ROCKWOODS
INVESTMENT GROUP

Environmental Impact Statement for Western Riverina Quarry

Rockwoods Investment Group Pty Ltd
ABN: 68 087 935 313

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

June 2024

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Environmental Impact Statement

for the

Western Riverina Quarry

Prepared for:

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Author's Certification

for the submission of an Environmental Impact Statement prepared in accordance with the *Environmental Planning and Assessment Act 1979*.

a) EIS prepared by:

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b) Development application by:

applicant name:	Rockwoods Investment Group Pty Ltd
applicant address:	609 Colinroobie Road LEETON NSW 2705

c) Application Number: EAR_1353

d) Address/land details:

Properties to be developed Land Description: Lot 12 DP1286927

e) Project Outline: The proposal involves the continued extraction of material at the existing Western Riverina Quarry. Annual production would be a maximum of 250 000 tonnes per year with an average annual production of approximately 165 000 tonnes per year.

f) Assessment of Environmental Impact: The assessment of environmental impacts of this project includes the matters referred to in the Secretary's Environmental Assessment Requirements provided to the Applicant on 17 July 2019 under Schedule 2, Part 2 of the *Environmental Planning and Assessment Regulation 2000*.

g) Declaration: I, Caiden O'Connor, hereby declare that I have overseen the preparation of the contents of this assessment and to the best of my knowledge:

i) this EIS has been prepared in accordance with the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000;*

ii) the document contains all available information that is relevant to the environmental assessment of the proposed development; and

iii) that the information contained in the document is neither false nor misleading.

Signature:

Name: Caiden O'Connor Date: 25 June 2024

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EXECUTIVE SUMMARY.....ES-1

SECTION 1 INTRODUCTION..... 1-1

1.1 SCOPE..... 1-3

1.2 FORMAT OF THE REPORT..... 1-3

1.3 THE APPLICANT AND THE SITE..... 1-6
- 1.3.1 The Applicant..... 1-6
- 1.3.2 The Quarry Site 1-6

1.4 BACKGROUND TO THE PROPOSAL 1-6

1.5 NEED FOR THE PROPOSAL..... 1-8

1.6 EXISTING OPERATIONS..... 1-8

1.7 CONSIDERATION OF ALTERNATIVES . 1-10

1.8 ENVIRONMENTAL MANAGEMENT AND DOCUMENTATION..... 1-10
- 1.8.1 Environmental Management..... 1-10
- 1.8.2 Environmental Documentation... 1-10

1.9 CONSULTATION 1-11
- 1.9.1 Surrounding Landowners 1-11
- 1.9.2 Government Agencies..... 1-11

1.10 MANAGEMENT OF INVESTIGATIONS .. 1-12

SECTION 2 DESCRIPTION OF THE PROPOSAL..... 2-1

2.1 INTRODUCTION..... 2-3
- 2.1.1 Objectives of the Proposal..... 2-3
- 2.1.2 Overview of the Proposal 2-3
- 2.1.3 Approvals Required 2-4

2.2 QUARRY SITE LAYOUT 2-5

2.3 RESOURCES AND PRODUCTS..... 2-7
- 2.3.1 Geology and Resources..... 2-7
- 2.3.2 Products..... 2-7

2.4 DEVELOPMENT ACTIVITIES..... 2-9
- 2.4.1 Introduction..... 2-9
- 2.4.2 Component Mark Out..... 2-9
- 2.4.3 Construction of Water Management Infrastructure 2-9
- 2.4.4 Vegetation Clearing 2-10
- 2.4.5 Soil Removal 2-11
- 2.4.6 Construction Activities..... 2-11

2.5 EXTRACTION OPERATIONS..... 2-12
- 2.5.1 Introduction..... 2-12
- 2.5.2 Design Features 2-12
- 2.5.3 Extraction Sequence..... 2-12
- 2.5.4 Extraction Method..... 2-16
- 2.5.5 Extraction Rate 2-16
- 2.5.6 Extraction Equipment..... 2-16

