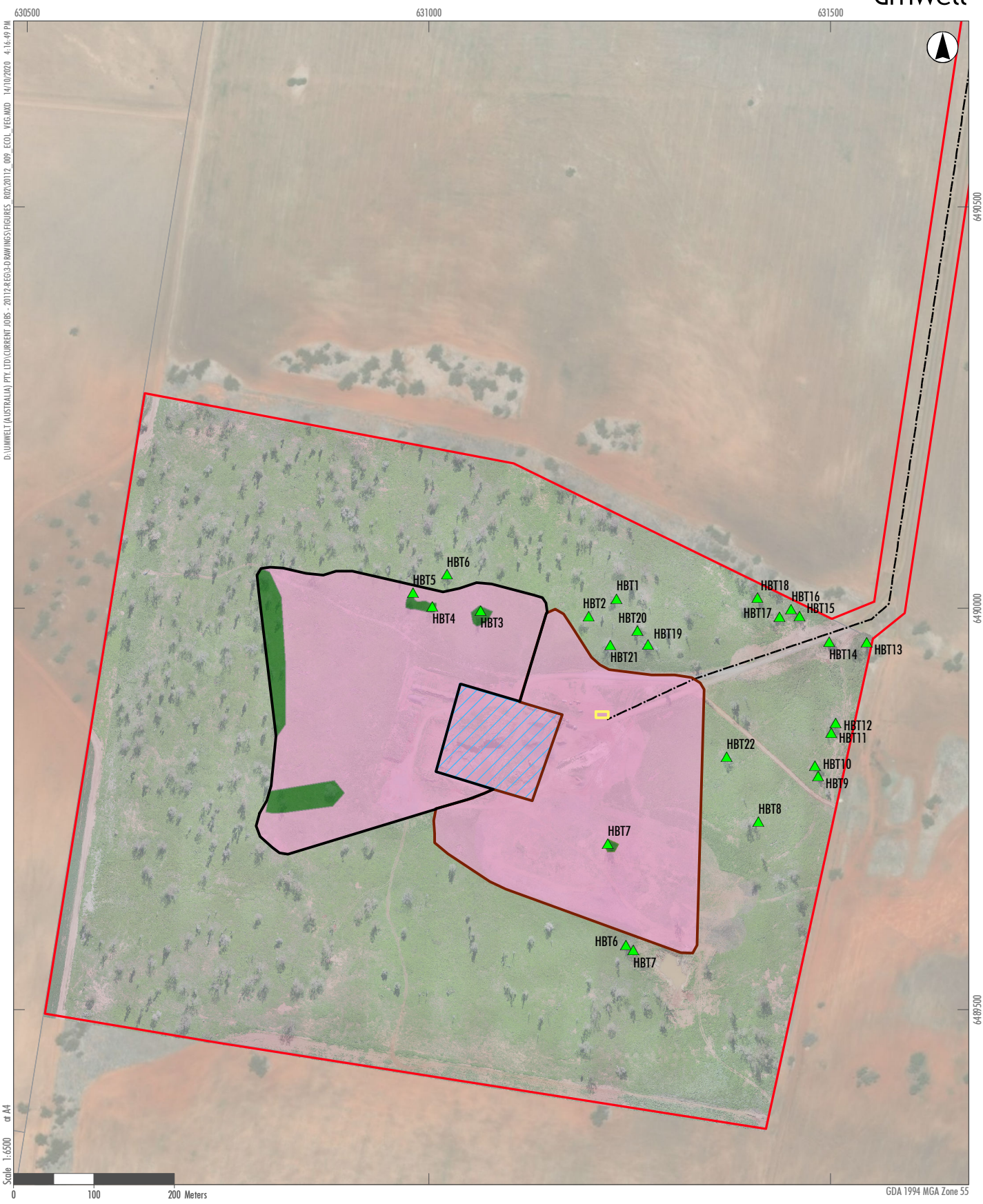
Impacts to these threatened species have been assessed by a 5-part Test of Significance under Section 7.3 of the BC Act which is provided in **Appendix 3**. The Test of Significance under the BC Act indicated that there was not likely to be a significant impact on any of these threatened species due to the already disturbed and modified nature of the habitat within the subject site.

An Assessment of Significance was also conducted under the Commonwealth EPBC Act for the superb parrot, which is also listed as vulnerable under the EPBC Act. This test also concluded that no significant impact upon this species is likely to result from the proposed quarry expansion.

3.5 Threatened Ecological Communities (TECs)

The vegetation within the subject site is not consistent with *Poplar Box Grassy Woodland on Alluvial Plains* listed as an EEC under the EPBC Act. This is because (in accordance with the EPBC Act listing

criteria, DoEE, 2019) the native perennial ground layer present does not constitute 50% or greater of the total ground layer. The vegetation within the subject site was dominated by exotic species. Plot data is presented in **Appendix 4.**



Legend

- Approved Quarry Site
- Private Haul Road
- Extraction Area
- Stockpile Area
- Site Office
- Processing Area
- Exotic/Disturbed
- PCT 98 Poplar Box – White Cypress Pine – Wilga – Ironwood shrubby woodland on red sandy-loam soils in the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion

FIGURE 3.1

Plant Community Types and Habitat Features

Image Source: ESRI (2020) Data source: NSW LPI (2020)

4.0 Recommendations

The following recommendations are provided to reduce the potential for the project to impact adversely on local flora and fauna

- Disturbance should be restricted to the areas shown in **Figure 2.1.** The area subject to disturbance shall be clearly demarcated in order to avoid disturbance to surrounding vegetation, particularly as a BDAR will be triggered if more than 1 ha of native vegetation is removed.
- All machinery should be free of weed material before entering and exiting the subject site to avoid the introduction or spread of weed species.
- An ecologist should be present during the removal of the hollow- bearing trees in the instance that any hollows are occupied, and fauna require relocation.
- Appropriate erosion and sediment controls should be implemented around the work areas to avoid impacts to runoff. It is understood specific erosion and sediment control measures are included as part of a hydrological assessment of the project.

5.0 Conclusion

The vegetation within the subject site is highly modified and contains very little native vegetation or habitat features for threatened fauna species. Targeted threatened flora transects were undertaken during the site visit, with neither of the two flora species considered to have a moderate likelihood of occurring in the subject site being detected.

Four threatened fauna species are considered to have potential to use the subject site. Assessments of Significance were conducted for these species under both the BC Act and the EPBC Act where applicable and concluded that significant impacts to these species are unlikely.

Yours sincerely

Philippa Fagan
Senior Ecologist

6.0 References

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Department of Planning, Industry and Environment (DPIE) (2016). The Native Vegetation of the Sydney Metropolitan Area - Version 3.1. Last updated August 2019.

Department of Planning, Industry and Environment (DPIE) (2020). BioNet Atlas of NSW Wildlife accessed October 2020.

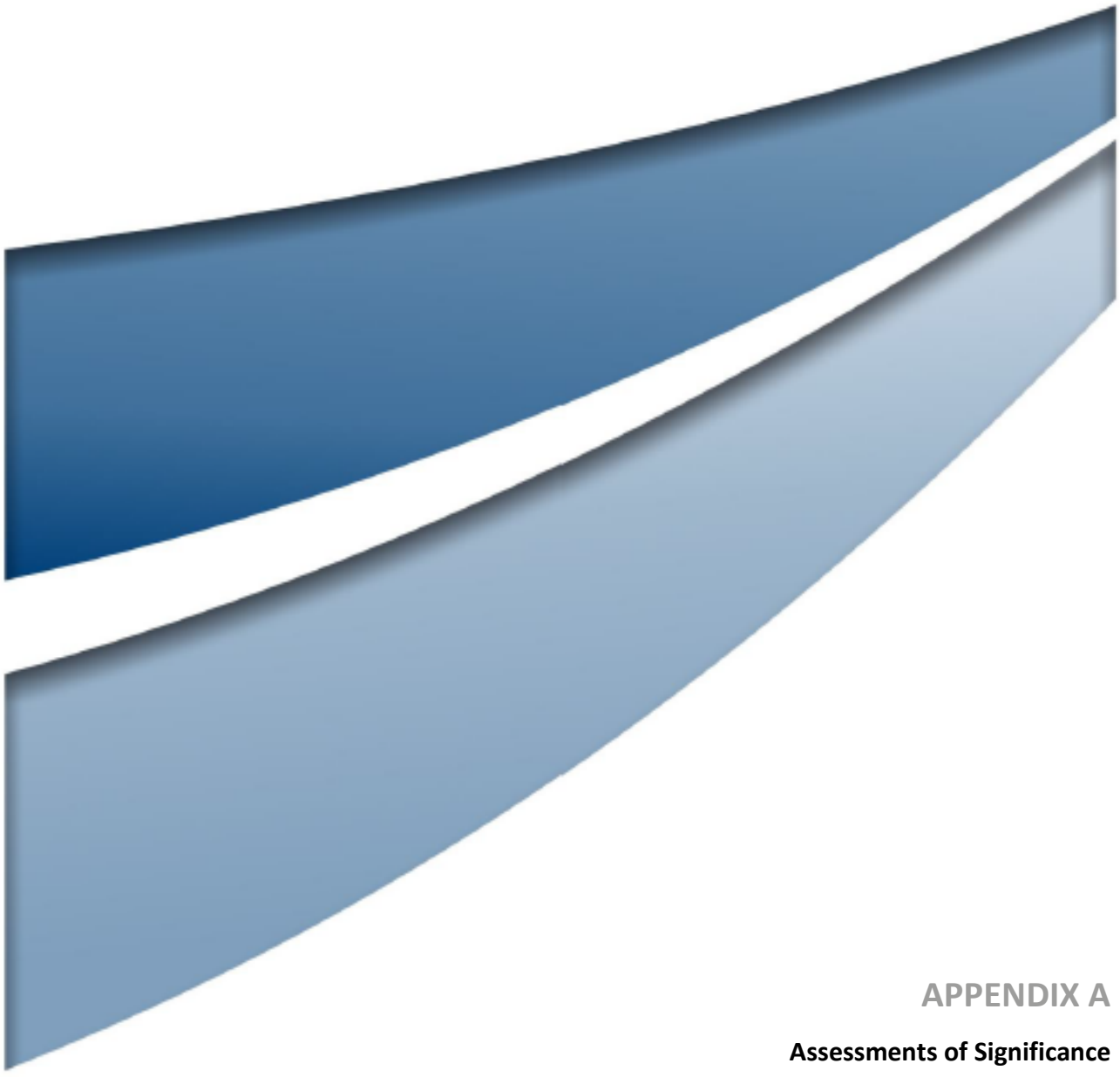
Department of Planning, Industry and Environment (DPIE) (2020b) Vegetation Information System (VIS) accessed October 2020.

Department of the Environment and Energy (DoEE) (2019). *Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* [online] found at: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/141pb-conservation-advice.pdf

Office of Environment and Heritage (OEH) (2016) Central West Lachlan State Vegetation Map.

Office of Environment and Heritage (OEH) (2017) *Biodiversity Assessment Method*, August 2017.

Ozark (2017). *Berakee Quarry Ecological Assessment*. August 2017.



APPENDIX A

Assessments of Significance

Test of Significance under the NSW *Biodiversity Conservation Act 2016*

Those species, endangered populations and TECs considered to have reasonable potential to occur (based on known distribution and habitat requirements) or recorded within the Study Area and with reasonable potential to be significantly impacted by the proposed work are addressed in detail in the following 'Test of Significance'. This assessment is conducted in accordance with Section 7.3 of the Biodiversity Conservation Act 2016 (BC Act).

A total of 0.8 ha of native vegetation is proposed to be removed, which already exists in a degraded and fragmented form. The habitat remaining largely refers to the remnant trees remaining and the hollow- bearing trees present, as well as foraging habitat for birds of prey such as the barking owl (17.4 ha of exotic vegetation). Those species to which this five- part test applies are:

- superb parrot (Polytelis swainsonii)
- glossy- black cockatoo (Calyptorhynchus lathamus)
- major Mitchell's cockatoo (Lophochroa leadbeateri)
- barking owl (Ninox connivens)

Threatened Species
The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:
a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction
It is considered unlikely that any of these species would utilise the habitat on site on a regular basis. While there are hollow- bearing trees present, and thus breeding habitat cannot be excluded, it is unlikely that these threatened bird species would utilise these hollows, given the exposed nature of the site and the disturbed surroundings. Removal of the hollow- bearing trees is unlikely to have an adverse effect on the lifecycle of these species such that a viable local population would be placed at risk of extinction. The remainder of the habitat to be removed is in the form of 17.4 ha of degraded foraging habitat for the barking owl. Removal of this degraded habitat is highly unlikely to have an adverse effect on the lifecycle of this species.
b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:
i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
Not applicable.
ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction
Not applicable.
c. in relation to the habitat of a threatened species or ecological community:
i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

Threatened Species
The vegetation on site is already highly fragmented and isolated, and the proposed works will only remove a minor area of trees (0.8 ha) on the edge of this already fragmented habitat. All of these species are highly mobile and are unlikely to be affected.
iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,
The habitat to be removed is highly degraded and is considered very unlikely to be important to the long-term survival of these species.
d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)
The proposed works will not impact any declared areas of outstanding biodiversity value.
e. whether the proposed development or activity is or is part of a key threatening process (KTP) or is likely to increase the impact of a key threatening process.
There are two KTPs relevant to this project, being: • Clearing of native vegetation • Loss of hollow- bearing trees. Given the quality of the habitat to be removed, the implications of this KTP are not considered to be significant. One KTP, anthropogenic climate change, may be exacerbated by the proposal.
Conclusion
Due to the quality of the habitat to be removed, it is considered highly unlikely that the proposed works will have a significant impact on the abovementioned threatened species.

Test of Significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Those species considered to have reasonable potential to occur (based on known distribution and habitat requirements) or recorded within the Study Area and with reasonable potential to be impacted by the proposed work are addressed in detail in the following 'Test of Significance'. This assessment is conducted in accordance with the EPBC Act.

Vulnerable species Significant impact criteria
The potential impacts of the proposed works on the habitat of the following threatened species consists of the removal of 0.8 ha of degraded native vegetation, including four hollow-bearing trees.

The proposed works are highly unlikely to interfere with the recovery of the vulnerable species superb parrot (Polytelis swainsonii).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of an important population of a species**
- No important population is likely to utilise this degraded and disturbed vegetation.
- **reduce the area of occupancy of an important population**
- The area of occupancy for any possible important population may be reduced by 0.8 ha, but this is the reduction of already fragmented, degraded and isolated vegetation.
- **fragment an existing important population into two or more populations**

- No fragmentation of any important population would occur, given the nature of the works and the high mobility of this species.

- **adversely affect habitat critical to the survival of a species**

- The habitat present would not be critical to the survival of this species.

- **disrupt the breeding cycle of an important population**

- The breeding cycle of any important population is not likely to be impacted upon.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

- No impact to the habitat is likely to occur, such that the species would decline, given that only 0.8 ha of already degraded vegetation is to be removed.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

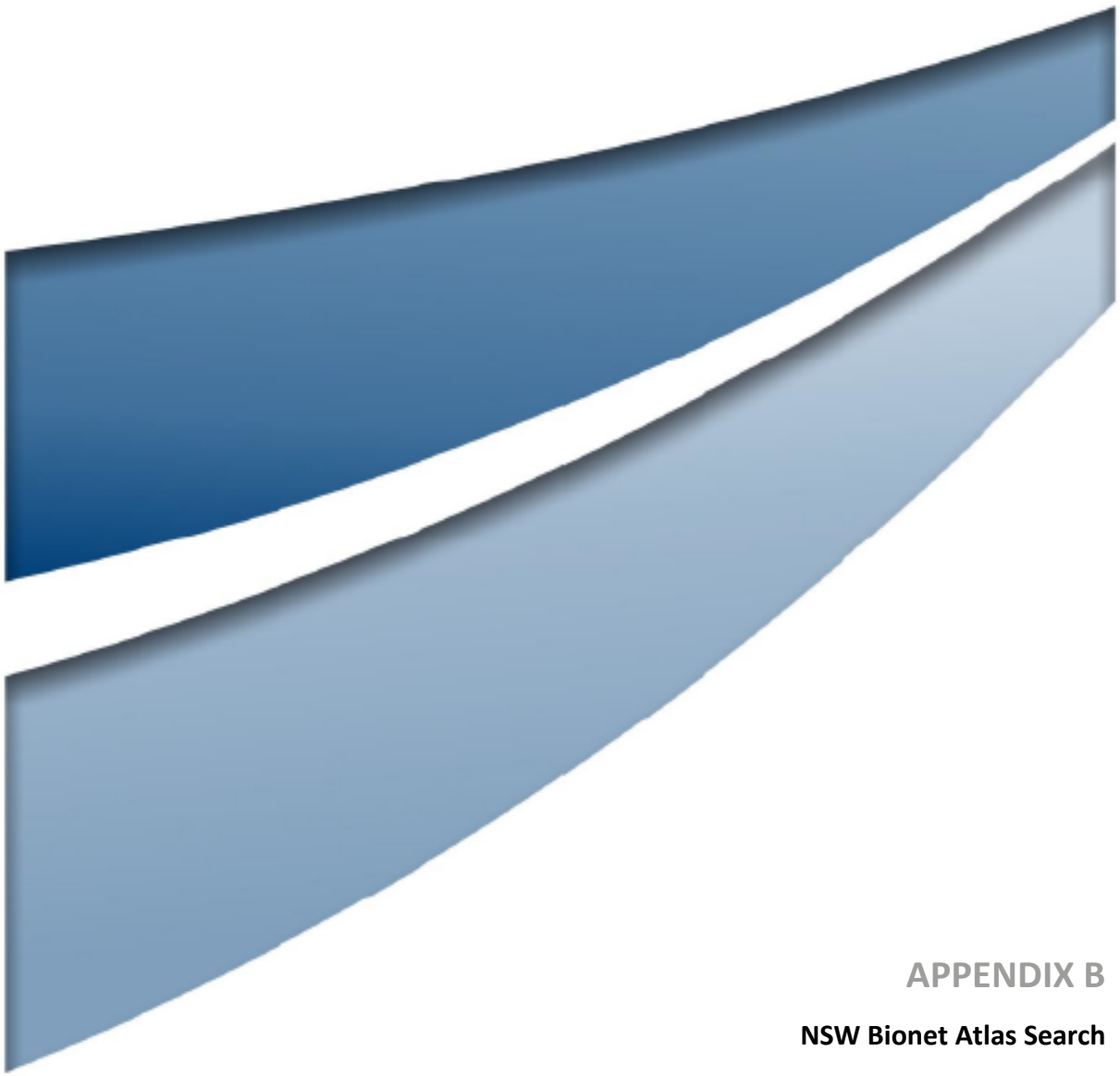
No invasive species harmful to this vulnerable species is likely to be introduced as a result of the works.

- **introduce disease that may cause the species to decline, or**

No disease harmful to this species is likely to be introduced as a result of these works.

interfere substantially with the recovery of the species.

The recovery of the species is highly unlikely to be impacted, given the nature of the works and the high mobility of the species.