2.6 PROCESSING OPERATIONS..... 2-17
- 2.6.1 Processing Plant Layout..... 2-17
- 2.6.2 Processing Operations..... 2-18
- 2.6.3 Operating Capacity and Rates... 2-18
- 2.6.4 Product Stockpiling 2-19

2.7 PRE-COAT OPERATIONS..... 2-19
- 2.7.1 Pre-Coat Plant Layout..... 2-19
- 2.7.2 Pre-coat Operations..... 2-20

2.8 ACCESS, TRAFFIC AND MATERIAL TRANSPORTATION 2-20
- 2.8.1 Access 2-20
- 2.8.2 Transport Routes..... 2-21
- 2.8.3 Traffic Types and Levels 2-21

2.9 WASTE MANAGEMENT 2-23
- 2.9.1 Introduction 2-23
- 2.9.2 Production By-products..... 2-23
- 2.9.3 Non-Production Wastes 2-23

2.10 INFRASTRUCTURE, UTILITIES AND SERVICES 2-24
- 2.10.1 Introduction 2-24
- 2.10.2 Buildings and Infrastructure..... 2-24
- 2.10.3 Power Supply 2-24
- 2.10.4 Telephone 2-24
- 2.10.5 Water Supply..... 2-25
- 2.10.6 Fuels and Lubricants..... 2-25
- 2.10.7 Sewage and Effluent Disposal... 2-25

2.11 EMPLOYMENT 2-25

2.12 HOURS OF OPERATION AND PROPOSAL LIFE..... 2-26

2.13 FUTURE EXTRACTION ACTIVITIES 2-26

2.14 REHABILITATION..... 2-26
- 2.14.1 Introduction 2-26
- 2.14.2 Designated Rehabilitation Areas 2-27
- 2.14.3 Extraction Area..... 2-27
- 2.14.4 Areas of Operational Disturbance 2-29
- 2.14.5 Final Land Uses..... 2-29

2.15 BIODIVERSITY OFFSET STRATEGY 2-29
- 2.15.1 Introduction 2-29
- 2.15.2 Impacts Requiring Offsetting 2-29
- 2.15.3 Impacts Not Requiring Offsetting..... 2-30
- 2.15.4 Credit Calculations..... 2-30
- 2.15.5 Securing Biodiversity Credits..... 2-30

SECTION 3 LEGISLATIVE AND PLANNING CONTEXT..... 3-1

3.1 INTRODUCTION..... 3-3

3.2 COMMONWEALTH LEGISLATION 3-3

3.3 NSW LEGISLATION 3-4

3.4 STATE ENVIRONMENTAL PLANNING POLICIES..... 3-6

3.5 LOCAL PLANNING ISSUES..... 3-9
- 3.5.1 Carrathool Local Environmental Plan 2012..... 3-9
- 3.5.2 Carrathool Development Control Plan 3-12