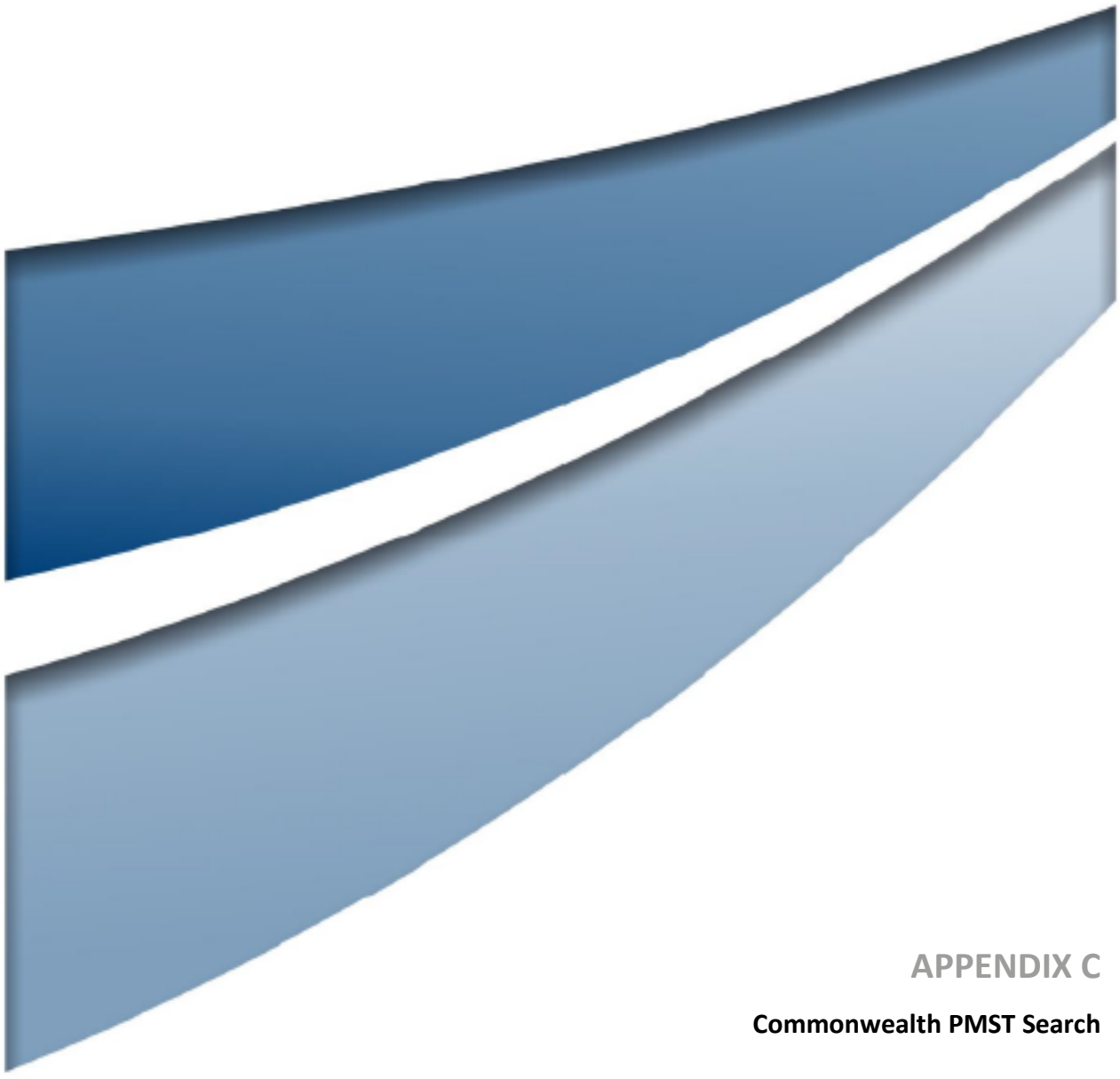


APPENDIX B

NSW Bionet Atlas Search

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -31.72 West: 148.30 East: 151.64 South: -33.24] returned a total of 9 records of 8 species.
Report generated on 26/02/2020 8:57 AM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Fauna	Aves	Otididae	1947	Ardeotis australis		Australian Bustard	E1,P		1	
Fauna	Aves	Burhinidae	1950	Burhinus grallarius		Bush Stone-curlew	E1,P		1	
Fauna	Aves	Cacatuidae	2150	Calyptorhynchus lathami		Glossy Black-Cockatoo	V,P,2		4	
Fauna	Aves	Psittacidae	2263	Polytelis swainsonii		Superb Parrot	V,P,3	V	11	
Fauna	Aves	Strigidae	2323	Ninox connivens		Barking Owl	V,P,3		3	
Fauna	Aves	Acanthizidae	2555	Chthonicola sagittata		Speckled Warbler	V,P		1	
Fauna	Aves	Pomatostomidae	2833	Pomatostomus temporalis temporalis		Grey-crowned Babbler (eastern subspecies)	V,P		8	
Fauna	Aves	Petroicidae	3134	Petroica boodang		Scarlet Robin	V,P		1	
Fauna	Aves	Estrildidae	3297	Stagonopleura guttata		Diamond Firetail	V,P		1	



APPENDIX C

Commonwealth PMST Search

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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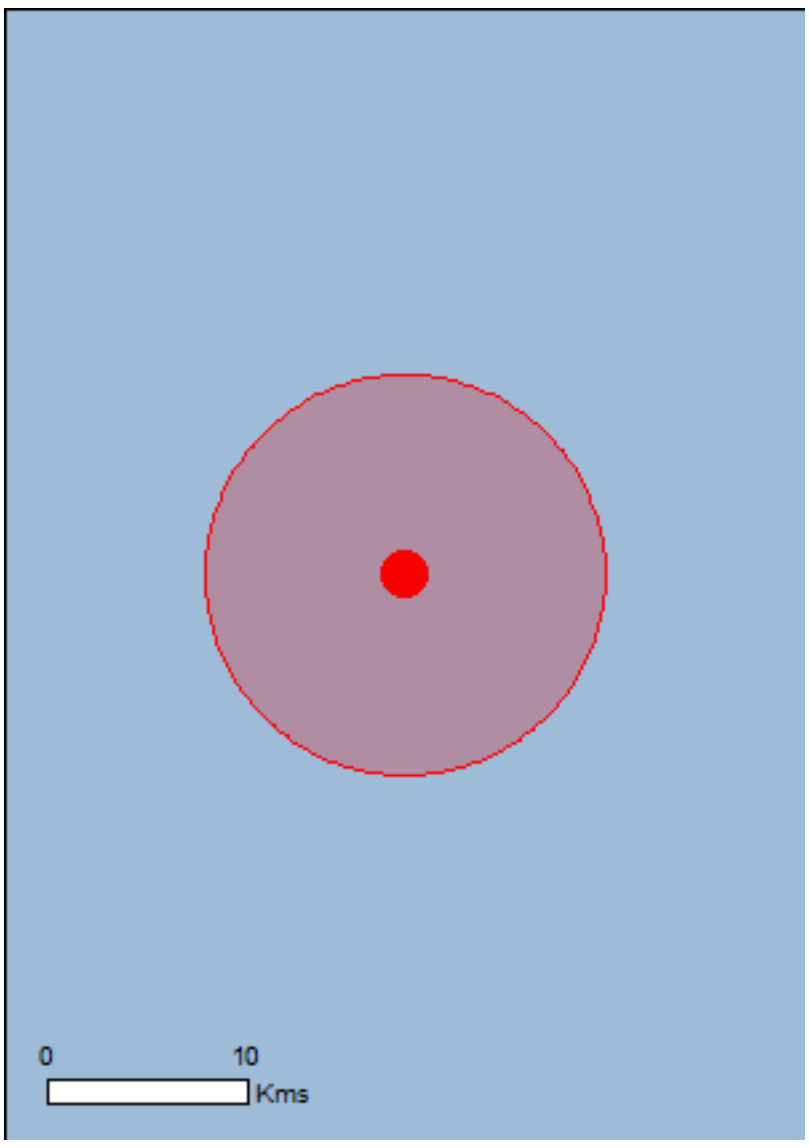
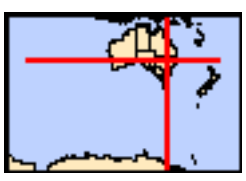
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	22
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	18
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	700 - 800km upstream
Riverland	700 - 800km upstream
The coorong, and lakes alexandrina and albert wetland	900 - 1000km upstream
The macquarie marshes	100 - 150km upstream

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community may occur within area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
[Leipoa ocellata](#) Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
[Polytelis swainsonii](#) Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area
[Rostratula australis](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
[Maccullochella peelii](#) Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
[Macquaria australasica](#) Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Mammals		
[Chalinolobus dwyeri](#) Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
[Dasyurus maculatus maculatus (SE mainland population)](#) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
[Nyctophilus corbeni](#) Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
[Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)](#) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
[Pteropus poliocephalus](#) Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
[Austrostipa wakoolica](#) [66623]	Endangered	Species or species habitat may occur within area
[Homoranthus darwinioides](#) [12974]	Vulnerable	Species or species habitat may occur within area
[Prasophyllum sp. Wybong (C.Phelps ORG 5269)](#) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
[Swainsona murrayana](#) Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
[Tylophora linearis](#) [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
[Aprasia parapulchella](#) Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-31.71917 148.38333

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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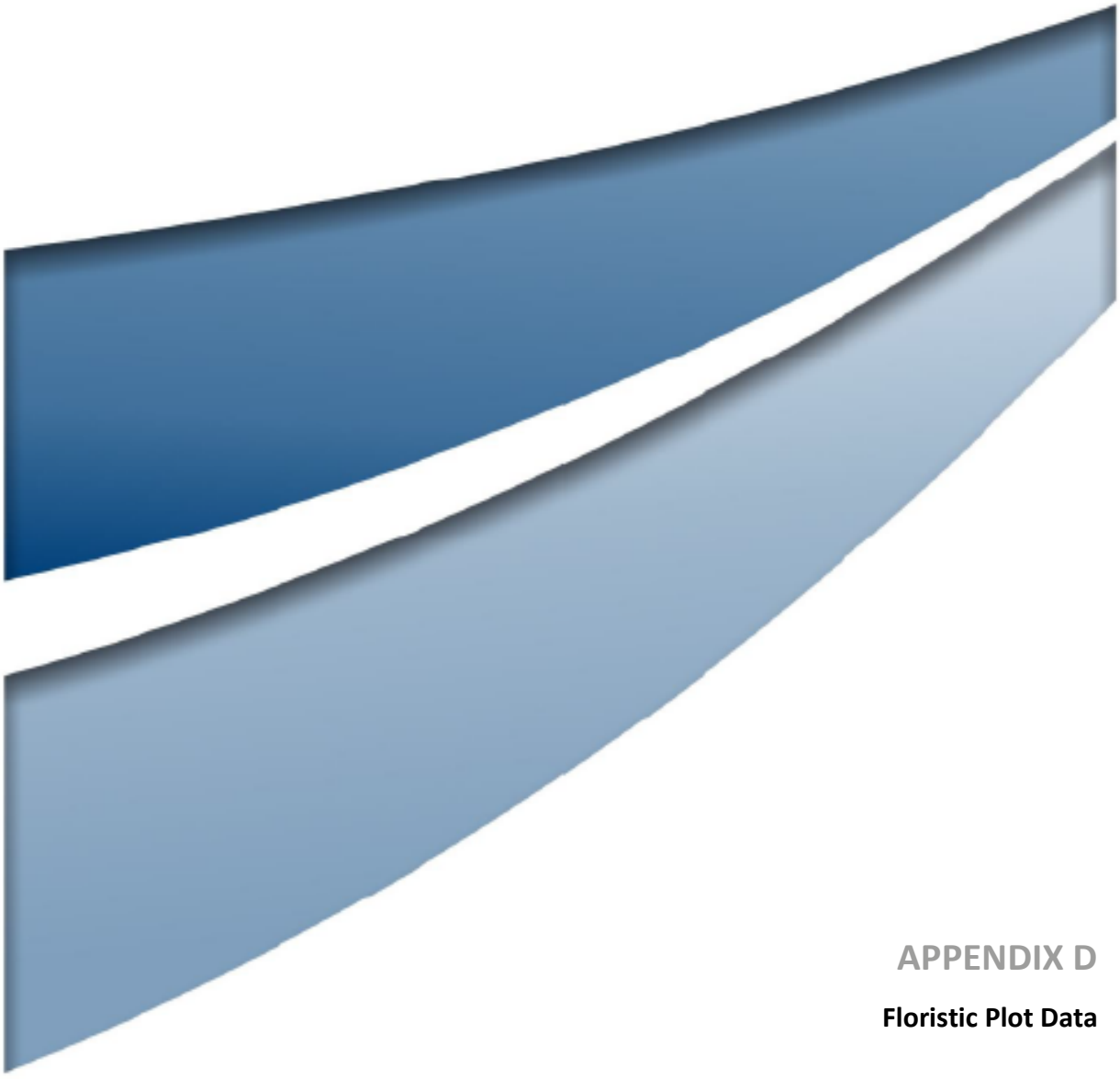
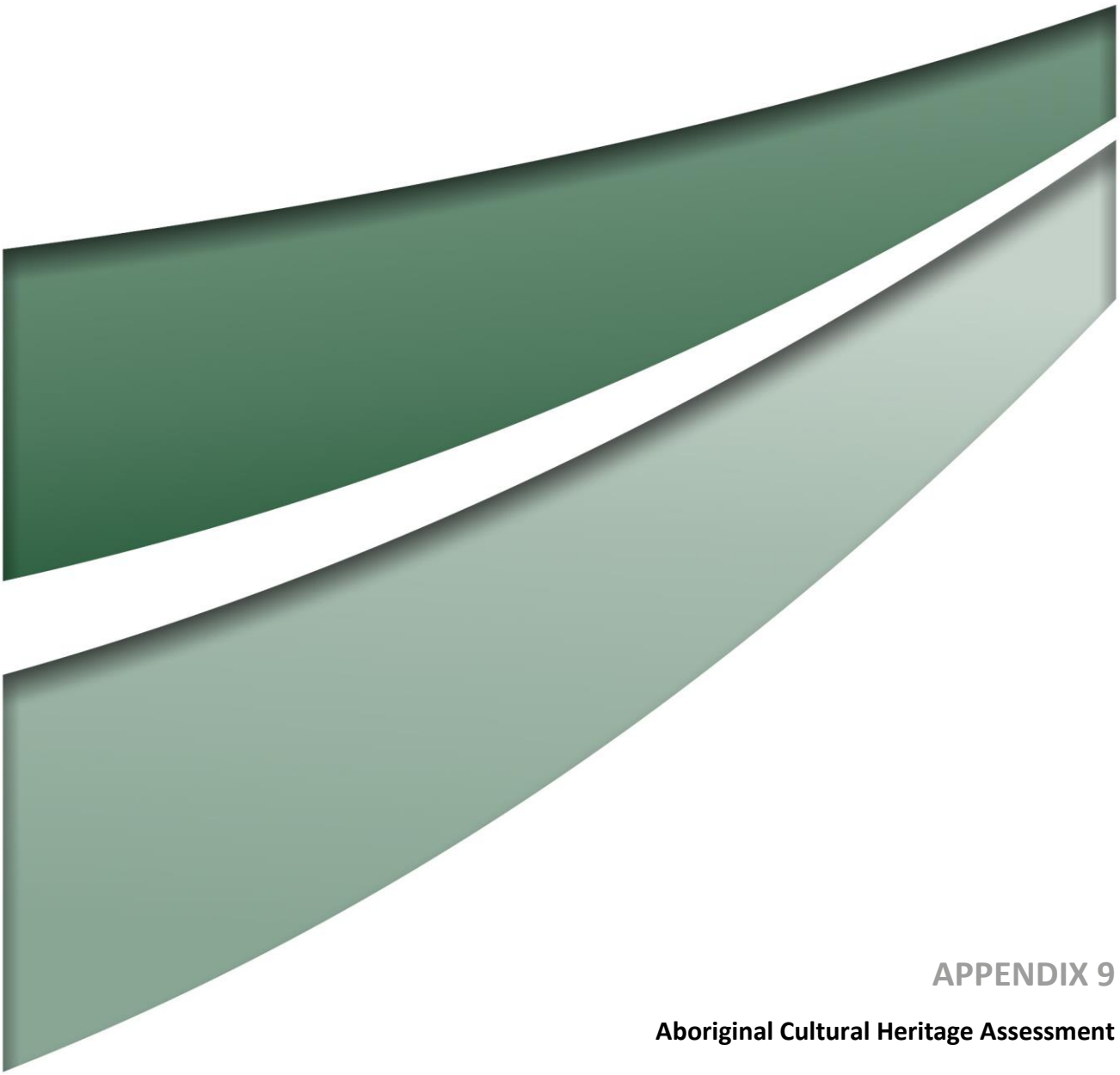


APPENDIX D

Floristic Plot Data

Appendix 4 – Floristic Plot Data

Family	Scientific Name	Common Name	Cover	Abundance
Boraginaceae	**Echium plantagineum*	Paterson's curse	10	2000
Brassicaceae	**Brassica spp.*	-	0.1	2
Chenopodiaceae	*Einadia nutans*	Nodding saltbush	0.1	5
Chenopodiaceae	*Enchylaena tomentosa*	Ruby saltbush	0.1	20
Chenopodiaceae	*Salsola australis*	-	0.1	5
Chenopodiaceae	*Sclerolaena burchii*	-	5	1000
Cucurbitaceae	**Cucumis myriocarpus*	Paddy melon	0.1	10
Cupressaceae	*Callitris glaucophylla*	White cypress pine	12	1
Fabaceae (Faboideae)	**Medicago polymorpha*	Burr medic	0.1	1000
Fabaceae (Faboideae)	*Glycine clandestina*	-	0.1	50
Fabaceae (Faboideae)	*Glycine tabacina*	-	0.1	5
Lamiacea	**Salvia reflexa*	Mintweed	0.1	500
Lamiaceae	**Marrubium vulgare*	White horehound	0.1	50
Lamiaceae	*Mentha diemenica*	Slender mint	2	200
Lomandraceae	*Lomandra filiformis subsp. filiformis*	Wattle mat- rush	0.1	50
Malvaceae	**Modiola caroliniana*	Red mallow	0.1	1
Malvaceae	*Sida corrugata*	-	3	200
Malvaceae	*Sida hackettiana*	-	0.1	5
Myrtaceae	*Eucalyptus populnea*	Bimbil box	15	1
Nyctaginaceae	*Boerhavia dominii*	Tarvine	1	200
Oxalidaceae	*Oxalis perennans*	sorrel	0.1	1
Poaceae	**Paspalum dilatatum*	Paspalum	0.1	1
Poaceae	*Chloris divaricata*	Slender chloris	0.1	50
Poaceae	*Eragrostis brownii*	Paddock lovegrass	0.1	20
Poaceae	*Paspalidium constricum*	-	0.1	1
Polygonaceae	**Acetosella vulgaris*	Sorrel	0.1	2
Portulacaceae	*Portulacca oleracea*	Purselane	0.1	2
Solanaceae	*Solanum esuriale*	Quena	1	200
Zygophyllaceae	**Tribulus terrestris*	Catheads	20	5000



APPENDIX 9

Aboriginal Cultural Heritage Assessment

View across the northwest portion of the study area.

ABORIGINAL ARCHAEOLOGICAL IMPACT ASSESSMENT

BERAKEE QUARRY EXPANSION

GILGANDRA LOCAL GOVERNMENT AREA

JANUARY 2021

Report prepared by

OzArk Environment & Heritage

for Regional Hardrock Gilgandra Unit Trust

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DOCUMENT CONTROLS

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Enquiries should be addressed to OzArk Environment & Heritage.

Acknowledgement

OzArk acknowledge Traditional Owners of the area on which this assessment took place and pay respect to their beliefs, cultural heritage and continuing connection with the land. We also acknowledge and pay respect to the post-contact experiences of Aboriginal people with attachment to the area and to the elders, past and present, as the next generation of role models and vessels for memories, traditions, culture and hopes of local Aboriginal people.

EXECUTIVE SUMMARY

OzArk Environment & Heritage (OzArk) has been engaged by Umwelt (Australia) Pty Ltd on behalf of Regional Hardrock Gilgandra Unit Trust (the proponent) to complete an Aboriginal Archaeological Impact Assessment (AAIA) of Lot 1 DP 1265657, 144 Ostlers Lane, located 10 kilometres (km) southeast of Collie, NSW.

The proponent is seeking development consent to extend the existing Berakee Quarry located within the Gilgandra Local Government Area. The purpose of the AAIA is to form part of the Environmental Impact Statement (EIS) being coordinated by the proponent to accompany an application for development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Secretary's Environmental Assessment Requirements (SEARS) for the proposal were issued on 24 December 2020. The current assessment follows the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* and field assessment and reporting followed the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*.

The study area comprises 68 hectares (ha) of land within Lot 1 DP 1265657 and a 1.7 km haul road extending from within Lot 1 DP 1265657 to the north through Lot 2 DP 1265657. Approximately 2 ha of land within the central portion of the current study area and the haul road were assessed by OzArk (2017) for the existing Berakee Quarry. The study area generally encompasses a low crest with outcropping basalt and is generally surrounded by cultivated land.

The fieldwork component of this assessment was undertaken by OzArk on Tuesday 29 September 2020. Mr Wayne and Russell Bamblett from the Gilgandra Local Aboriginal Land Council attended the fieldwork.

One previously unrecorded Aboriginal site (Berakee-ST1) was identified during the survey. Berakee-ST1 is a scarred tree located along the western boundary of the study area. No landforms within the study area were assessed as likely to contain subsurface archaeological deposits.

Berakee-ST1 is located 170 m from the nearest impact associated with the proposal (the extraction area). As such, Berakee-ST1 will not be impacted by the proposal.

Recommendations concerning Aboriginal cultural values within the study area are as follows:

1. An Aboriginal Heritage Impact Permit is not required as Aboriginal site Berkaee-ST1 will not be harmed by the proposal.
2. All land-disturbing activities must be confined to within the assessed area. Should the parameters of the proposed work extend beyond the assessed area, then further archaeological assessment may be required by a suitably qualified archaeologist.

3. Inductions for staff undertaking the proposed work should indicate the location of Berakee-ST1 and explain the legislative protection requirements for all Aboriginal sites and objects in NSW under the *National Parks and Wildlife Act 1974* and the relevant fines for non-compliance. Staff should be briefed on the *Unanticipated Finds Protocol* (**Appendix 2**) and the identification of Aboriginal objects within the local region, with particular emphasis placed upon stone artefact identification (**Appendix 4**).
4. In the unlikely event that Aboriginal skeletal material is encountered, the *Unanticipated Skeletal Remains Protocol* (**Appendix 3**) should be followed.

CONTENTS

EXECUTIVE SUMMARY ..... **IV**

1 INTRODUCTION **1**

1.1 Description of the proposal 1

1.2 Background 1

1.3 Proposed work 2

1.4 Study area 5

1.5 Relevant legislation 5

1.5.1 State legislation 6

1.5.2 Commonwealth legislation 7

1.5.3 Applicability to the proposal 7

2 THE ARCHAEOLOGICAL ASSESSMENT **8**

2.1 Assessment approach 8

2.2 Purpose and objectives 8

2.2.1 Aboriginal archaeological assessment objectives 8

2.3 Date of archaeological assessment 8

2.4 OzArk involvement 8

2.4.1 Field assessment 8

2.4.2 Reporting 8

2.5 Aboriginal community involvement 9

2.6 Report compliance with the Code of Practice 9

3 LANDSCAPE CONTEXT **11**

3.1 Topography 11

3.2 Geology and soils 11

3.3 Hydrology 12

3.4 Flora and fauna 12

3.5 Climate 13

3.6 Land–use history and existing levels of disturbance 13

3.7 Conclusion 14

4 ABORIGINAL ARCHAEOLOGY BACKGROUND **15**

4.1 Ethno-historic sources of regional Aboriginal culture 15
4.2 Regional archaeological context 15
4.2.1 OzArk 2011. *Aboriginal Heritage Assessment: Proposed Yarrandale to Gilgandra 66kV Transmission Line* 15
4.2.2 OzArk 2016. *Central West Local Land Services Travelling Stock Reserves Study* 16
4.2.3 OzArk 2017b. *Aboriginal Due Diligence Archaeological Assessment: Gilgandra Solar Farm*. 18
4.2.4 OzArk 2018. *Aboriginal Due Diligence Archaeological Assessment: Gilgandra CBD Project Stage II*. 18
4.2.5 OzArk 2020. *Aboriginal Due Diligence Archaeological Assessment: Gilgandra Industrial Subdivision.* 18
4.3 Local archaeological context 19
4.3.1 Desktop database searches conducted 19
4.4 Predictive model for site location 20
4.4.1 Conclusion 21
5 RESULTS OF ABORIGINAL ARCHAEOLOGICAL ASSESSMENT 24
5.1 Sampling strategy and field methods 24
5.2 Effective survey coverage 24
5.3 Aboriginal sites recorded 26
Berakee-ST1 26
5.4 Aboriginal community input 28
5.5 Discussion 28
6 SIGNIFICANCE AND IMPACT ASSESSMENT 29
6.1 Assessment of significance 29
6.2 Assessed significance of the recorded sites 31
6.3 Likely impacts to Aboriginal heritage from the proposal 32
6.4 Ecologically sustainable development principles 32
7 MANAGEMENT OF ABORIGINAL CULTURAL HERITAGE SITES 33
7.1 General management principles 33
7.2 Management and mitigation of recorded Aboriginal sites 33

8 RECOMMENDATIONS 34

REFERENCES 35

PLATES 37

APPENDIX 1: AHIMS SEARCH RESULT 41

APPENDIX 2: ABORIGINAL HERITAGE: UNANTICIPATED FINDS PROTOCOL 42

APPENDIX 3: UNANTICIPATED SKELETAL REMAINS PROTOCOL 43

APPENDIX 4: ABORIGINAL HERITAGE: ARTEFACT IDENTIFICATION 44

FIGURES

Figure 1-1: Map showing the location of the study area in relation to Collie. 1
Figure 1-2: Location of the 2017 study area in relation to the current study area. 2
Figure 1-3: Proposed work showing impact footprint. 4
Figure 1-4: Aerial showing the study area. 5
Figure 3-1: Topography of the study area. 11
Figure 3-2: The study area in relation to nearby waterways. 12
Figure 3-3: Photo showing stock levels at Berida Station in c. 1910 (Harrison 2004). 13
Figure 4-1: Location of previously recorded AHIMS sites in relation to the study area. 20
Figure 5-1: Pedestrian coverage of the study area during the 2020 survey and the 2017 inspection. 24
Figure 5-2: Location of Berakee-ST1 within the study area. 26
Figure 5-3: Berakee-ST1. View of the scarred tree and surrounds. 27

TABLES

Table 2-1: Report compliance with the Code of Practice. 9
Table 4-1: Association of all recorded sites to landscape units (OzArk 2016). 17
Table 4-2: Frequency of site types in association with landscape types (OzArk 2016). 17
Table 4-3: Aboriginal cultural heritage: desktop-database search results. 19
Table 5-1: Effective survey coverage within the study area. 25
Table 5-2: Effective survey coverage and incidences of site recording. 25
Table 5-3: Recorded Aboriginal site details. 26
Table 5-4: Berakee-ST1 attributes. 27
Table 6-1: Aboriginal cultural heritage: significance assessment. 32
Table 6-2: Aboriginal cultural heritage: impact assessment. 32

PLATES

Plate 1: Detail of larger fragments of outcropping basalt present. 37
Plate 2: Detail of the red sandy loam present with a scatter of small basalt fragments. 37
Plate 3: View south along the eastern portion of the study area showing small areas of exposure. 38
Plate 4: View north from the eastern portion of the study area along a gentle slope. 38
Plate 5: View north from the southern portion of the study area which has been impacted by the construction of a dam and contouring. 39
Plate 6: View northwest to a stand of White Cypress Pine in the southwest of the study area. . 39
Plate 7: View north from the top of the crest showing remnant Poplar Box in the background. . 40
Plate 8: View east along a gentle slope in the north of the study area. 40

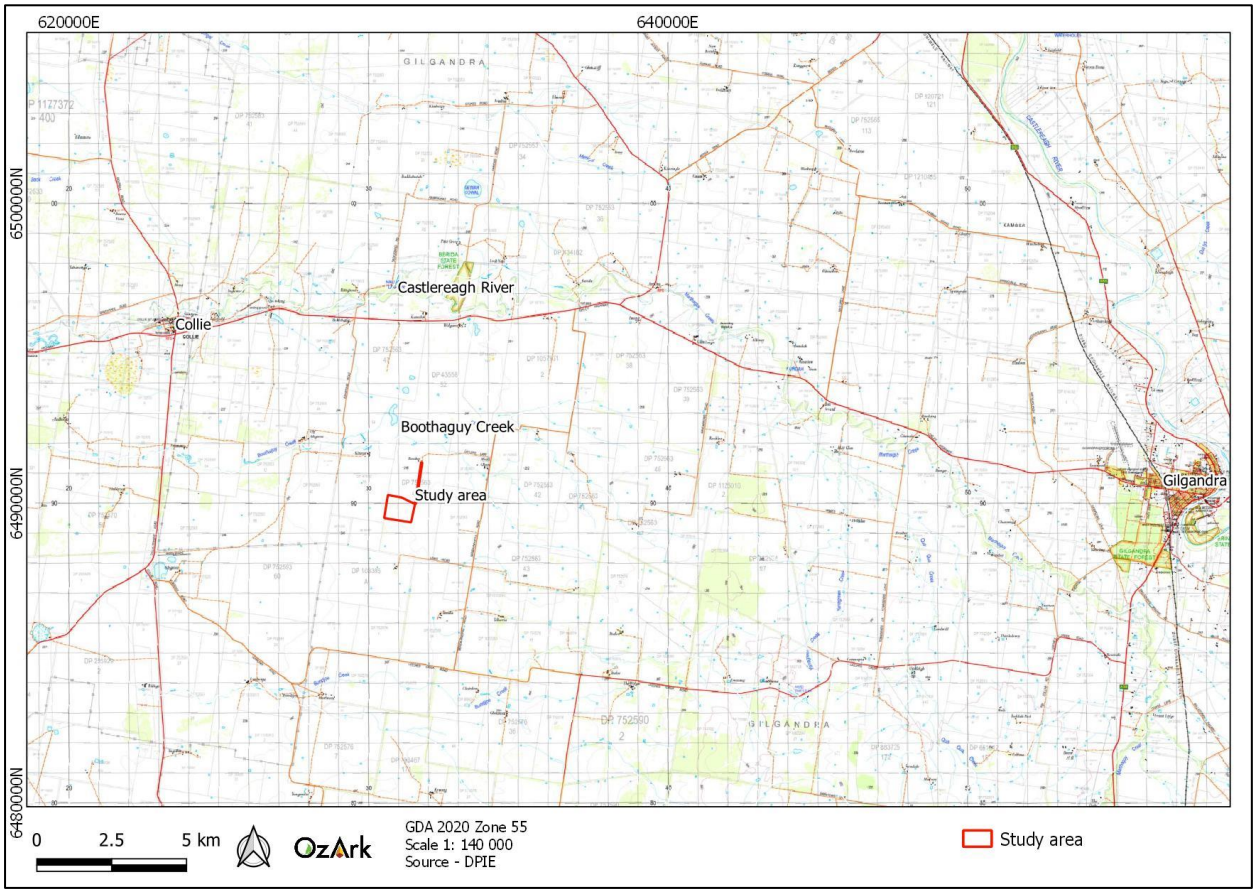
1 INTRODUCTION

1.1 DESCRIPTION OF THE PROPOSAL

OzArk Environment & Heritage (OzArk) has been engaged by Umwelt (Australia) Pty Ltd on behalf of Regional Hardrock Gilgandra Unit Trust (the proponent) to complete an Aboriginal Archaeological Impact Assessment (AAIA) of Lot 1 DP 1265657, 144 Ostlers Lane, located 10 kilometres (km) southeast of Collie, NSW (the study area; **Figure 1-1**). The study area has the potential to be impacted by the proposed extension of the Berakee Quarry (the proposal). The proposal is in the Gilgandra Local Government Area (LGA).

The purpose of the AAIA is to form part of the Environmental Impact Statement (EIS) being coordinated by the proponent to accompany an application for development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Figure 1-1: Map showing the location of the study area in relation to Collie.



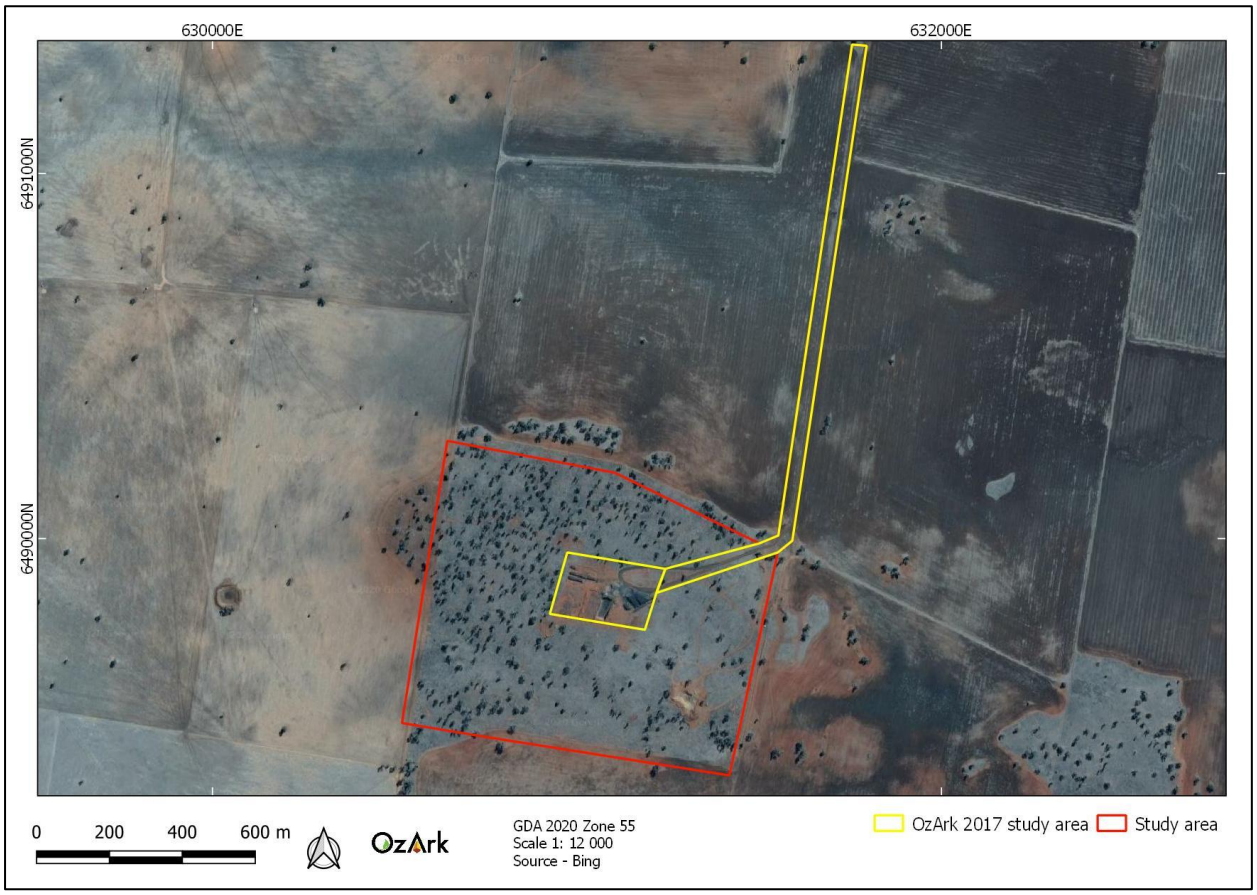
1.2 BACKGROUND

In 2017, OzArk completed a Due Diligence assessment for the initial Berakee Quarry. Approximately 2 hectares (ha) of land within the central portion of the current study area was assessed for the extraction area, as well as a 1.7 km alignment for a haul road (**Figure 1-2**).

No Aboriginal sites or sensitive landforms were identified during the assessment.

In January 2018, Berakee Quarry was approved by Gilgandra Shire Council as DA 2017/218, with operations commencing soon thereafter. In June 2019, a modification to DA 2017/218 was approved by Gilgandra Shire Council allowing for the operation of a private haul road from the Quarry across Lots 1 and 2 DP 1265657 (formerly Lot 45 DP752563), Lot 52 DP43558 (by Right of Carriageway). Construction of the private haul road was completed in June 2020.

Figure 1-2: Location of the 2017 study area in relation to the current study area.



1.3 PROPOSED WORK

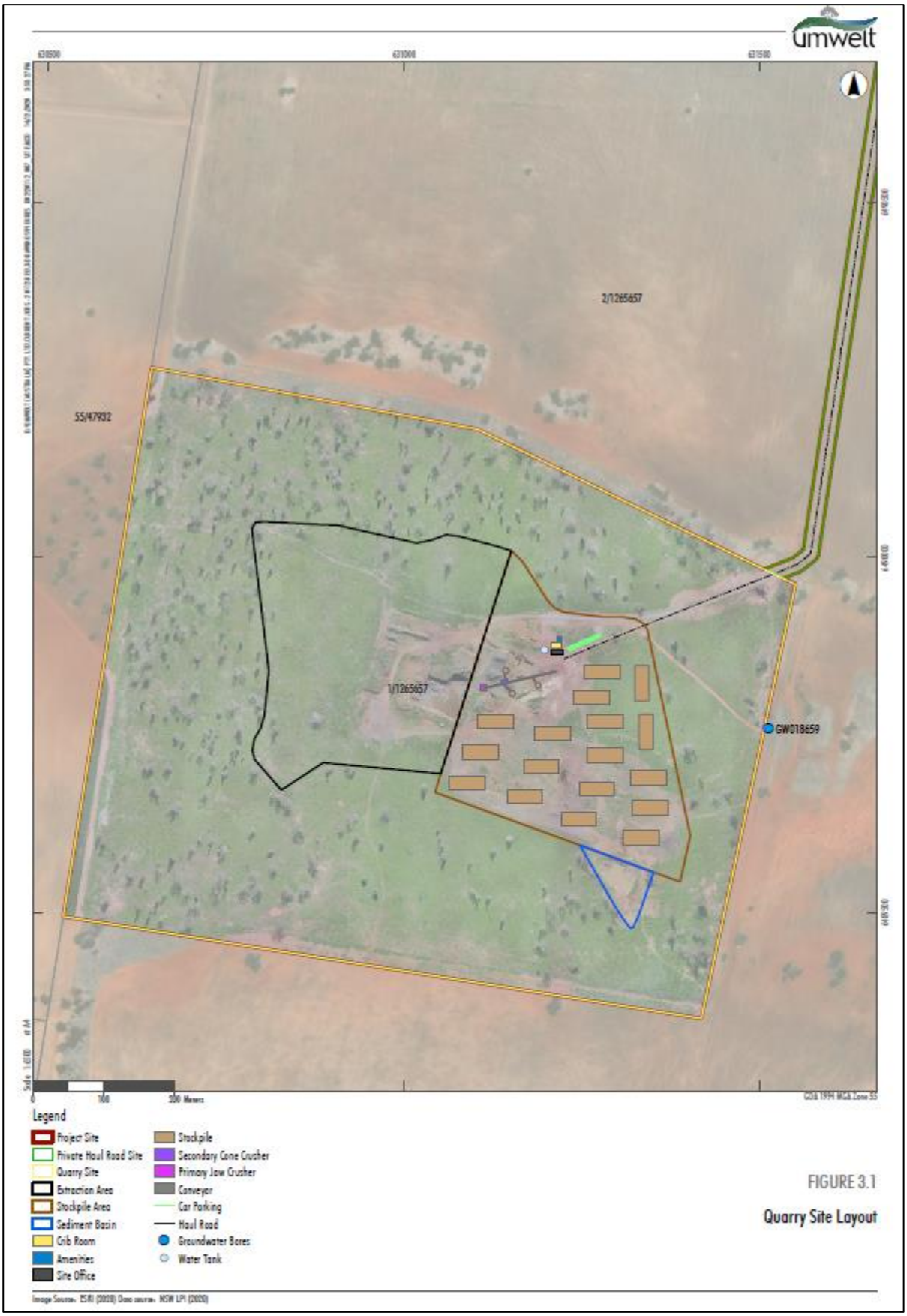
The proponent is seeking approval to extend the extraction area, production rate, quarry life and disturbance footprint of the Berakee Quarry.