3.6 OTHER ENVIRONMENTAL POLICIES, GUIDELINES AND PLANS 3-12

SECTION 4 ENVIRONMENTAL SETTING 4-1

4.1 TOPOGRAPHY AND DRAINAGE 4-3

4.2 METEOROLOGY 4-3

4.2.1 Introduction 4-3

4.2.2 Temperature 4-6

4.2.3 Rainfall and Evaporation 4-6

4.2.4 Wind 4-7

4.3 LAND OWNERSHIP AND SURROUNDING RESIDENCES 4-7

4.3.1 Land Ownership 4-7

4.3.2 Land Uses 4-9

4.4 BUSH FIRE HAZARD 4-9

4.5 SERVICES 4-9

SECTION 5 ENVIRONMENTAL FEATURES, SAFEGUARDS AND IMPACTS 5-1

5.1 TRAFFIC AND TRANSPORT 5-4

5.1.1 Introduction 5-4

5.1.2 Existing Road Transport Environment 5-4

5.1.3 Predicted Changes to the Traffic Environment 5-9

5.1.4 Management and Mitigation Measures 5-10

5.1.5 Assessment of Impacts 5-10

5.1.6 Conclusion 5-11

5.2 AIR QUALITY 5-11

5.2.1 Introduction 5-11

5.2.2 The Existing Environment 5-12

5.2.3 Criteria for Assessment 5-13

5.2.4 Potential Sources of Air Contaminants 5-14

5.2.5 Assessment Methodology 5-14

5.2.6 Proposed Management and Monitoring Measures 5-16

5.2.7 Assessment of Impacts 5-16

5.2.8 Conclusion 5-18

5.3 NOISE AND VIBRATION 5-19

5.3.1 INTRODUCTION 5-19

5.3.2 The Existing Environment 5-19

5.3.3 Criteria for Assessment 5-20

5.3.4 Management and Mitigation Measures 5-22

5.3.5 Assessment Methodology 5-23

5.3.6 Assessment of Impacts 5-24

5.3.7 Monitoring 5-26

5.3.8 Conclusion 5-26

5.4 WATER RESOURCES 5-27

5.4.1 Introduction 5-27

5.4.2 Groundwater 5-27

5.4.3 Surface Water 5-29

5.4.4 Water Use 5-34

5.5 BIODIVERSITY 5-35

5.5.1 Introduction 5-35

5.5.2 Assessment Methodology 5-35

5.5.3 Vegetation Communities and Threatened Species 5-36

5.5.4 Management and Mitigation Measures 5-38

5.5.5 Assessment of Impacts 5-40

5.5.6 Conclusion 5-41

5.6 CULTURAL HERITAGE 5-41

5.6.1 Introduction 5-41

5.6.2 Aboriginal Cultural Heritage 5-42

5.6.3 Survey and Results 5-46

5.6.4 Management and Mitigation Measures 5-49

5.6.5 Significance Assessment of Sites Recorded by OzArk 5-50

5.6.6 Significance Assessment of Sites Recorded by Registered Aboriginal Parties 5-52

5.6.7 Assessment of Impacts 5-53

5.6.8 Conclusion 5-54

5.7 SOIL AND LAND RESOURCES 5-55

5.7.1 Introduction 5-55

5.7.2 Site Soils 5-55

5.7.3 Management and Mitigation Measures 5-56

5.7.4 Impact Assessment 5-56

5.8 VISIBILITY 5-58

5.8.1 Introduction 5-58

5.8.2 The Existing Visual Landscape 5-58

5.8.3 Management and Mitigation Measures 5-58

5.8.4 Changes to Visual Amenity 5-58

5.8.5 Assessment of Impacts 5-59

5.9 PUBLIC SAFETY HAZARDS 5-59

5.9.1 Introduction 5-59

5.9.2 Bush Fire Hazards 5-59

5.9.3 Handling Storage and Disposal of Hydrocarbons Bush Fire Hazards 5-63

5.10 SOCIAL AND ECONOMIC 5-64

5.10.1 Introduction 5-64

5.10.2 The Existing Social and Economic Setting 5-64

5.10.3 Costs and Benefits of the Proposal 5-68

5.10.4 Management and Mitigation Measures 5-69

5.10.5 Impact Assessment 5-69

SECTION 6 SUMMARY OF ENVIRONMENTAL MANAGEMENT AND MONITORING MEASURES..... 6-1

SECTION 7 EVALUATION AND JUSTIFICATION OF THE PROPOSAL..... 7-1

7.1 EVALUATION OF THE PROJECT..... 7-3
7.1.1 Residual Environmental Risk and Impacts..... 7-3
7.1.2 Ecologically Sustainable Development..... 7-4
7.2 JUSTIFICATION OF THE PROPOSAL..... 7-5
7.2.1 Introduction..... 7-5
7.2.2 Biophysical Considerations..... 7-6
7.2.3 Economic and Social Considerations..... 7-7
7.2.4 Consequences of not Proceeding with the Proposal..... 7-8
7.2.5 Objects of the Environmental Planning and Assessment Act 1979..... 7-8
7.3 CONCLUSION..... 7-9