The layout of the proposed Quarry extension is shown on **Figure 1-3** which identifies the location of the proposed extraction area, stockpile area and internal roads and infrastructure. The maximum extraction area of the proposal is up to 8.4 ha of land within Lot 1 DP 1265657. The stockpile area will be extended to a maximum area of 7.8 ha to allow for the placement of up to 250,000 t of product. The existing haul road will be utilised for the transportation of material from the Berakee Quarry.

The proposal will involve the stripping of soil across all areas of disturbance to a depth of 300 millimetres (mm) and extraction of basalt within the extraction area to a maximum depth of 240 metres (m) Australian Height Datum (AHD). While surrounding areas will not be subject to this

ground disturbance, the proposed work would include the construction of stockpiles and a processing area. Groundcover vegetation would be removed, but the design will avoid the clearance of all but four mature trees.

Figure 1-3: Proposed work showing impact footprint.



1.4 STUDY AREA

The study area comprises 68 ha of land within Lot 1 DP 1265657 and a 1.7 km haul road extending from within Lot 1 DP 1265657 to the north through Lot 2 DP 1265657.

The study area generally encompasses a low crest with outcropping basalt and is generally surrounded by cultivated land. The central portion of the study area contains the Berakee Quarry and the associated haul road; while the remainder of the study area contains mature and regrowth vegetation (**Figure 1-4**). Vegetation clearing undertaken on the study area by the former landowner as allowable clearing activities under Schedule 5A of the *Local Land Services Act 2013*.

Figure 1-4: Aerial showing the study area.

1.5 RELEVANT LEGISLATION

Cultural heritage is managed by several state and national Acts. Baseline principles for the conservation of heritage places and relics can be found in the *Burra Charter* (Burra Charter 2013). The *Burra Charter* has become the standard of best practice in the conservation of heritage places in Australia, and heritage organisations and local government authorities have incorporated the inherent principles and logic into guidelines and other conservation planning documents. The *Burra Charter* generally advocates a cautious approach to changing places of

heritage significance. This conservative notion embodies the basic premise behind legislation designed to protect our heritage, which operates primarily at a state level.

Several Acts of parliament provide for the protection of heritage at various levels of government.

1.5.1 State legislation

Environmental Planning and Assessment Act 1979 (EP&A Act)

This Act established requirements relating to land use and planning. The framework governing environmental and heritage assessment in NSW is contained within the following parts of the EP&A Act:

- Part 4: Local government development assessments, including heritage. May include schedules of heritage items
    - Division 4.7: Approvals process for state significant development.

National Parks and Wildlife Act 1974 (NPW Act)

Amended during 2010, the NPW Act provides for the protection of Aboriginal objects (sites, objects and cultural material) and Aboriginal places. Under the Act (Part 6), an Aboriginal object is defined as: any deposit, object or material evidence (not being a handicraft for sale) relating to indigenous and non-European habitation of the area that comprises NSW, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains.

An Aboriginal place is defined under the NPW Act as an area which has been declared by the Minister administering the Act as a place of special significance for Aboriginal culture. It may or may not contain physical Aboriginal objects.

As of 1 October 2010, it is an offence under Section 86 of the NPW Act to 'harm or desecrate an object the person knows is an Aboriginal object'. It is also a strict liability offence to 'harm an Aboriginal object' or to 'harm or desecrate an Aboriginal place', whether knowingly or unknowingly. Section 87 of the Act provides a series of defences against the offences listed in Section 86, such as:

- The harm was authorised by and conducted in accordance with the requirements of an *Aboriginal Heritage Impact Permit* (AHIP) under Section 90 of the Act;
- The defendant exercised 'due diligence' to determine whether the action would harm an Aboriginal object; or
- The harm to the Aboriginal object occurred during the undertaking of a 'low impact activity' (as defined in the regulations).

Under Section 89A of the Act, it is a requirement to notify the Secretary of the Department of Premier and Cabinet of the location of an Aboriginal object. Identified Aboriginal items and sites

are registered on Aboriginal Heritage Information Management System (AHIMS) that is administered by Heritage NSW.

1.5.2 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act, administered by the Commonwealth Department of Agriculture, Water and Environment, provides a framework to protect nationally significant flora, fauna, ecological communities and heritage places. The EPBC Act establishes both a National Heritage List and Commonwealth Heritage List of protected places. These lists may include Aboriginal cultural sites or sites in which Aboriginal people have interests. The assessment and permitting processes of the EPBC Act are triggered when a proposed activity or development could potentially have an impact on one of the matters of national environment significance listed by the Act. Ministerial approval is required under the EPBC Act for proposals involving significant impacts to national/commonwealth heritage places.

Other

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* is aimed at the protection from injury and desecration of areas and objects that are of significance to Aboriginal Australians. This legislation has usually been invoked in emergency and conflicted situations.

1.5.3 Applicability to the proposal

The current proposal will be assessed under Part 4 of the EP&A Act. The Secretary's Environmental Assessment Requirements (SEARS) or the proposal were issued on 24 December 2020 as EAR number 1488.

Any Aboriginal sites within the study area are afforded legislative protection under the NPW Act.

It is noted there are no Commonwealth or National heritage listed places within the study area, and as such, the heritage provisions of the EPBC Act and other Commonwealth Acts do not apply.

2 THE ARCHAEOLOGICAL ASSESSMENT

2.1 ASSESSMENT APPROACH

The current assessment follows the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (Code of Practice; DECCW 2010).

Field assessment and reporting followed the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011).

2.2 PURPOSE AND OBJECTIVES

The purpose of the current study is to identify and assess heritage constraints relevant to the proposed works.

2.2.1 Aboriginal archaeological assessment objectives

The current assessment will apply the Code of Practice in the completion of an Aboriginal archaeological assessment to meet the following objectives:

Objective One: Undertake background research on the study area to formulate a predicative model for site location within the study area

Objective Two: Identify and record objects or sites of Aboriginal heritage significance within the study area, as well as any landforms likely to contain further archaeological deposits

Objective Three: Assess the likely impacts of the proposed work to Aboriginal cultural heritage and provide management recommendations.

2.3 DATE OF ARCHAEOLOGICAL ASSESSMENT

The fieldwork component of this assessment was undertaken by OzArk on the Tuesday 29 September 2020.

2.4 OZARK INVOLVEMENT

2.4.1 Field assessment

The fieldwork component of the heritage assessment was undertaken by:

- Archaeologist: Stephanie Rusden (OzArk Senior Archaeologist, BS University of Wollongong, BA University of New England).

2.4.2 Reporting

The reporting component of the heritage assessment was undertaken by:

- Report author: Stephanie Rusden.

- Report contributor: Harrison Rochford (OzArk Heritage Officer, B. Lib. Studies [Hons], M. Phil. [Arts and Social Science]).
- Reviewer: Ben Churcher (OzArk Principal Archaeologist; BA[Hons], Dip Ed).

2.5 ABORIGINAL COMMUNITY INVOLVEMENT

The fieldwork for the proposal was accompanied by Wayne and Russell Bamblett representing the Gilgandra Local Aboriginal Land Council (LALC).

2.6 REPORT COMPLIANCE WITH THE CODE OF PRACTICE

The Code of Practice establishes requirements that should be followed by all archaeological investigations where harm to Aboriginal objects may be possible. **Table 2-1** tabulates the compliance of this report with the requirements established by the Code of Practice.

Table 2-1: Report compliance with the Code of Practice.

Code of Practice Requirement	Context of the Requirement	Concordance in this report
Requirement 1	Review previous archaeological work	*see subsections below*
Requirement 1a	Previous archaeological work	**Section 4.2**
Requirement 1b	AHIMS searches	**Section 4.3.1**
Requirement 2	Review the landscape context	**Section 3**
Requirement 3	Summarise and discuss the local and regional character of Aboriginal land use and its material traces	**Section 4.2** and **4.3**
Requirement 4	Predict the nature and distribution of evidence	*see subsections below*
Requirement 4a	Predictive model	**Section 4.4**
Requirement 4b	Predictive model results	**Section 4.4.1**
Requirement 5	Archaeological survey	*see subsections below*
Requirement 5a	Survey sampling strategy	**Section 5.1**
Requirement 5b	Survey requirements	This Requirement was fulfilled during the undertaking of the survey
Requirement 5c	Survey units	**Section 5.2**
Requirement 6	Site definition	**Section 5.3**
Requirement 7	Site recording	*see subsections below*
Requirement 7a	Information to be recorded	Site information is detailed in **Section 5.3**
Requirement 7b	Scales for photography	All artefact photographs employed a centimetre scale bar.
Requirement 8	Location information and geographic reporting	*see subsections below*
Requirement 8a	Geospatial information	All recorded Aboriginal site locations were logged using a non-differential handheld GPS.
Requirement 8b	Datum and grid coordinates	All coordinates are provided in GDA Zone 55.
Requirement 9	Record survey coverage data	**Section 5.1** and **5.2**
Requirement 10	Analyse survey coverage	**Section 5.2**
Requirement 11	Archaeological Report content and format	This report adheres to this Requirement.

Code of Practice Requirement	Context of the Requirement	Concordance in this report
Requirement 12	Records	OzArk undertakes to maintain all survey records for at least five years.
Requirement 13	Notifying OEH and reporting	*see subsections below*
Requirement 13a	Notification of breaches	Not applicable
Requirement 13b	Provision of information	Not applicable
Requirement 14	Test excavation which is not excluded from the definition of harm	Test excavation was not required
Requirement 15	Pre-conditions to carrying out test excavation	*see subsections below*
Requirement 15a	Consultation	Test excavation was not required
Requirement 15b	Test excavation sampling strategy	Test excavation was not required
Requirement 15c	Notification	Test excavation was not required
Requirement 16	Test excavation that can be carried out in accordance with this Code	*see subsections below*
Requirement 16a	Test excavations	Test excavation was not required
Requirement 16b	Objects recovered during test excavations	Test excavation was not required
Requirement 17	When to stop test excavations	Test excavation was not required

3 LANDSCAPE CONTEXT

An understanding of the environmental contexts of a study area is requisite in any Aboriginal archaeological investigation (DECCW 2010). It is a particularly important consideration in the development and implementation of survey strategies for the detection of archaeological sites. In addition, natural geomorphic processes of erosion and/or deposition, as well as humanly activated landscape processes, influence the degree to which these material culture remains are retained in the landscape as archaeological sites; and the degree to which they are preserved, revealed and/or conserved in present environmental settings.

3.1 TOPOGRAPHY

The study area is located within the Myall Glen Basalts landscape unit as described by Mitchell (2002: 14). The Myall Glen Basalts landscape comprises low rises above a plain of underlying tertiary basalt, with an elevation of approximately 250 m.

The study area encompasses a broad, low gradient hill typical of the landforms associated with the Myall Glen Basalts landscape unit (**Figure 3-1**). Landforms surrounding the study area consist of extensive alluvial plains associated with the Castlereagh River and its tributaries.

Figure 3-1: Topography of the study area.

1. View north across the low-gradient hill.

2. View west across the crest of the hill.

3.2 GEOLOGY AND SOILS

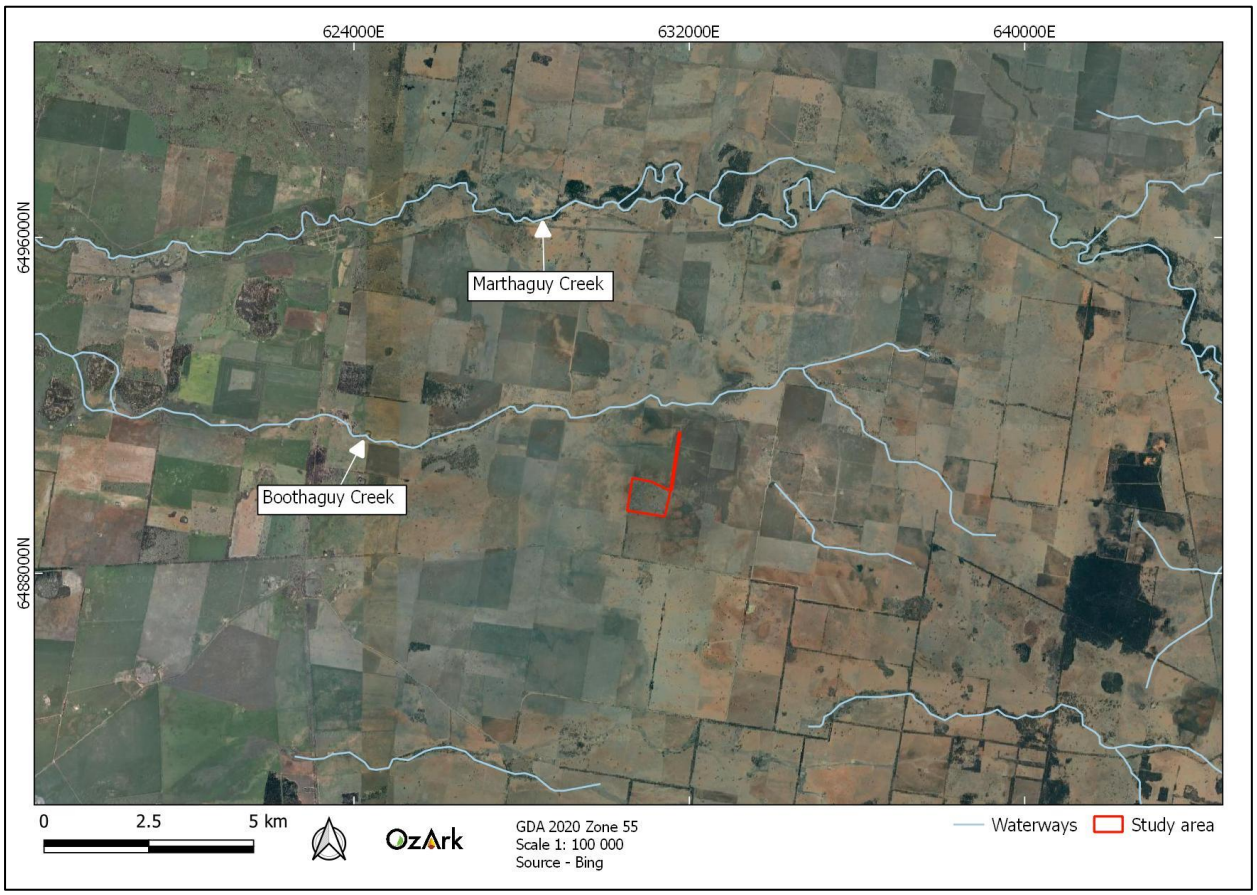
The study area is located on a low hill with outcropping and underlying basalt (**Plate 1**). The underlying basalt is up to 5 m thick and likely derived as a valley fill from the Warrumbungles (Mitchell 2002: 14).

Soils within the study area predominantly consists of dark reddish-brown sandy loam with very frequent stony inclusions (OzArk 2017a; **Plate 2**).

3.3 HYDROLOGY

The study area does not contain any hydrological features. The majority of the study area is over 2 km south of the nearest waterway, Boothaguy Creek (also referred to locally as Calf Pen Creek), and 6 km south of Marthaguy Creek (**Figure 3-2**). Boothaguy and Mathaguy Creeks are both ephemeral, but it is possible that the area had more reliable water in the past as the drainage networks across the Castlereagh alluvial fan have likely changed over time. The Castlereagh River, the major permanent water source in the region, is located 28 km east of the study area.

Figure 3-2: The study area in relation to nearby waterways.



3.4 FLORA AND FAUNA

Poplar Box and White Cypress Pine trees dominant the study area. These include both mature and regrowth trees scattered across the entirety of the study area (**Plate 3** to **Plate 8**). Ground stratum species within the study area consist mainly of two native grasses, Knotty Spear Grass and Rough Spear Grass, with small patches of weeds consisting mainly of White Horehound and Paterson's Curse (OzArk 2017c).

Poplar Box and White Cypress Pine were traditionally used for a variety of purposes. The bark of Poplar Box is suitable for making a range of tools and implements, while the resin from both tree species can be used for many purposes including sealing coolamons and containers so that they are watertight (Murrumbidgee CMA 2008).

The Poplar Box woodland vegetation community would have also provided numerous habitat types for fauna. For example, canopy trees provide foraging and nesting/resting habitat for birds and arboreal fauna, while ground cover plants, logs and fallen leaves also provide shelter and foraging habitat for terrestrial fauna.

3.5 CLIMATE

The study area is in a semi-arid climate zone. Highest average temperatures occur in January at 33.1 degrees Celsius. The coolest average maximum temperatures are 15.6 degrees in July. January has the highest average rainfall (63.7 millimetres) although winter has more days of rain.

3.6 LAND–USE HISTORY AND EXISTING LEVELS OF DISTURBANCE

The study area was grazed for over 150 years before approval for the current quarry operation. The earliest known colonial ownership of the land currently known as Berakee was in the 1840s and the property become part of Berida Station in 1862 (Christison 2009: 38). The station was one of the many owned by influential property owner and politician Edward Flood (1805–1888). **Figure 3-3** shows the large number of sheep, albeit temporarily corralled for this photograph, at the station in 1910. This would suggest that there is a potential for high levels of disturbance related to grazing within and surrounding the study area. Vegetation clearance within the study area appears to have been less intensive than the surrounding cropped paddocks.

Figure 3-3: Photo showing stock levels at Berida Station in c. 1910 (Harrison 2004).

3.7 CONCLUSION

The review of the environmental factors associated with the study area allows the following conclusions to be drawn in terms past Aboriginal occupation:

- Topography: the study area consists of a broad, low gradient hill which would not have been an impediment to movement or occupation (camping) in the past. However, occupation of this area in antiquity by Aboriginal people would most likely have been limited to transient inhabitation resulting from movement across the landscape to other areas which provide more stable resources, such as water provided by creek lines and the Castlereagh River.