SECTION 8 REFERENCES..... 8-1

SECTION 9 GLOSSARY OF TECHNICAL TERMS, ACRONYMS, SYMBOLS AND UNITS..... 9-1

APPENDICES

Appendix 1: Secretary's Environmental Assessment Requirements and Matters Identified for Consideration

Appendix 2: Coverage of Secretary's Environmental Assessment Requirements and Requirements of Consulted Government Agencies

Appendix 3: Traffic Impact Assessment

Appendix 4: Air Quality Impact Assessment

Appendix 5: Noise and Vibration Impact Assessment

Appendix 6: Sediment Basin Storage Requirement Calculations

Appendix 7: Biodiversity Development Assessment Report

Appendix 8: Aboriginal Cultural Heritage Assessment

FIGURES

Figure 1.1 Locality Plan..... 1-4
Figure 1.2 Quarry Site and its Access..... 1-7
Figure 1.3 Existing Western Riverina Quarry Layout..... 1-9
Figure 2.1 Quarry Site Layout..... 2-6
Figure 2.2 Quarry Site Geology..... 2-8
Figure 2.3 Stage 1 Extraction Area and Site Layout..... 2-13
Figure 2.4 Stage 2 Extraction Area and Site Layout..... 2-14
Figure 2.5 Stage 3 Extraction Area and Site Layout..... 2-15
Figure 2.6 Processing Plant Layout..... 2-18
Figure 2.7 Pre-coat Plant Layout..... 2-20
Figure 2.8 Indicative Transport Route..... 2-22
Figure 2.9 Indicative Final Landform..... 2-28
Figure 3.1 Land Zoning..... 3-10
Figure 4.1 Regional Topography and Drainage..... 4-4
Figure 4.2 Quarry Site Topography and Drainage..... 4-5
Figure 4.3 Annual Wind Rose..... 4-7
Figure 4.4 Land Ownership, Surrounding Residences and Groundwater Bores..... 4-8
Figure 4.5 Existing Services..... 4-10
Figure 5.1 Surrounding Road Network..... 5-4
Figure 5.2 Operational Scenarios..... 5-14
Figure 5.3 Quarry Site Catchments – Stage 1..... 5-29
Figure 5.4 Quarry Site Catchments – Stage 2..... 5-30
Figure 5.5 Quarry Site Catchments – Stage 3..... 5-31
Figure 5.6 Quarry Site Vegetation Mapping..... 5-36
Figure 5.7 Quarry Site Aboriginal Heritage Sites..... 5-42
Figure 5.8 Land and Soil Capability..... 5-56

TABLES

Table 2.1 Material Balance and Estimated Resource 2-7
Table 2.2 Indicative Blast Design Parameters 2-16
Table 2.3 Mobile Equipment Fleet 2-17
Table 2.4 Operating Capacity and Rates ... 2-19
Table 2.5 Laden Heavy Vehicle Movements 2-21
Table 2.6 Proposed Hours of Operation..... 2-26
Table 2.7 Ecosystem Credits Required for Biodiversity Offset..... 2-30
Table 2.8 Species Credits Required for Biodiversity Offset 2-30
Table 3.1 Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007..... 3-6
Table 4.1 Climate Data Summary – SILO (1889 to Present)..... 4-6
Table 4.2 Distances to Closest Privately-owned Residences..... 4-9
Table 5.1 Surveyed Daily Traffic Volumes 2020 (vehicles per day) 5-6
Table 5.2 Surveyed Weekday Average Traffic Volumes and Composition 2020 (vehicles per day) 5-7
Table 5.3 Surveyed Weekday Peak Hour Traffic Volumes 2020 (vehicles per hour)..... 5-7
Table 5.4 Level of Service Criteria for Two Lane, Two-way Rural Roads..... 5-8
Table 5.5 Baseline Future Traffic Volumes (2030)..... 5-9
Table 5.6 Future Weekday Traffic Volumes with Maximum Proposal-generated Traffic..... 5-10
Table 5.7 Summary of Background Air Quality Used in the AQIA..... 5-13
Table 5.8 Air Quality Assessment Criteria..... 5-13
Table 5.9 Summary of Annual Average Particulate Matter Concentrations..... 5-16
Table 5.10 Predicted Maximum Incremental 24-hour PM10 and PM2.5 Concentrations..... 5-17
Table 5.11 Noise Source Sound Power Levels..... 5-23
Table 5.12 Predicted Operational Noise Levels (dB(A),Leq(15min))..... 5-25
Table 5.13 Operational Road Traffic Noise Levels – Residential Receivers..... 5-25
Table 5.14 Predicted Blast Overpressure and Ground Vibration 5-26
Table 5.15 Settlement and Storage Volume Requirements..... 5-33
Table 5.16 Vegetation Integrity Assessment 5-38
Table 5.17 Aboriginal Cultural Heritage Database Search Results..... 5-46
Table 5.18 Effective Survey Coverage within the Quarry Site 5-47
Table 5.19 Newly Recorded Aboriginal Cultural Heritage Sites..... 5-48
Table 5.20 RAP Recorded Aboriginal Cultural Heritage Sites..... 5-49
Table 5.21 Significance Ratings of Sites Recorded by OzArk..... 5-52
Table 5.22 Significance Ratings of Sites Recorded by RAPs..... 5-53
Table 5.23 Impacts on Recorded Sites..... 5-53
Table 5.24 Bush Fire Attack Levels..... 5-61
Table 5.25 Bushfire Hazard – Activities and Controls 5-62
Table 5.26 Population Statistics (Rankins Springs SSC, Carrathool LGA and NSW)..... 5-65
Table 5.27 Employment Statistics (Rankins Springs SSC, Carrathool LGA and NSW) 5-66
Table 5.28 Industry Employment Statistics (Rankins Springs SSC, Carrathool LGA and NSW)..... 5-67
Table 6.1 Summary of Environmental Measures and Monitoring Measures..... 6-3
Table 7.1 Objects of the EP&A Act..... 7-8

Executive Summary

Introduction

This *Environmental Impact Statement* (EIS) has been prepared by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Rockwoods Investment Group Pty Ltd ("the Applicant"), to support a development application submitted to the Carrathool Shire Council ("Council) for the continued operation and extension of the Western Riverina Quarry ("the Quarry"). The existing Quarry is located approximately 17km northwest of Rankins Springs and 61km southeast of Hillston (see **Figure ES1**).

The Quarry has operated since 1987 with existing operations approved under DA2/91 issued by Council on 19 July 1991 which allows for the Quarry to extract, process and transport an unspecified quantity of material each year[1].

The Applicant is seeking development consent for the continued operation and extension of extraction operations within the Quarry which would also increase the total area of disturbance, annual production and annual product despatch. These activities are collectively referred to as "the Proposal" and the site of the development referred to as the "Quarry Site".

The Proposal is classified as "Designated Development" and "Regional Development" and therefore requires development consent to be issued by the Western Regional Planning Panel. In order to obtain development consent, the development application for the Proposal needs to be accompanied by an EIS. The Proposal is also classified as "Integrated Development" as it would require a variation to Environment Protection Licence 3767 (EPL 3767) issued by the Environment Protection Authority (EPA), an Aboriginal Heritage Impact Permit (AHIP) approved under the *National Parks and Wildlife Act 1974* (NPW Act), a controlled activity approval under the *Water Management Act 2000* (WM Act) and a permit under Section 138 of the *Roads Act 1993* (Roads Act).