- Geology and soils: the outcropping parent rock (basalt) of the local environment would have been a suitable raw material type, procured by Aboriginal people for the manufacture of stone artefacts, and as such, is likely to have increased visitation to the local area.

- Hydrology: the study area offers little in terms of hydrological resources with only drainage lines present which would not have held water for prolonged periods of time. As such, hydrology was likely not a factor in attracting occupation to the study area.

- Vegetation: Mature, native species known to be present within the study area would have provided resources for Aboriginal people in the past, however, resources likely to have supported a large population of people would have been present closer to the banks of more permanent water sources. Given the presence of remnant mature vegetation within the study area, there is potential that scarred trees will be present.

- Climate: The climate would not have been an impediment to year-round occupation.

- Land-use: The study area has undergone relatively low levels of landform modification (outside of the existing quarry operations) in the form of grazing and vegetation clearance. Both of these activities result in soil erosion and soil loss. This soil movement causes archaeological deposits to be exposed through loss of A Horizon soils and they are subsequently dispersed across the landscape and/or become deflated coming to rest on lower soil strata.

4 ABORIGINAL ARCHAEOLOGY BACKGROUND

4.1 ETHNO-HISTORIC SOURCES OF REGIONAL ABORIGINAL CULTURE

According to Horton's map of Indigenous Australia, the study area lies at the boundary of the areas associated with the Wailwan and Wiradjuri language groups (Horton 2004). People of the Wailwan group inhabited the area north of the study area surrounding the Macquarie Marshes and its tributary waterways. The area associated with the Wiradjuri people to the south of the study area is vast, from Gilgandra and Nyngan to Wagga Wagga, encompassing local groups with distinct cultural and social practices.

Early accounts of first contact between colonists and Aboriginal people in the Macquarie River area can be found in Oxley (1820) and Sturt (1828 and 1833). Oxley also records some details of the scouting of Evans during their 1818 expedition that passed 20 km north of the current study area between Armatree and Curban near the Castlereagh River. While the ethnographic information in these explorers' accounts is limited, the people encountered by Evans and Oxley as they traversed from the Macquarie Marshes to the Warrumbungles were recorded to be travelling, hunting or camping in small groups. Oxley comments in detail on the tools and equipment of the hunters in particular, noting "…*lances… elamongs (shields), clubs, chisels and workbags filled with…paint and feathers, necklaces of teeth…nets and [possum skin] clokes*" (Oxley 1820 cit. in Whitehead 2004: 145). Evans noted a large number of camps as they passed through the area as he felt their own camp was "surrounded by their smokes". The low-lying areas were in flood and noted be well-resourced with waterbirds and fish.

4.2 REGIONAL ARCHAEOLOGICAL CONTEXT

Previous archaeological studies undertaken within the region are summarised below to provide information to obtain a sound understanding of the nature and distribution of archaeological sites within the area.

4.2.1 OzArk 2011. *Aboriginal Heritage Assessment: Proposed Yarrandale to Gilgandra 66kV Transmission Line*

OzArk (2011) were commissioned by Essential Energy to undertake an Aboriginal heritage assessment for the proposed Yarrandale to Gilgandra 66kV transmission line. The landforms of the assessed area comprised a gently undulating terrain in the vicinity of the Talbragar River and a number of smaller named creeks. The field survey identified four artefact scatters with potential archaeological deposit (PAD) along creek banks and adjacent landforms, and three scarred trees within landforms with remnant vegetation.

4.2.2 OzArk 2016. *Central West Local Land Services Travelling Stock Reserves Study*

During 2016 OzArk was engaged by Central West Local Lands Service (CWLLS) to formulate and test a predictive model for Aboriginal site location within Travelling Stock Reserves (TSRs) across the CWLLS area. In formulating a predictive model for site location, Mitchell (2002) landscape units were used to characterise the landform types, which are often obscured by local variations in topography.

The resolution of the Mitchell landscape units was too fine to be of use across such a broad area; therefore, OzArk 2016 used a higher-level classification within Mitchell landscapes to describe the landscapes within the CWLLS area and divided the various landscape types based on the below characteristics:

- Channels and Floodplains
- Alluvial Plains
- Slopes
- Uplands
- Downs.

Previously recorded sites registered with AHIMS were plotted against this list of landscape types, the following observations were made:

- A high number of sites (n=876) have been recorded in Slopes landscapes. This is perhaps biased by the fact that Dubbo is located within this landscape type and the highest number of sites in the CWLLS area have been recorded in and around Dubbo
- The highest concentration of sites is within Channel and Floodplain landscapes (n=927)
- Alluvial Plains landscapes have the third highest concentration of sites (n=770)
- Relatively small numbers of sites are recorded in Uplands (n=5) or Plateau landscapes (n=34)
- A moderate number of sites have been recorded in Downs landscapes (n=255). These recordings were largely due to three or four clusters of sites that may have skewed the data. If the veracity of all site recordings in this category was able to be verified, it was suspected that the actual number of sites in Downs landscapes would be lower.

Following a 2014 study by OzArk (a predictive modelling tool for landforms surrounding the City of Dubbo), OzArk (2016) divided the CWLLS area into two stream orders: major waterways (normally named rivers) and minor waterways (normally named creeks and their larger tributaries). Based on the evidence of Aboriginal site location set out in OzArk's 2014 study, two buffers were established for each waterway type, namely:

- 200 m either side of a major waterway (Drainage 1 buffer)

- 100 m either side of a minor waterway (Drainage 2 buffer).

Thus, the OzArk (2016) CWLLS predictive model became an interplay between a location's landscape type and its distance to drainage lines. This model was tested by assessing 32 TSRs within the CWLLS area that represent a variety of landscape types and at variable distances to water. As a result of the assessment, 59 sites were recorded. 26 (44 per cent) of the sites were scarred trees, 22 (37 per cent) were artefact scatters and 11 (19 per cent) were isolated finds.

The majority of recorded sites were located in Channel and Floodplain landscapes (35 sites or 59 per cent of all sites). This was followed by 10 sites located in Slopes landscapes, four in Alluvial Plains landscapes and one in Downs landscapes. No sites were recorded in Uplands or Plateau landscapes.

Table 4-1 clearly demonstrates that the most archaeologically sensitive landscapes in the CWLLS area is Channels and Floodplains, followed by Slopes landscapes. Other landscape types have a low representation, however, do show that sites are possible in all landscape types.

Table 4-1: Association of all recorded sites to landscape units (OzArk 2016).

Landscape unit	Number of sites	Percentage of total (n=59)
Channels and Floodplains	36	61
Alluvial Plains	6	10
Slopes	14	23
Downs	1	2
Uplands	2	4
Plateau	0	0

Site types associated with the landscapes most-frequently recording sites (Channels and Floodplains, and Slopes), are that Channel and Floodplain landscapes are more likely to contain scarred trees and Slopes landscapes are more likely to contain artefact scatters/isolated finds (**Table 4-2**).

Table 4-2: Frequency of site types in association with landscape types (OzArk 2016).

Site type	Channels and Floodplains	Slopes
Artefact scatter	11 (30.5%)	7 (50%)
Isolated Finds	4 (11%)	3 (21%)
Scarred trees	21 (58.5%)	4 (29%)

The association of sites recorded in the OzArk (2016) study to the drainage buffers established in the predictive model indicates that 27 sites (or 46 per cent of all sites) were recorded within the Drainage 1 buffer and 10 sites (or 17 per cent of all sites) were recorded within the Drainage 2 buffer. Therefore, in excess of 63 per cent of all sites were recorded within one of the two drainage buffers; although with a clear bias to Drainage 1 buffer areas.

Implications for the current study area

The study area is situated on a basalt outcrop landform with moderate elevation above the surrounding alluvial plains. As such, it is best considered an extension of the slope landscape located immediately to the east. OzArk (2016) suggests that this landscape would have moderate archaeological sensitivity, accounting for 23% of sites identified (n=14). However, the distance of the study area from reliable fresh water (over 2 km) places the study area outside of the two drainage buffers in which 63% of all sites were recorded. According to the OzArk 2016 model, archaeological sensitivity of the study area is substantially lowered.

4.2.3 OzArk 2017b. *Aboriginal Due Diligence Archaeological Assessment: Gilgandra Solar Farm*.

OzArk undertook an Aboriginal due diligence assessment for the proposed Gilgandra Solar Farm in 2017. The assessment area included 188 ha of land, the majority of which was extensively cleared and subject to cultivation. The assessment area was situated over a gentle sloping receding to the southeast towards Drillwarrina Creek. The field inspection identified one previously unrecorded isolated find (Oakvale IF1). Previously recorded AHIMS site #28-4-0056 was located during the field inspection and an extension of the site from the original recording was made as artefacts were identified on the same landform outside the previously delineated site extent.

4.2.4 OzArk 2018. *Aboriginal Due Diligence Archaeological Assessment: Gilgandra CBD Project Stage II*.

In 2018 OzArk assessed a 500 m area along the western bank of the Castlereagh River in Gilgandra for a proposed walking path. The terrace landform was assessed to have high archaeological from the desktop level, however, the visual inspection identified high levels of disturbance within the study area and its archaeological potential was assessed to be low. No Aboriginal objects were recorded during the inspection.

4.2.5 OzArk 2020. *Aboriginal Due Diligence Archaeological Assessment: Gilgandra Industrial Subdivision.*

OzArk completed a heritage assessment for a proposed subdivision in Gilgandra. The study area was approximately 140 ha of land on the Castlereagh alluvial plains. Based on the landforms present in the study area and extensive ground surface disturbance, it was concluded that there was low potential for the presence of any Aboriginal sites. No Aboriginal objects and landforms with archaeological potential were recorded during the inspection.

4.3 LOCAL ARCHAEOLOGICAL CONTEXT

4.3.1 Desktop database searches conducted

A desktop search was conducted of the following databases to identify any potential previously recorded heritage within the study area. The results of this search are summarised in **Table 4-3** and presented in detail in **Appendix 1**.

Table 4-3: Aboriginal cultural heritage: desktop-database search results.

Name of Database Searched	Date of Search	Type of Search	Comment
Commonwealth Heritage Listings	28/9/2020	Gilgandra LGA	No places listed on either the National or Commonwealth heritage lists are located within the study area
National Native Title Claims Search	28/9/2020	NSW	No Native Title Claims cover the study area.
AHIMS	25/9/2020	20 x 20 km centred on the study area	Nine sites located within the search area however none are located within or near to the study area.
Local Environmental Plan (LEP)	28/9/2020	Gilgandra LEP of 2011	None of the Aboriginal places noted occur within or near to the study area.

A search of the AHIMS database on 25 September 2020 returned nine records for Aboriginal heritage sites within a 20 km x 20 km search area over the study area (GDA Zone 55 Eastings: 620237–640237, Northings: 6480178–6500178). **Figure 4-1** shows the location of the AHIMS sites that have been recorded in relation to the study area. All previously recorded sites are located over 7 km from the study area.

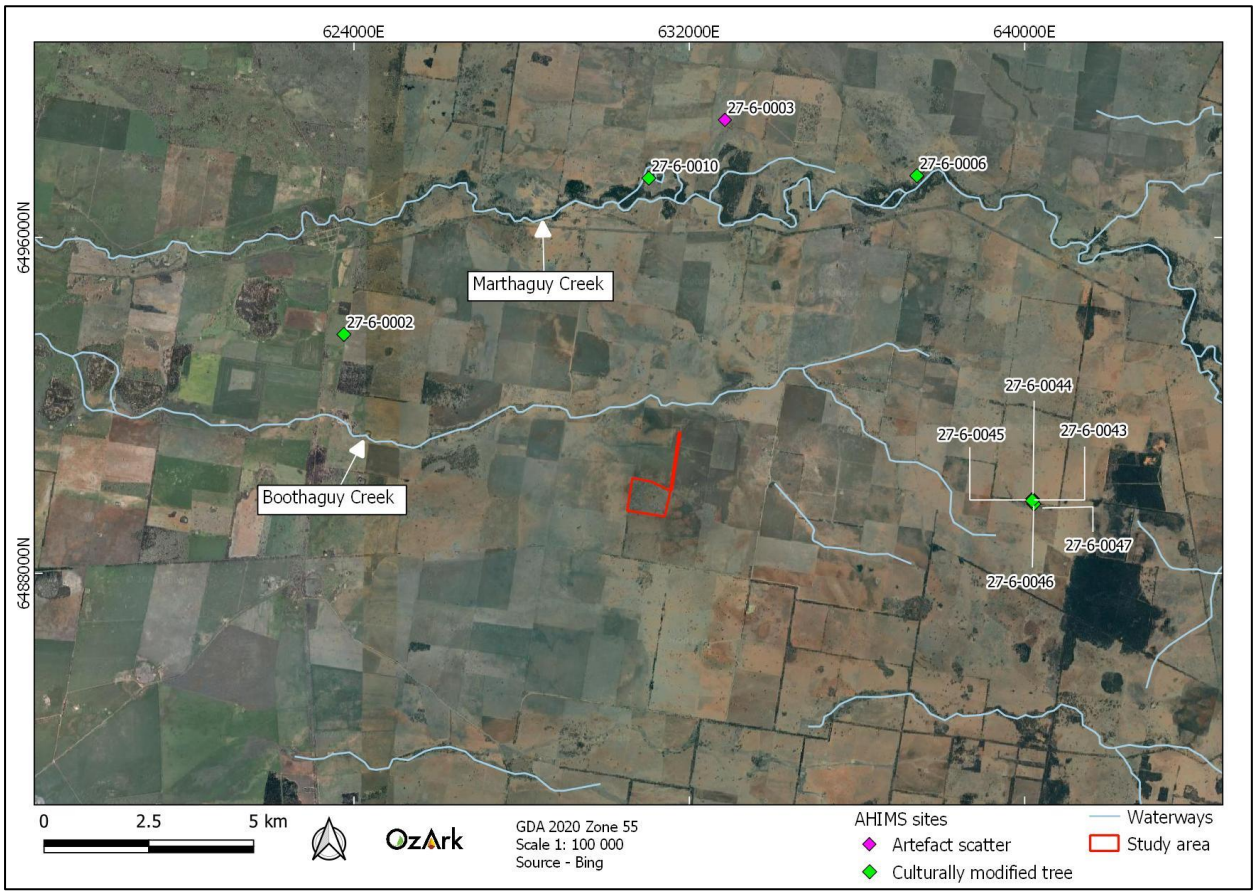
Of the previously recorded sites, eight are culturally modified trees and one is an artefact scatter. Seven of the culturally modified trees are listed as scarred trees, while one is recorded as a carved tree (27-6-0002).

The paucity of AHIMS recordings in the search area renders interpretation of settlement patterns difficult. The AHIMS search results and the regional archaeological context show that few archaeological surveys and studies have been undertake near the study area. As such, the absence of sites does not suggest that there is low archaeological sensitivity across the landforms in the local area, but rather that the sites and objects that exist have not been recorded.

According to the results of the CWLLS study (**Section 4.2.2**), the most archaeologically sensitive landscapes in the CWLLS area is Channels and Floodplains, followed by Slopes landscapes (OzArk 2016). The results of the AHIMS search are generally consistent with this finding with four previously recorded sites located within the Channels and Floodplains (Castlereagh Channels and Floodplains) and five are within the Slopes landscapes (Goonoo Slopes). In addition, scarred trees are the prevalent site type across both landscapes. The CWLLS findings also concluded

that sites were most likely to be identified within 200 m of a major waterway (Drainage 1 buffer) and 100 m of a minor waterway (Drainage 2 buffer). The results of the AHIMS result do not accord to this result with none of the recorded sites located within either of the buffer areas. However, the prevalence of scarred trees is skewed by the five recordings located 8 km to the east of the study area all of which are recorded within 100 m of each other within the Slopes landscape.

Figure 4-1: Location of previously recorded AHIMS sites in relation to the study area.



4.4 PREDICTIVE MODEL FOR SITE LOCATION

Across Australia, numerous archaeological studies in widely varying environmental zones and contexts have demonstrated a high correlation between the permanence of a water source and the permanence and/or complexity of Aboriginal occupation. Site location is also affected by the availability of and/or accessibility to a range of other natural resources including: plant and animal foods; stone and ochre resources and rock shelters; as well as by their general proximity to other sites/places of cultural/mythological significance. Consequently, sites tend to be found along permanent and ephemeral water sources, along access or trade routes or in areas that have good flora/fauna resources and appropriate shelter.

In formulating a predictive model for Aboriginal archaeological site location within any landscape it is also necessary to consider post-depositional influences on Aboriginal material culture. In all but the best preservation conditions very little of the organic material culture remains of ancestral

Aboriginal communities survives to the present. Generally, it is the more durable materials such as stone artefacts, stone hearths, shells, and some bones that remain preserved in the current landscape. Even these, however, may not be found in their original depositional context since these may be subject to either (a) the effects of wind and water erosion/transport—both over short- and long-time scales—or (b) the historical impacts associated with the introduction of European farming practices including grazing and cropping, land degradation, and farm related infrastructure. Scarred trees, due to their nature, may survive for up to several hundred years but rarely beyond.

4.4.1 Conclusion

Based on knowledge of the environmental contexts of the study area and a desktop review of the known local and regional archaeological record, the following predictions are made concerning the probability of those site types being recorded within the study area.

- Isolated finds may be indicative of: random loss or deliberate discard of a single artefact, the remnant of a now dispersed and disturbed artefact scatter, or an otherwise obscured or sub-surface artefact scatter. They may occur anywhere within the landscape but are more likely to occur in topographies where open artefact scatters typically occur.
    - As isolated finds can occur anywhere, particularly within disturbed contexts, it is predicted that this site type could be recorded within the study area.
- Open artefact scatters are defined as two or more artefacts, not located within a rock shelter, and located no more than 50 m away from any other constituent artefact. This site type may occur almost anywhere that Aboriginal people have travelled and may be associated with hunting and gathering activities, short- or long-term camps, and the manufacture and maintenance of stone tools. Artefact scatters typically consist of surface scatters or sub-surface distributions of flaked stone discarded during the manufacture of tools but may also include other artefactual rock types such as hearth and anvil stones. Less commonly, artefact scatters may include archaeological stratigraphic features such as hearths and artefact concentrations which relate to activity areas. Artefact density can vary considerably between and across individual sites. Small ground exposures revealing low density scatters may be indicative of a background scatter rather than a spatially or temporally distinct artefact assemblage. These sites are classed as 'open', that is, occurring on the land surface unprotected by rock overhangs, and are sometimes referred to as 'open camp sites'.

  Artefact scatters are most likely to occur on level or low gradient contexts, along the crests of ridgelines and spurs, and elevated areas fringing watercourses or wetlands. Larger sites may be expected in association with permanent water sources.

  Topographies which afford effective through-access across, and relative to, the surrounding landscape, such as the open basal valley slopes and the valleys of creeks, will tend to contain more and larger sites, mostly camp sites evidenced by open artefact scatters.

- The study area mostly comprises a low gradient hill distant from any semi-reliable water sources. Therefore, the landform present and lack of water would not have drawn Aboriginal people to the study area on a regular basis. The abundance of basalt would have been a greater attraction of Aboriginal people to the area. Therefore, should the basalt present have been utilised for stone tool procurement then it is expected that artefacts will be present. Should any additional materials be identified than they will have been transported to this location.