The EIS has been prepared in accordance with Secretary's Environmental Assessment Requirements (SEARs) Number 1353 which were accompanied by additional assessment requirements provided by various government agencies. It is noted Council did not provide any requirements relating to the Proposal.

Description of the Proposal

The principal resources being extracted at the Western Riverina Quarry have been identified as leucite-rich basalt and quartzite material, which are located within the Tullibigeal Leucitite, a unit deposited during the Middle Miocene (approximately 15.9 to 11.6 million years ago). The Applicant conservatively estimates that the extension of the extraction area would provide for a further 4.9 million tonnes of material to be recovered during the life of the Proposal.

The Applicant is seeking development consent for the following activities.

i) Extraction of basalt and quartzite from within the proposed extraction area to produce up to 250 000tpa of Quarry products.

[1] It is noted that neither the Applicant nor Council have been able to locate a copy of the EIS or Statement of Environmental Effects (SoEE) that accompanied the development application in 1991. It is assumed that an extraction rate of between >30 000tpa to 100 000tpa was approved as part of this application due to the subsequent issuance of Environment Protection Licence (EPL) 3767 which allows extraction of between >30 000tpa to 100 000tpa.

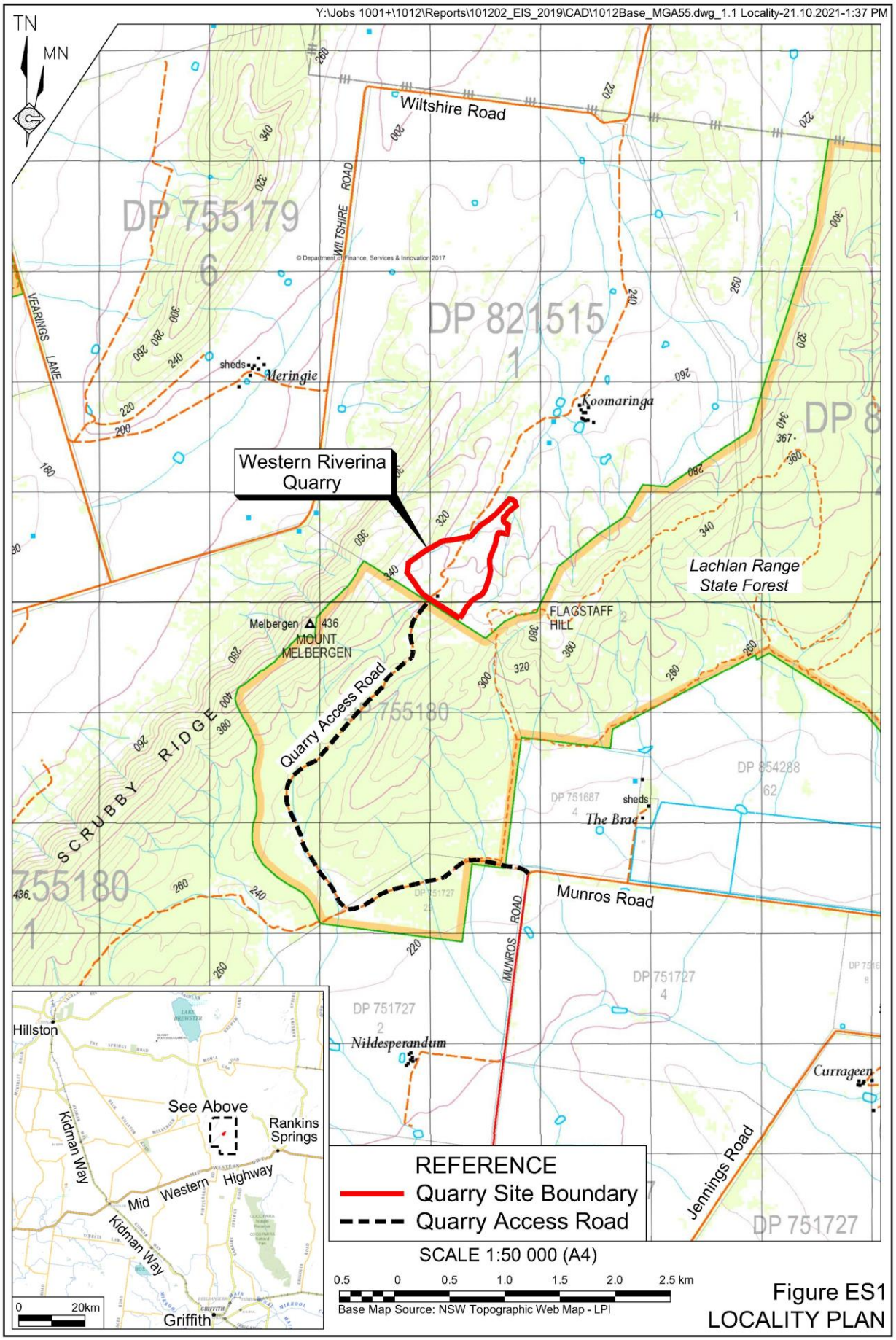


Figure ES1
LOCALITY PLAN

ii) Importation of up to 1 500tpa of concrete washout and construction materials per annum for incorporation in products.

iii) Crushing and screening of fragmented rock and imported materials on site using a fixed processing plant.

iv) Pre-coating of up to 20 000tpa of aggregates.

v) Transportation of up to 250 000tpa Quarry products to end points of use within the Carrathool LGA and broader Riverina Region.

vi) Ongoing employment of local personnel.

vii) Progressive and final rehabilitation of the Quarry to develop a final landform suitable for grazing and passive biodiversity conservation.

The principal components and the respective areas within the Quarry Site are as follows (see **Figure ES2**).

- Extraction area (18.1ha).
- Processing and Product Stockpiling Area (5.5ha).
- Ancillary Components Area (0.7ha).
- "No-go" Areas (1.1ha).
- Rehabilitation Areas (14.8ha).
- Quarry Access Road (5.2km).

The Quarry Site covers a total area of 46.5ha of which up to approximately 35.5ha would be disturbed throughout the life of the Quarry.

Extraction would be undertaken in a staged manner (Stages 1 to 3) with drilling and blasting used to fragment the raw materials from within the extraction area. The raw materials would then be loaded and hauled to the fixed processing plant. The processing plant comprises a "Top Plant" and "Bottom Plant" which would produce a range of aggregates, rail ballast, rock spalls and road pavement products. Approximately 20 000tpa of aggregates would be pre-coated with a bitumen-based emulsion prior to despatch. The processing and product stockpiling area and ancillary components area would initially be located to the west of the extraction area, however, these areas would be relocated to the north of the extraction area prior to Stage 3 to allow for the extraction of resource in these areas.

The Applicant proposes to use the existing transport routes for transportation of products to end points of use. **Figure ES3** displays the indicative transport routes and traffic distribution for the Proposal. The Proposal would allow for a maximum of 12 laden heavy vehicle movements per hour and 60 laden heavy vehicle movements per day.

The Applicant proposes to rehabilitate the Quarry Site to create a final landform that is suitable for grazing and biodiversity conservation. Emphasis would be placed upon progressive rehabilitation of completed areas within the Quarry Site.

Assessment and Management of Key Environmental Issues

The components and features of the existing environment within and surrounding the Quarry Site have been studied in detail and the Proposal has been designed to avoid or minimise environmental risks and impacts as much as is considered reasonable and feasible. Many aspects of the Proposal have also been planned so that impacts would remain consistent with currently approved activities or would result in only minor changes.