  Findings from the historical documents, largely the journals of early explorers including Oxley, describe small camps in the region, even in areas in proximity to reliable water (the Castlereagh River) (**Section 4.1**). As the study area does not contain any hydrological features, the ethnographic information suggests only very small, less-complex artefact scatters will be recorded, if any at all.

- Aboriginal scarred trees contain evidence of the removal of bark (and sometimes wood) in the past by Aboriginal people, in the form of a scar. Bark was removed from trees for a wide range of reasons. It was a raw material used in the manufacture of various tools, vessels and commodities such as string, water containers, roofing for shelters, shields and canoes. Bark was also removed because of gathering food, such as collecting wood boring grubs or creating footholds to climb a tree for possum hunting. Due to the multiplicity of uses and the continuous process of occlusion (or healing) following removal, it is difficult to accurately determine the intended purpose for any example of bark removal. Scarred trees may occur anywhere old growth trees survive. The identification of scars as Aboriginal cultural heritage items can be problematical because some forms of natural trauma and European bark extraction create similar scars. Many remaining scarred trees probably date to the historic period when bark was removed by Aboriginal people for both their own purposes and for roofing on early European houses. Consequently, the distinction between European and Aboriginal scarred trees may not be clear.

  - Culturally modified trees, particularly scarred trees, are the dominant site type in the vicinity of the study area (**Section 4.3**). Previous recordings in the region show a prevalence of culturally modified trees within the Channels and Floodplains and the Slopes landscapes. While the study area is located within the Basalts (hills) landscape, it is considered to be an extension of the Slopes landscape (**Section 4.3.1**). This in combination with the presence of remnant mature vegetation within the study area means culturally modified trees may be identified.

- Quarry sites and stone procurement sites typically consist of exposures of stone material where evidence for human collection, extraction and/or preliminary processing has survived. Typically, these involve the extraction of siliceous or fine grained igneous and meta-sedimentary rock types for the manufacture of artefacts. The presence of quarry/extraction sites is dependent on the availability of suitable rock formations.

  - The underlying geology of the study area and the known presence of outcropping basalt within the study area suggest that quarry sites and stone procurement sites may be identified. However, it should be noted that the 2017 which included the central portion of the study area did not identify any evidence of quarrying.

- Burials are generally found in soft sediments such as aeolian sand, alluvial silts and rock shelter deposits. In valley floor and plains contexts, burials may occur in locally elevated topographies rather than poorly drained sedimentary contexts. Burials are also known to have occurred on rocky hilltops in some limited areas. Burials are generally only visible where there has been some disturbance of sub-surface sediments or where some erosional process has exposed them.
    - While the soils of the study area comprise a sandy loam (**Section 3.2**), the underlying geology and thin A Horizon soils suggest that it is unlikely to have been used for burials in the past.
- Bora/Ceremonial sites are places which have ceremonial or spiritual connections. Ceremonial sites may comprise of natural landscapes or have archaeological material. Bora sites are ceremonial sites which consist of a cleared area and earthen rings.
    - This site type does not necessarily follow landform predictability and are, overall, a rare site type with a low likelihood of being present and remaining extant.

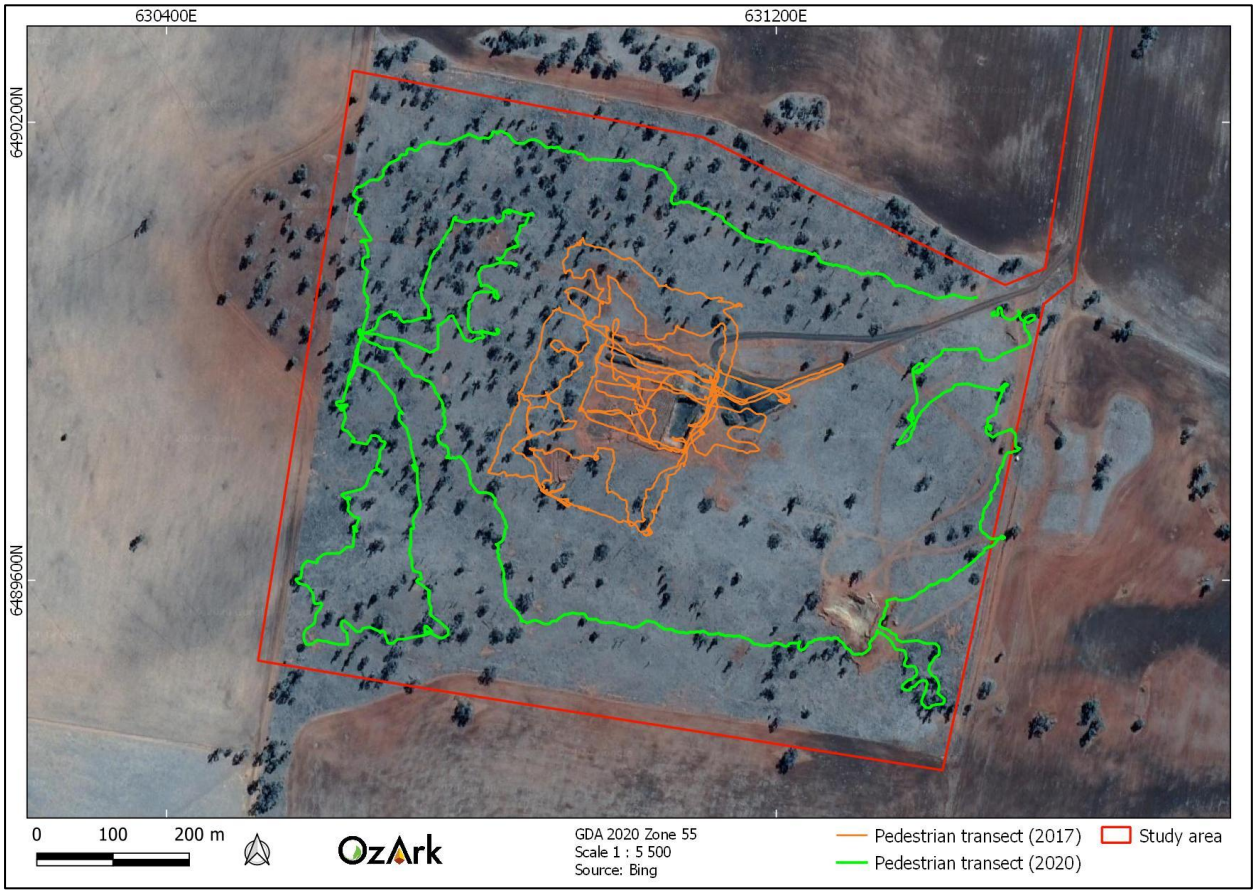
5 RESULTS OF ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

5.1 SAMPLING STRATEGY AND FIELD METHODS

The Aboriginal cultural heritage assessment of the study area will follow the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (Code of Practice; DECCW 2010). The field inspection will follow the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (The Guide; OEH 2011).

The study area was inspected by pedestrian transects focussing on areas of exposure and mature, native trees. **Figure 5-1** shows the survey tracks of the OzArk archaeologist during the survey. As well as the archaeologist, there were two Aboriginal site officers undertaking the survey, so the actual area of survey coverage was greater than is indicated on this figure. The survey excluded areas which were subject to the 2017 survey for the existing quarry (**Figure 5-1**).

Figure 5-1: Pedestrian coverage of the study area during the 2020 survey and the 2017 inspection.



5.2 EFFECTIVE SURVEY COVERAGE

Two of the key factors influencing the effectiveness of archaeological survey are ground surface visibility (GSV) and ground surface exposure (GSE). These factors are quantified to ensure that the survey data provides adequate evidence for the evaluation of the archaeological materials

across the landscape. For the purposes of the current assessment, these terms are used in accordance with the definitions provided in the Code of Practice.

GSV is defined as:

> *… the amount of bare ground (or visibility) on the exposures which might reveal artefacts or other archaeological materials. It is important to note that visibility, on its own, is not a reliable indicator of the detectability of buried archaeological material. Things like vegetation, plant or leaf litter, loose sand, stone ground or introduced materials will affect the visibility. Put another way, visibility refers to 'what conceals'* (DECCW 2010: 39).

GSE is defined as:

> *… different to visibility because it estimates the area with a likelihood of revealing buried artefacts or deposits rather than just being an observation of the amount of bare ground. It is the percentage of land for which erosion and exposure was sufficient to reveal archaeological evidence on the surface of the ground. Put another way, exposure refers to 'what reveals'* (DECCW 2010: 37).

Table 5-1 calculates the effective survey coverage within the study area. In general, **Table 5-1** presents an approximation of the amount of ground surface able to be seen at any location within the study area. For example, at any one location within the study area approximately 15% of the ground surface could be seen (**Plate 3** and **Plate 4**). Exposures in these landforms were afforded by farm tracks, along fences and around a dam in the south.

Table 5-1: Effective survey coverage within the study area.

Survey Unit	Landform	Survey Unit Area (sq m)	Visibility %	Exposure %	Effective Coverage Area (sq m) (= Survey Unit Area x Visibility % x Exposure %)	Effective Coverage % (= Effective Coverage Area / Survey Unit Area x 100)
1	Low gradient hill	680,000	75	20	102,000	15

Table 5-2 demonstrates that although the survey efficacy was reasonable at approximately 15%, no sites were recorded. As such, the low percentage of site recordings is due to factors other than survey efficacy (such as landform type, distance to water etc.).

Table 5-2: Effective survey coverage and incidences of site recording.

Landform	Landform area (sq m)	Area Effectively Surveyed (sq m) (= Effective Coverage Area)	% of Landform Effectively Surveyed (= Area Effectively Surveyed / Landform x 100)	Number of Sites
Low gradient hill	680,000	102,000	15	1 (scarred tree)

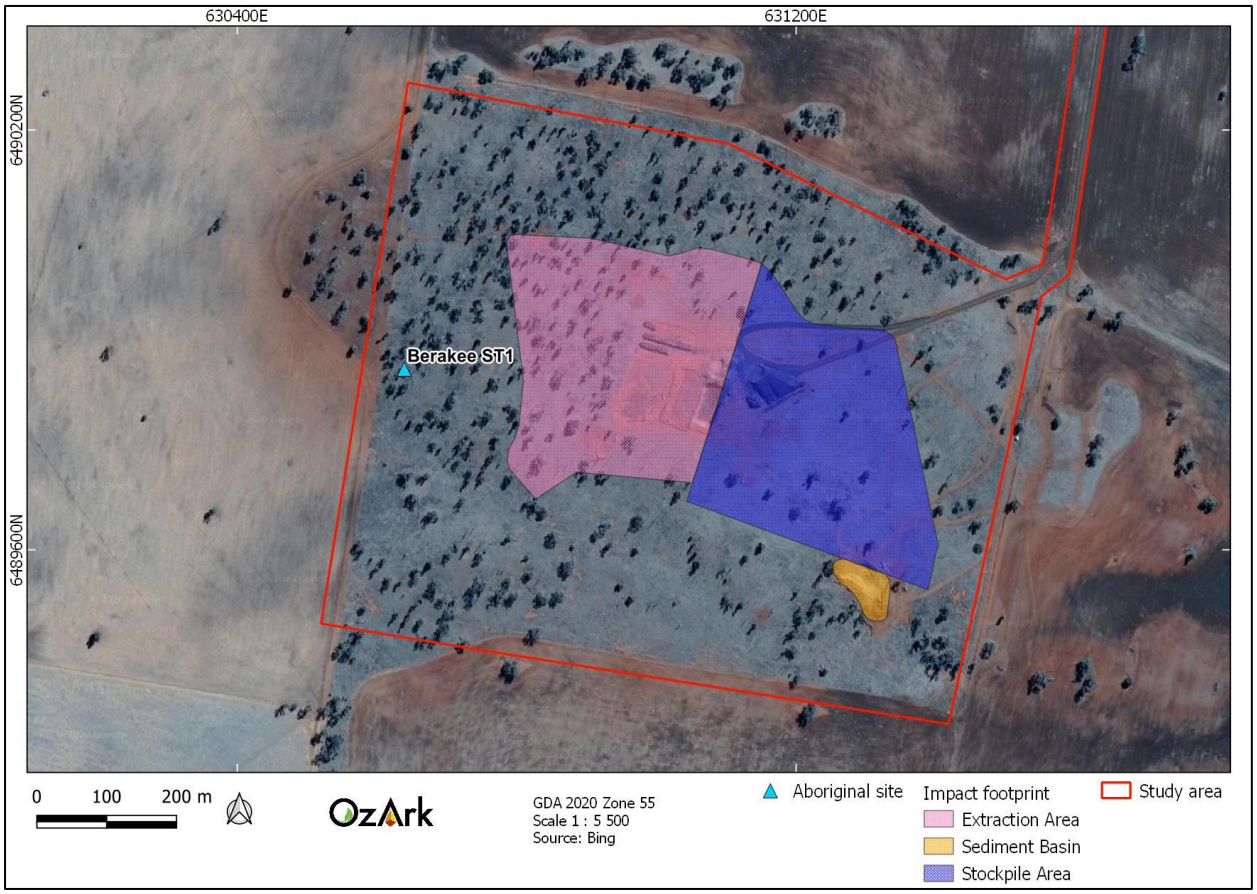
5.3 ABORIGINAL SITES RECORDED

One previously unrecorded Aboriginal site, a scarred tree, was recorded during the survey (**Table 5-3** and **Figure 5-2**). No landforms within the study area were assessed as likely to contain subsurface archaeological deposits.

Table 5-3: Recorded Aboriginal site details.

Site Name	Coordinates (GDA20 Zone 55)	Site type
Berakee-ST1	630638E 6489858N	Scarred tree

Figure 5-2: Location of Berakee-ST1 within the study area.



Berakee-ST1

Site Type: Scarred tree

GPS Coordinates: GDA20 Zone 55 630638E 6489858N

Location of Site: Berakee-ST1 is located along the western boundary of Lot 1 DP 1265657 on the Berakee property (**Figure 5-2**). The site is 3.1 km west of Berida-Innisfail Road and 6.2 km south of the Oxley Highway.

Description of Site: Berakee-ST1 is a box located on a low crest in an area with scattered mature and regrowth trees. The tree exhibits one cultural scar which is elongated with irregular regrowth on one side (**Table 5-4** and **Figure 5-3**).

Table 5-4: Berakee-ST1 attributes.

Type of tree	Box
Condition of tree (good, fair, dead)	Good
Scar Length (cm)	83
Scar Width (cm)	33
Scar Depth (cm)	19
Overgrowth (cm)	30
Scar shape (Elongated, oval, irregular)	Elongated
Orientation (direction of scar is facing)	Southwest
Condition of scar (good, fair, poor)	Good
Associated with artefacts/PAD	No

Figure 5-3: Berakee-ST1. View of the scarred tree and surrounds.

1. Berakee-ST1, view of the scar and surrounds.

2. Berakee-ST1, close up of the scar on the inside of a split trunk.

3. Berakee-ST1, detail of the scar.

5.4 ABORIGINAL COMMUNITY INPUT

Two Aboriginal site officers from the Gilgandra LALC were present during the field survey (**Section 2.5**). There were no objections to the manner in which the survey implemented and completed, and all field inspection processes were discussed and agreed upon prior to their enactment.

5.5 DISCUSSION

Predictions based on landform modelling and the regional archaeological context concluded that scarred trees; quarries and stone artefacts were the most likely site types to be identified based on the presence of remnant mature vegetation and outcropping basalt (**Section 4.4**). The results of the current study partially conform to the predictive model with one scarred tree being identified (**Section 5.3**). Of the basalt cobbles observed none showed evidence of knapping or quarrying procurement activities for the purpose of stone artefact manufacture.

The identification of a scarred tree within the Slopes landscape unit is consistent with the findings of the CWLLS study and the location of previously recorded scarred trees in the local area. While scarred trees in this landscape unit were more likely to be located within either a drainage 1 or drainage 2 buffer, Berakee-ST1 is located well outside these buffers (over 2 km). The location of Berakee-ST1 does, however, accord with the location of other previously recorded scarred trees in the surrounding area; all of which are also located outside these buffers.

6 SIGNIFICANCE AND IMPACT ASSESSMENT

6.1 ASSESSMENT OF SIGNIFICANCE

The concept of cultural significance is used in Australian heritage practice and legislation to encompass all of the cultural values and meanings that might be recognised in a place. The *Burra Charter*'s (Burra Charter 2013) definition of cultural significance is broad and encompasses places that are significant to Indigenous cultures.

The *Burra Charter* definition of 'place' is also broad and encompasses Indigenous places of cultural significance. 'Place' includes locations that embody spiritual value (such as Dreaming places, sacred landscapes, and stone arrangements), social and historical value (such as massacre sites), as well as scientific value (such as archaeological sites). In fact, one place may be all of these things or may embody all of these values at the same time.

In some cases, the find-spot of a single artefact may constitute a 'place'. Equally, a suite of related locations may together comprise a single 'place', such as the many individual elements that make up a songline. These more complex places are sometimes called a cultural landscape or cultural route.

The *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011: 8–9) notes that cultural significance is comprised of an assessment of social values, scientific values, aesthetic values, and historic values. These values are described as:

Social or Cultural Value

Social or cultural value refers to the spiritual, traditional, historical or contemporary associations and attachments the place or area has for Aboriginal people. Social or cultural value is how people express their connection with a place and the meaning that place has for them.

Places of social or cultural value have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities can experience a sense of loss should a place of social or cultural value be damaged or destroyed.

There is not always consensus about a place's social or cultural value. Because people experience places and events differently, expressions of social or cultural value do vary and, in some instances, will be in direct conflict. When identifying values, it is not necessary to agree with or acknowledge the validity of each other's values, but it is necessary to document the range of values identified.

Social or cultural value can only be identified through consultation with Aboriginal people. This could involve a range of methodologies, such as cultural mapping, oral histories, archival

documentation and specific information provided by Aboriginal people specifically for the investigation.

This type of value may not be in accord with interpretations made by the archaeologist: a site may have low archaeological value but high social value, or vice versa.

Archaeological/Scientific Value

This refers to the importance of a landscape, area, place or object because of its rarity, representativeness and the extent to which it may contribute to further understanding and information (Burra Charter 2013).

Information about scientific values will be gathered through any archaeological investigation undertaken. Archaeological investigations must be carried out according to Heritage NSW's *Code of practice for archaeological investigation of Aboriginal objects in NSW*.

Often scientific values are informed by social values that allow a contemporary understanding of the archaeological data to be understood.

Assessing a site in this context involves placing it into a broader regional framework, as well as assessing the site's individual merits in view of current archaeological discourse. This type of value relates to the ability of a site to answer current research questions and is also based on a site's condition (integrity), content and representativeness.

The overriding aim of cultural heritage management is to preserve a representative sample of the archaeological resource. This will ensure that future research within the discipline can be based on a valid sample of the past. Establishing whether a site can contribute to current research also involves defining 'research potential'. Questions regularly asked when determining significance are: can this site contribute information that no other site can? Is this site representative of other sites in the region?

Aesthetic Value

This refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with the social values. It may consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use (Burra Charter 2013).

Historic Value

Historic value refers to the associations of a place with a historically important person, event, phase or activity in an Aboriginal community. Historic places do not always have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). They may have 'shared' historic values with other (non-Aboriginal) communities.

Places of post-contact Aboriginal history have generally been poorly recognised in investigations of Aboriginal heritage. Consequently, the Aboriginal involvement and contribution to important regional historical themes is often missing from accepted historical narratives. This means it is often necessary to collect oral histories along with archival or documentary research to gain enough understanding of historic values.

6.2 ASSESSED SIGNIFICANCE OF THE RECORDED SITES

Table 6-1 presents a summary of the significance assessment of Aboriginal cultural heritage sites recorded during this assessment. Further details of each of the assessment criteria are provided below.

Social or Cultural Value

The assessment of cultural or social value concerns the importance of a site or features to the relevant cultural group – in this case the Aboriginal community. Aspects of social value include assessment of sites, items, and landscapes that are traditionally significant or that have contemporary importance to the Aboriginal community. This importance involves both traditional links with specific areas, as well as an overall concern by Aboriginal people for their sites generally and the continued protection of these. This type of value may not be in accord with interpretations made by the archaeologist: a site may have low archaeological value but high social value, or vice versa.

The social or cultural value of Berakee-ST1 has been assessed as high in accordance with the views of the Aboriginal site officers (Wayne and Russell Bamblett) who attended the survey.

Archaeological/Scientific Value

The recorded scarred tree identified is a representative example of the region's most common site type. Due to the frequency of this site type within the region and locality, the archaeological significance of the site is reduced. Furthermore, the tree is not associated with a landform displaying a high level of sub-surface archaeological potential and therefore has low research potential.

Aesthetic Value

Berakee-ST1 has been assessed as having low aesthetic value. Despite scars on trees being typically less difficult for the layperson to interpret, the tree is located within a landscape which has been modified by agricultural practices and quarrying.

Historic Value

Berakee-ST1 does not have an apparent direct relationship to known historic Aboriginal sites (e.g. missions, massacre sites, etc.). As such, this site is assessed as having no historic value.

Table 6-1: Aboriginal cultural heritage: significance assessment.

Site Name	Social or Cultural Value	Archaeological / Scientific Value	Aesthetic Value	Historic Value
Berakee-ST1	High	Low	Low	None

6.3 LIKELY IMPACTS TO ABORIGINAL HERITAGE FROM THE PROPOSAL

Berakee-ST1 is located 170 m from the nearest impact associated with the proposal (the extraction area; **Figure 5-2**). As such, Berakee-ST1 will not be impacted by the proposal (**Table** 6-2).

Table 6-2: Aboriginal cultural heritage: impact assessment.

Site Name	Type of Harm (Direct/Indirect None)	Degree of Harm (Total/Partial/None)	Consequence of Harm (Total/Partial/No Loss of Value)
Berakee-ST1	None	None	No loss of value

6.4 ECOLOGICALLY SUSTAINABLE DEVELOPMENT PRINCIPLES

Ecologically sustainable development principles (ESD) (defined in s.6 of the *Protection of the Environment Administration Act 1991*) requires the integration of economic and environmental considerations (including cultural heritage) in the decision-making process.

With regards to cultural heritage, the most important aspect of ESD is inter-generational equity whereby the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. Similarly, inter-generational equity maintains that places and items of cultural heritage value should be preserved for the education, enjoyment and use of future generations.

The development does not add to the cumulative impact on the region's Aboriginal cultural heritage as no sites will be harmed.

Conversely, the proposal has added to inter-generational equity as it has allowed an archaeologist and Aboriginal community members to visit the area and record a site. As a result, the site is now known and statutorily protected so that it will be available for cultural or educational purposes into the future.

7 MANAGEMENT OF ABORIGINAL CULTURAL HERITAGE SITES

7.1 GENERAL MANAGEMENT PRINCIPLES

Appropriate management of cultural heritage items is primarily determined based on their assessed significance as well as the likely impacts of the proposed development. **Section 6.2** and **Section 6.3** describe, respectively, the significance / potential of the recorded sites and the likely impacts of the development. The following management options are general principles, in terms of best practice and desired outcomes, rather than mitigation measures against individual site disturbance.

- Avoid impact by altering the development proposal or in this case by avoiding impact to a recorded Aboriginal site. If this can be done, then a suitable curtilage around the site must be provided to ensure its protection both during the short-term construction phase of development and in the long-term use of the area. If plans are altered, care must be taken to ensure that impacts do not occur to areas not previously assessed.

- If impact is unavoidable then approval to disturb sites under the authority of an AHIP must be sought from Heritage NSW. Whether the AHIP is consented will depend on many factors including the site's assessed significance. An AHIP application must be accompanied by an Aboriginal Cultural Heritage Assessment Report (ACHAR) and follow the *Aboriginal cultural heritage consultation requirements for proponents* (DECCW 210b).

7.2 MANAGEMENT AND MITIGATION OF RECORDED ABORIGINAL SITES

Newly recorded Aboriginal site Berakee-ST1 is located 170 m from the nearest impact associated with the proposal (the extraction area; **Section 6.3**). As such, management in the form of creating an exclusion buffer around the scarred tree is not considered necessary.

While the Berakee-ST1 will not be impacted by the proposal, inductions for staff undertaking the proposed work should indicate the presence and location of Berakee-ST1 and explain the legislative protection requirements for Aboriginal sites and objects in NSW under the NPW Act and the relevant fines for non-compliance.

8 RECOMMENDATIONS

Under Section 89A of the NPW Act it is mandatory that all previously unrecorded Aboriginal sites be registered with AHIMS. As a professional in the field of cultural heritage management it is the responsibility of OzArk to ensure this process is undertaken.

To this end it is noted that one previously unrecorded Aboriginal site was recorded during the assessment.

The following recommendations are made based on these impacts and with regard to:

- Legal requirements under the terms of the NPW Act whereby it is illegal to damage, deface or destroy an Aboriginal place or object without the prior written consent of Heritage NSW
- The findings of the current investigations undertaken within the study area
- The interests of the Aboriginal community.

Recommendations concerning Aboriginal cultural values within the study area are as follows:

1. An AHIP is not required as Aboriginal site Berakee-ST1 will not be harmed by the proposal.
2. All land-disturbing activities must be confined to within the assessed area. Should the parameters of the proposed work extend beyond the assessed area, then further archaeological assessment may be required by a suitably qualified archaeologist.
3. Inductions for staff undertaking the proposed work should indicate the location of Berakee-ST1 and explain the legislative protection requirements for all Aboriginal sites and objects in NSW under the NPW Act and the relevant fines for non-compliance. Staff should be briefed on the *Unanticipated Find Protocol* (**Appendix 2**) and the identification of Aboriginal objects within the local region, with particular emphasis placed upon stone artefact identification (**Appendix 4**).
4. In the unlikely event that Aboriginal skeletal material is encountered, the *Unanticipated Skeletal Remains Protocol* (**Appendix 3**) should be followed.

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PLATES

Plate 1: Detail of larger fragments of outcropping basalt present.

Plate 2: Detail of the red sandy loam present with a scatter of small basalt fragments.

Plate 3: View south along the eastern portion of the study area showing small areas of exposure.

Plate 4: View north from the eastern portion of the study area along a gentle slope.

Plate 5: View north from the southern portion of the study area which has been impacted by the construction of a dam and contouring.

Plate 6: View northwest to a stand of White Cypress Pine in the southwest of the study area.

Plate 7: View north from the top of the crest showing remnant Poplar Box in the background.

Plate 8: View east along a gentle slope in the north of the study area.

APPENDIX 1: AHIMS SEARCH RESULT

Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Berakee Quarry
Client Service ID : 538262

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
27-6-0047	Boothaguy Creek ST1	GDA	55	640225	6489651	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Newcastle,Mr.Andy Roberts					Permits		
27-6-0043	Boothaguy Creek ST5	GDA	55	640205	6489753	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Newcastle,Mr.Andy Roberts					Permits		
27-6-0044	Boothaguy Creek ST4	GDA	55	640185	6489754	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Newcastle,Mr.Andy Roberts					Permits		
27-6-0045	Boothaguy Creek ST3	GDA	55	640170	6489742	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Newcastle,Mr.Andy Roberts					Permits		
27-6-0046	Boothaguy Creek ST2	GDA	55	640185	6489730	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Jacobs Group (Australia) Pty Ltd - Newcastle,Mr.Andy Roberts					Permits		
27-6-0002	Collie;	AGD	55	623648	6493507	Open site	Valid	Modified Tree (Carved or Scarred) : -	Carved Tree	65
	Contact	Recorders	ASRSYS					Permits		
27-6-0003	Gewah;	AGD	55	632738	6498616	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	C.S Vale					Permits		
27-6-0006	Berida;	AGD	55	637318	6497287	Open site	Valid	Modified Tree (Carved or Scarred) : -	Carved Tree	65
	Contact	Recorders	Kate Sullivan					Permits		
27-6-0010	Ferngrove;Berida;	AGD	55	630923	6497229	Open site	Valid	Modified Tree (Carved or Scarred) : -	Carved Tree	65
	Contact	Recorders	ASRSYS					Permits		

Report generated by AHIMS Web Service on 25/09/2020 for Stephanie Rusden for the following area at Datum :GDA, Zone : 55, Eastings : 620237 - 640237, Northings : 6480178 - 6500178 with a Buffer of 0 meters. Additional Info : Survey. Number of Aboriginal sites and Aboriginal objects found is 9

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 1 of 1

APPENDIX 2: ABORIGINAL HERITAGE: UNANTICIPATED FINDS PROTOCOL

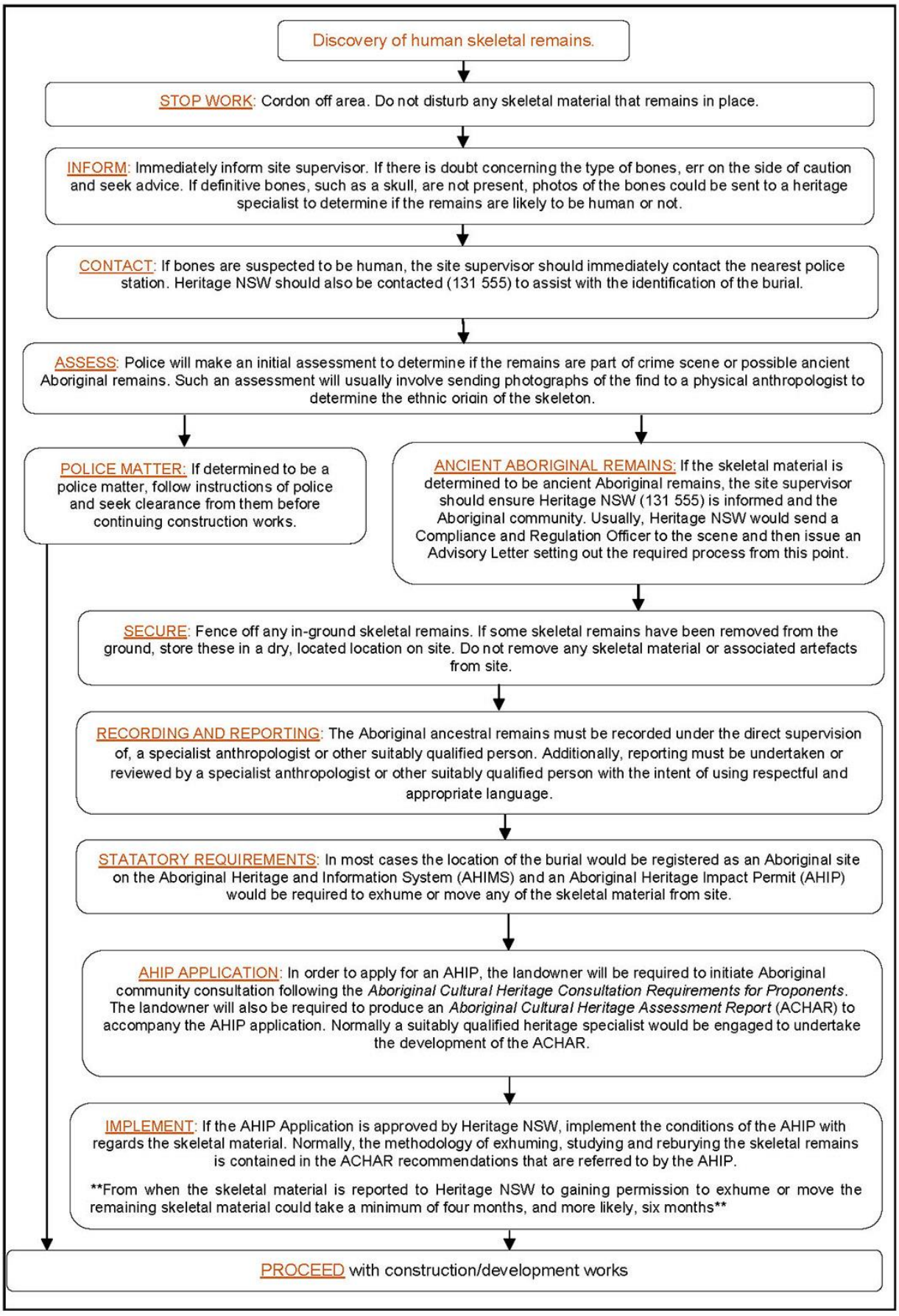
An Aboriginal artefact is anything which is the result of past Aboriginal activity. This includes stone (artefacts, rock engravings etc.), plant (culturally scarred trees) and animal (if showing signs of modification; i.e. smoothing, use). Human bone (skeletal) remains may also be uncovered while onsite.

Cultural heritage significance is assessed by the Aboriginal community and is typically based on traditional and contemporary lore, spiritual values, and oral history, and may also take into account scientific and educational value.

Protocol to be followed in the event that previously unrecorded or unanticipated Aboriginal object(s) are encountered:

1. If any Aboriginal object is discovered and/or harmed in, or under the land, while undertaking the proposed development activities, the proponent must:
    a. Not further harm the object;
    b. Immediately cease all work at the particular location;
    c. Secure the area so as to avoid further harm to the Aboriginal object;
    d. Notify Heritage NSW as soon as practical on 131 555, providing any details of the Aboriginal object and its location; and
    e. Not recommence any work at the particular location unless authorised in writing by Heritage NSW.
2. In the event that Aboriginal burials are unexpectedly encountered during the activity, work must stop immediately, the area secured to prevent unauthorised access and NSW Police and Heritage NSW contacted.
3. Cooperate with the appropriate authorities and relevant Aboriginal community representatives to facilitate:
    a. The recording and assessment of the find(s);
    b. The fulfilment of any legal constraints arising from the find(s), including complying with Heritage NSW directions; and
    c. The development and implementation of appropriate management strategies, including consultation with stakeholders and the assessment of the significance of the find(s).
4. Where the find(s) are determined to be Aboriginal object(s), recommencement of work in the area of the find(s) can only occur in accordance with any consequential legal requirements and after gaining written approval from Heritage NSW (normally an Aboriginal Heritage Impact Permit).

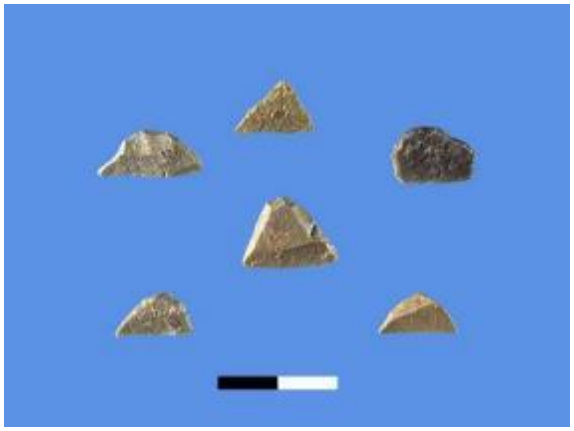
APPENDIX 3: UNANTICIPATED SKELETAL REMAINS PROTOCOL



APPENDIX 4: ABORIGINAL HERITAGE: ARTEFACT IDENTIFICATION

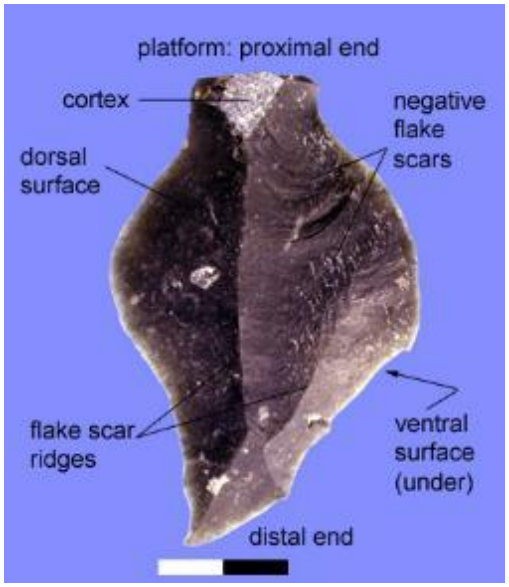
Basalt flake

Volcanic blades

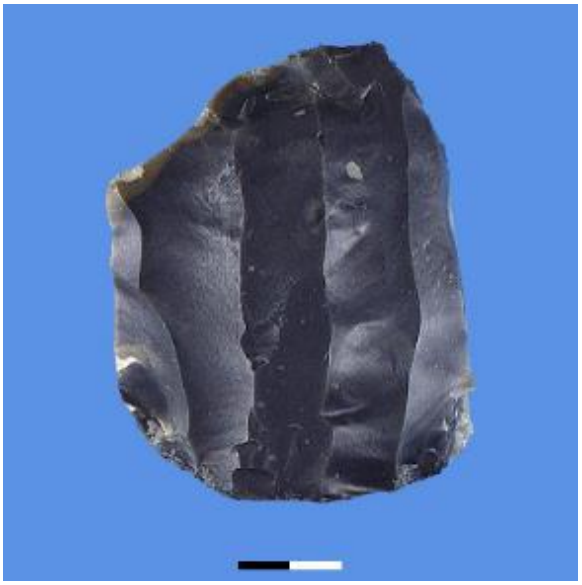


Microliths (scale = 1cm)

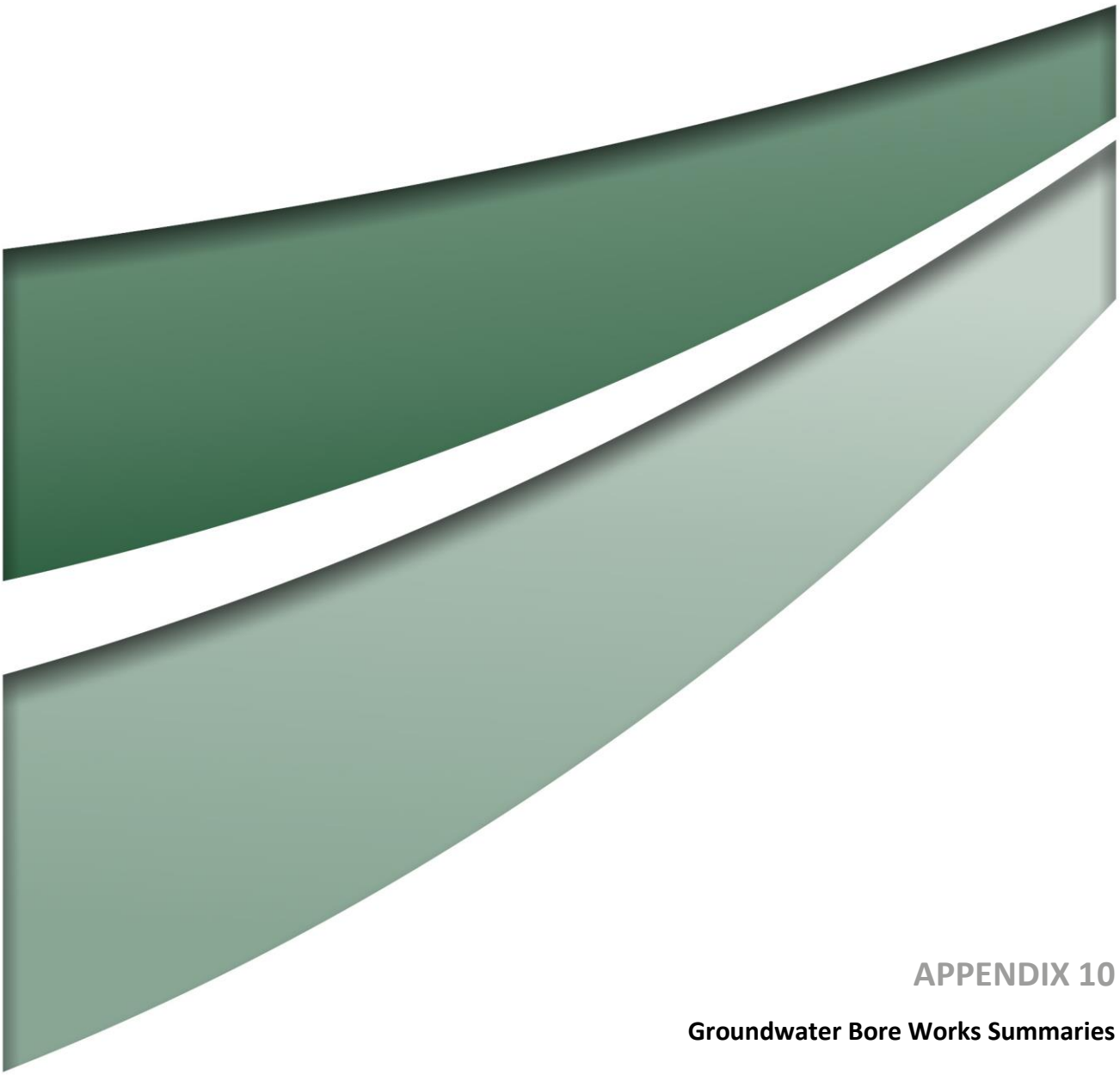
Scraper (scale = 1cm)



Flake characteristics (scale = 1cm)



Core from which flakes have been removed (scale = 1cm)



APPENDIX 10

Groundwater Bore Works Summaries

NSW Office of Water
Work Summary

GW018659

Licence: 80BL010754 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK
Intended Purpose(s): STOCK

Work Type: Bore
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/09/1960
Final Depth: 20.40 m
Drilled Depth: 20.40 m

Contractor Name:
Driller:
Assistant Driller:

Property: BERAKEE
GWMA: 811 - CENTRAL WEST FRACTURED ROCKS
GW Zone: -
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.015	45
Licensed:	EWENMAR	BUNDOBERING	Whole Lot //

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:
CMA Map: 8534-N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6489719.0
Easting: 631544.0
Latitude: 31°43'13.4"S
Longitude: 148°23'18.2"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Withdrawn	0.00	0.00				

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.83	1.83	Clay Red Basaltic Stones	Clay	
1.83	10.97	9.14	Clay Basaltic Stones	Clay	
10.97	14.02	3.05	Rock Hard	Rock	
14.02	19.81	5.79	Rock Basaltic Stones	Rock	
19.81	20.42	0.61	Basalt Hard	Basalt	

Remarks

***** End of GW018659 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

NSW Office of Water
Work Summary

GW010858

Licence: 80BL004006 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK
Intended Purpose(s): STOCK

Work Type: Bore open thru rock
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/06/1954
Final Depth: 37.70 m
Drilled Depth: 37.80 m

Contractor Name:
Driller:
Assistant Driller:

Property: BERAKEE
GWMA: 811 - CENTRAL WEST FRACTURED ROCKS
GW Zone: -
Standing Water Level (m):
Salinity Description: Fresh
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.015	45
Licensed:	EWENMAR	BUNDOBERING	Whole Lot //

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:
CMA Map: 8534-N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6490086.0
Easting: 631733.0
Latitude: 31°43'01.4"S
Longitude: 148°23'25.2"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	-0.30	22.50	152			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.80	22.90	0.10	Fractured	18.20		0.23			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.22	1.22	Clay Red	Clay	
1.22	4.27	3.05	Clay	Clay	
4.27	6.10	1.83	Stones	Gravel	
6.10	7.92	1.82	Stones Hard	Gravel	
7.92	9.14	1.22	Stones Soft	Gravel	
9.14	22.86	13.72	Clay Brownish Red	Clay	
22.86	23.01	0.15	Shale Loose Water Supply	Shale	
23.01	37.80	14.79	Shale Very Hard	Shale	

Remarks

***** End of GW010858 *****

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NSW Office of Water
Work Summary

GW013091

Licence: 80BL006065 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK
Intended Purpose(s): STOCK

Work Type: Bore
Work Status: Abandoned,Backfilled
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/03/1957
Final Depth: 60.00 m
Drilled Depth: 60.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: KINROSS
GWMA: 811 - CENTRAL WEST FRACTURED ROCKS
GW Zone: -
Standing Water Level (m):
Salinity Description: Fresh
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.15	55//47932
Licensed:	EWENMAR	BUNDOBERING	Whole Lot 55//47932

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:
CMA Map: 8534-N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6490696.0
Easting: 629793.0
Latitude: 31°42'42.4"S
Longitude: 148°22'11.2"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	36.00	60.00	200			Down Hole Hammer
1		Backfill	Drilled Cuttings	36.00	60.00	200			
1	1	Casing	Threaded Steel	-0.30	37.10	152			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
37.40	37.70	0.30	Consolidated	34.70		0.10			
41.40	41.70	0.30	Fractured	34.70		0.15			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	Soil	Soil	
0.30	4.57	4.27	Clay	Clay	
4.57	13.11	8.54	Clay Sand	Clay	
13.11	23.77	10.66	Clay	Clay	
23.77	31.09	7.32	Sandstone	Sandstone	
31.09	34.14	3.05	Clay	Clay	
34.14	41.45	7.31	Sandstone Water Supply	Sandstone	
36.00	60.00	24.00	Granite	Granite	
41.45	46.02	4.57	Shale Water Supply	Shale	

Remarks

24/01/2012: Nat Carling, 24-Jan-2012; This bore was deepened on 5/2/11 to 60m & then backfilled & abandoned. Attached new water licence.

***** End of GW013091 *****

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NSW Office of Water
Work Summary

GW054495

Licence: 80BL116283 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): GENERAL USE

Work Type: Bore
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/12/1981
Final Depth: 18.30 m
Drilled Depth: 18.30 m

Contractor Name:
Driller:
Assistant Driller:

Property: MYALL GLEN BERINDA INNISFAIL RD GILGANDRA 2827 NSW
GWMA: 601 - GREAT ARTESIAN BASIN
GW Zone: 013 - SOUTHERN RECHARGE GROUNDWATER SOURCE
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.015	44
Licensed:	EWENMAR	BUNDOBERING	Whole Lot 44//752563

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:
CMA Map: 8534-N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6491090.0
Easting: 632720.0
Latitude: 31°42'28.4"S
Longitude: 148°24'02.2"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Welded Steel	-0.80	18.30	165			Seated on Bottom
1	1	Opening	Slots - Vertical	13.70	18.30	165		1	Oxy-Acetylene Slotted, A: 3.18mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
14.60	14.90	0.30	Unconsolidated	12.20		0.88			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.83	1.83	Topsoil Dark Brown Sandy	Topsoil	
1.83	3.66	1.83	Clay Sandy	Clay	
3.66	11.28	7.62	Basalt	Basalt	
11.28	14.63	3.35	Basalt Decomposed	Basalt	
14.63	14.94	0.31	Basalt Decomposed Coarse Water Supply	Basalt	
14.94	18.29	3.35	Basalt	Basalt	

Remarks

***** End of GW054495 *****

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NSW Office of Water
Work Summary

GW016885

Licence: 80BL007503 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK
Intended Purpose(s): STOCK

Work Type: Bore open thru rock
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/02/1958

Final Depth: 17.70 m
Drilled Depth: 17.70 m

Contractor Name:
Driller:
Assistant Driller:

Property: MYALL GLEN GILGANDRA 2827 NSW
GWMA: 601 - GREAT ARTESIAN BASIN
GW Zone: 013 - SOUTHERN RECHARGE GROUNDWATER SOURCE

Standing Water Level (m):
Salinity Description: Fresh
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.015	51
Licensed:	EWENMAR	BUNDOBERING	Whole Lot 51//752563

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:

CMA Map: 8534-N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)

Northing: 6489295.0
Easting: 633355.0

Latitude: 31°43'26.4"S
Longitude: 148°24'27.2"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	0.40	16.90	152			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
17.40	17.70	0.30	Fractured	14.90		0.38			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.61	0.61	Soil	Soil	
0.61	1.83	1.22	Clay	Clay	
1.83	15.54	13.71	Sand Rock	Sandstone	
15.54	17.37	1.83	Rock Hard	Rock	
17.37	17.68	0.31	Basalt Broken Water Supply	Basalt	

Remarks

***** End of GW016885 *****

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NSW Office of Water
Work Summary

GW004811

Licence: **Licence Status:**

Authorised Purpose(s):
Intended Purpose(s): STOCK

Work Type: Bore open thru rock
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date: **Final Depth:** 100.50 m
Completion Date: 01/02/1912 **Drilled Depth:** 100.60 m

Contractor Name:
Driller:
Assistant Driller:

Property: **Standing Water Level (m):**
GWMA: **Salinity Description:** V.Salty
GW Zone: **Yield (L/s):**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.015	51
Licensed:			

Region: 80 - Macquarie-Western **CMA Map:** 8534-N
River Basin: 421 - MACQUARIE RIVER **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6490212.0 **Latitude:** 31°42'56.4"S
Elevation Source: (Unknown) **Easting:** 633893.0 **Longitude:** 148°24'47.2"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	0.00	92.90	152			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
92.90	92.90	0.00	Fractured	24.30		1.26			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	4.88	4.88	Clay Pink	Clay	
4.88	12.80	7.92	Sandstone Soft	Sandstone	
12.80	29.87	17.07	Basalt Soft	Basalt	
29.87	29.89	0.02	Cavity	Cavity	
29.89	92.96	63.07	Basalt Hard Very Hard Bands	Basalt	
92.96	100.58	7.62	Basalt Hard	Basalt	

Remarks

***** End of GW004811 *****

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NSW Office of Water
Work Summary

GW009983

Licence: 80BL003192
Licence Status: CONVERTED

Authorised Purpose(s): STOCK
Intended Purpose(s): STOCK

Work Type: Bore open thru rock
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/05/1952
Final Depth: 65.80 m
Drilled Depth: 65.80 m

Contractor Name:
Driller:
Assistant Driller:

Property: TARELLA
GWMA: 811 - CENTRAL WEST FRACTURED ROCKS
GW Zone: -
Standing Water Level (m):
Salinity Description: Fresh
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.028	34
Licensed:	EWENMAR	EIRABAN	Whole Lot //

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:
CMA Map: 8534-N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6487064.0
Easting: 632010.0
Latitude: 31°44'39.4"S
Longitude: 148°23'37.2"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	-0.30	45.40	127			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
45.70	45.80	0.10	(Unknown)	38.10		0.10			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	8.53	8.53	Clay Reddish	Clay	
8.53	21.95	13.42	Clay Light Brown	Clay	
21.95	22.25	0.30	Ironstone	Ironstone	
22.25	23.77	1.52	Clay White Sand	Clay	
23.77	27.43	3.66	Sandstone Yellow Hard	Sandstone	
27.43	30.48	3.05	Sandstone Soft	Sandstone	
30.48	33.83	3.35	Sandstone Hard	Sandstone	
33.83	39.01	5.18	Clay Yellow	Clay	
39.01	45.72	6.71	Clay Grey	Clay	
45.72	45.87	0.15	Sand Grey Water Supply	Sand	
45.87	46.63	0.76	Sandstone Hard	Sandstone	
46.63	60.96	14.33	Clay Grey	Clay	
60.96	65.84	4.88	Shale Grey	Shale	

Remarks

***** End of GW009983 *****

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NSW Office of Water
Work Summary

GW018609

Licence: 80BL010755 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK
Intended Purpose(s): STOCK

Work Type: Bore
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date: **Final Depth:** 51.50 m
Completion Date: 01/10/1960 **Drilled Depth:** 51.50 m

Contractor Name:
Driller:
Assistant Driller:

Property: BERAKEE **Standing Water Level (m):**
GWMA: 811 - CENTRAL WEST FRACTURED ROCKS **Salinity Description:**
GW Zone: - **Yield (L/s):**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM,015	45
Licensed:	EWENMAR	BUNDOBERING	Whole Lot //

Region: 80 - Macquarie-Western **CMA Map:** 8534-N
River Basin: 421 - MACQUARIE RIVER **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6489138.0 **Latitude:** 31°43'32.4"S
Elevation Source: (Unknown) **Easting:** 631194.0 **Longitude:** 148°23'05.2"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Withdrawn	0.00	0.00				

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
35.30	35.30	0.00	Fractured			0.06			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	Soil	Soil	
0.30	9.14	8.84	Clay Greyish Red	Clay	
9.14	12.19	3.05	Clay	Clay	
12.19	13.72	1.53	Clay Stones	Clay	
13.72	21.95	8.23	Clay Yellow	Clay	
21.95	51.51	29.56	Shale Broken Water Supply	Shale	

Remarks

***** End of GW018609 *****

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NSW Office of Water
Work Summary

GW011693

Licence: 80BL004728 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore open thru rock
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/10/1956
Final Depth: 18.80 m
Drilled Depth: 18.90 m

Contractor Name:
Driller:
Assistant Driller:

Property: BERAKE
GWMA: 811 - CENTRAL WEST FRACTURED ROCKS
GW Zone: -
Standing Water Level (m):
Salinity Description: 1001-3000 ppm
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.015	45
Licensed:	EWENMAR	BUNDOBERING	Whole Lot //

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:
CMA Map: 8534-N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6491286.0
Easting: 631827.0
Latitude: 31°42'22.4"S
Longitude: 148°23'28.2"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	-0.30	17.90	152			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.50	18.60	0.10	Fractured	14.60		0.95			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.52	1.52	Clay Red	Clay	
1.52	7.62	6.10	Rock Soft	Rock	
7.62	11.58	3.96	Rock Hard	Rock	
11.58	15.24	3.66	Rock Porous	Rock	
15.24	18.44	3.20	Shale	Shale	
18.44	18.59	0.15	Shale Loose	Shale	
18.59	18.90	0.31	Shale Hard Water Supply	Shale	

Remarks

***** End of GW011693 *****

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NSW Office of Water
Work Summary

GW011216

Licence: 80BL004137 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/09/1955
Final Depth: 46.00 m
Drilled Depth: 46.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: BERAKEE
GWMA: 811 - CENTRAL WEST FRACTURED ROCKS
GW Zone: -
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.015	45
Licensed:	EWENMAR	BUNDOBERING	Whole Lot //

Region: 80 - Macquarie-Western
River Basin: 421 - MACQUARIE RIVER
Area/District:
CMA Map: 8534-N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6491413.0
Easting: 631513.0
Latitude: 31°42'18.4"S
Longitude: 148°23'16.2"E

GS Map: -
MGA Zone: 0
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Nil	0.00	0.00				

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.20	18.20	0.00	Unconsolidated						

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	14.02	14.02	Clay Brownish Red	Clay	
14.02	16.76	2.74	Clay	Clay	
16.76	19.51	2.75	Clay Hard Baked	Clay	
19.51	24.38	4.87	Clay Red	Clay	
24.38	34.44	10.06	Clay	Clay	
34.44	35.66	1.22	Clay Grey	Clay	
35.66	39.62	3.96	Clay	Clay	
39.62	45.42	5.80	Shale Hard	Shale	
45.42	46.02	0.60	Basalt	Basalt	

Remarks

***** End of GW011216 *****

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NSW Office of Water
Work Summary

GW019130

Licence: 80BL011211 **Licence Status:** CONVERTED

Authorised Purpose(s): STOCK
Intended Purpose(s): STOCK

Work Type: Bore open thru rock
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date: **Final Depth:** 41.70 m
Completion Date: 01/01/1961 **Drilled Depth:** 41.80 m

Contractor Name:
Driller:
Assistant Driller:

Property: BERAKEE **Standing Water Level (m):**
GWMA: 811 - CENTRAL WEST FRACTURED ROCKS **Salinity Description:** Fresh
GW Zone: - **Yield (L/s):**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.015	45
Licensed:	EWENMAR	BUNDOBERING	Whole Lot //

Region: 80 - Macquarie-Western **CMA Map:** 8534-N
River Basin: 421 - MACQUARIE RIVER **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6488590.0 **Latitude:** 31°43'50.4"S
Elevation Source: (Unknown) **Easting:** 630687.0 **Longitude:** 148°22'46.2"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	-0.40	38.00	152			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
38.40	41.10	2.70	Fractured	35.60		0.88			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.61	0.61	Soil	Soil	
0.61	13.72	13.11	Clay	Clay	
13.72	25.91	12.19	Clay Yellow	Clay	
25.91	32.92	7.01	Clay Yellow Clean	Clay	
32.92	33.53	0.61	Clay White	Clay	
33.53	39.93	6.40	Sandstone	Sandstone	
39.93	41.15	1.22	Sand Clay	Sand	
41.15	41.76	0.61	Shale Water Supply	Shale	

Remarks

***** End of GW019130 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

NSW Office of Water
Work Summary

GW023008

Licence: 80BL015001 **Licence Status:** CONVERTED

Authorised Purpose(s): NOT KNOWN,STOCK
Intended Purpose(s): STOCK

Work Type: Bore open thru rock
Work Status:
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date: **Final Depth:** 47.80 m
Completion Date: 01/11/1965 **Drilled Depth:** 47.90 m

Contractor Name:
Driller:
Assistant Driller:

Property: KYWONG **Standing Water Level (m):**
GWMA: 811 - CENTRAL WEST FRACTURED ROCKS **Salinity Description:** Fresh
GW Zone: - **Yield (L/s):**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	EWENM	EWENM.028	2
Licensed:	EWENMAR	EIRABAN	Whole Lot A//103385

Region: 80 - Macquarie-Western **CMA Map:** 8534-N
River Basin: 421 - MACQUARIE RIVER **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6487602.0 **Latitude:** 31°44'22.4"S
Elevation Source: (Unknown) **Easting:** 630885.0 **Longitude:** 148°22'54.2"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	-0.30	37.80	152			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
39.30	46.30	7.00	Consolidated	35.60		0.76			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.61	0.61	Loam	Loam	
0.61	9.14	8.53	Clay	Clay	
9.14	12.50	3.36	Clay Yellow	Clay	
12.50	21.34	8.84	Clay	Clay	
21.34	22.56	1.22	Clay White	Clay	
22.56	33.53	10.97	Clay Yellow Sand	Clay	
33.53	35.05	1.52	Clay White	Clay	
35.05	46.33	11.28	Sandstone Porous Water Supply	Sandstone	
46.33	47.85	1.52	Clay Grey	Clay	

Remarks

***** End of GW023008 *****

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