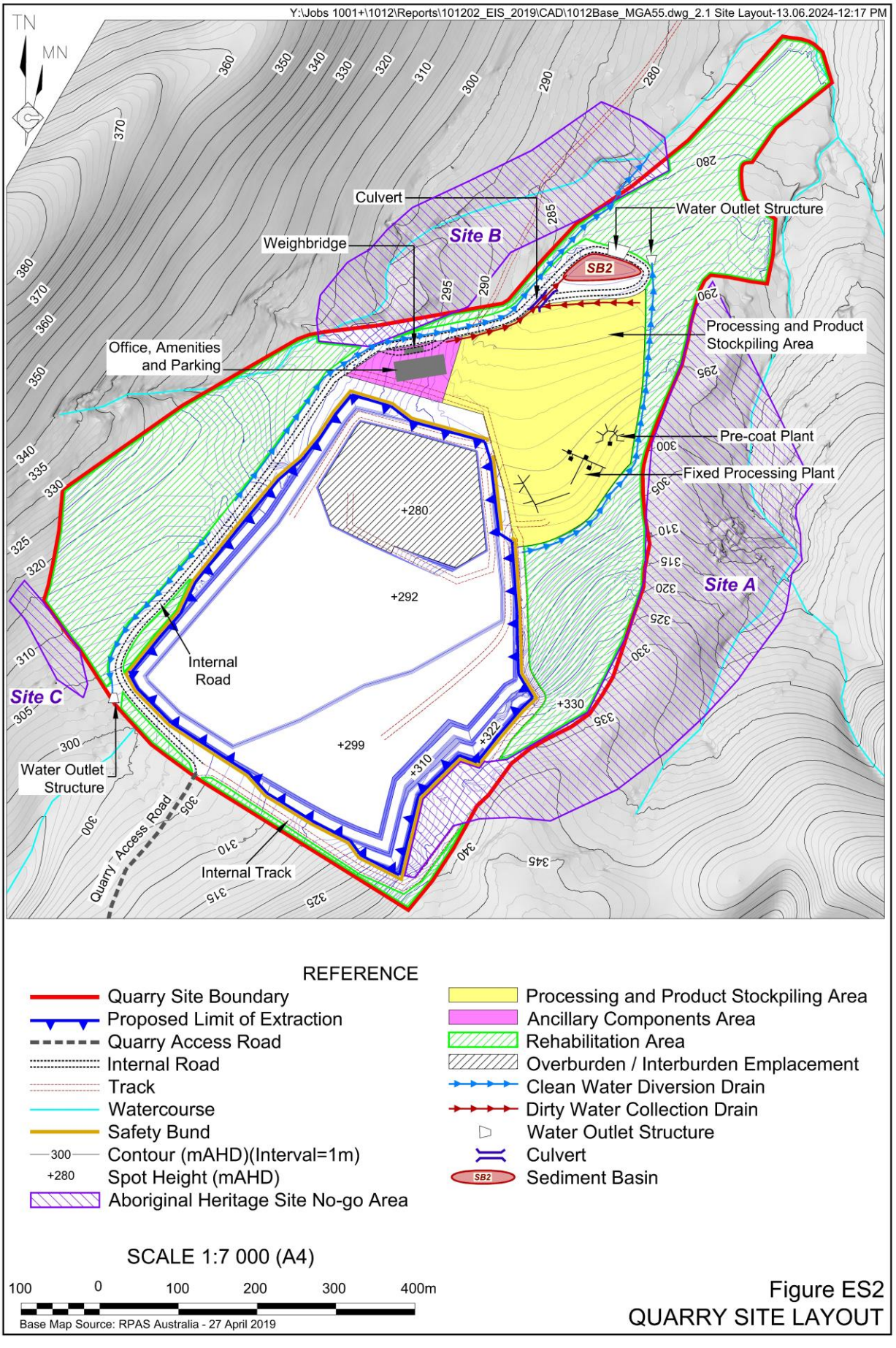
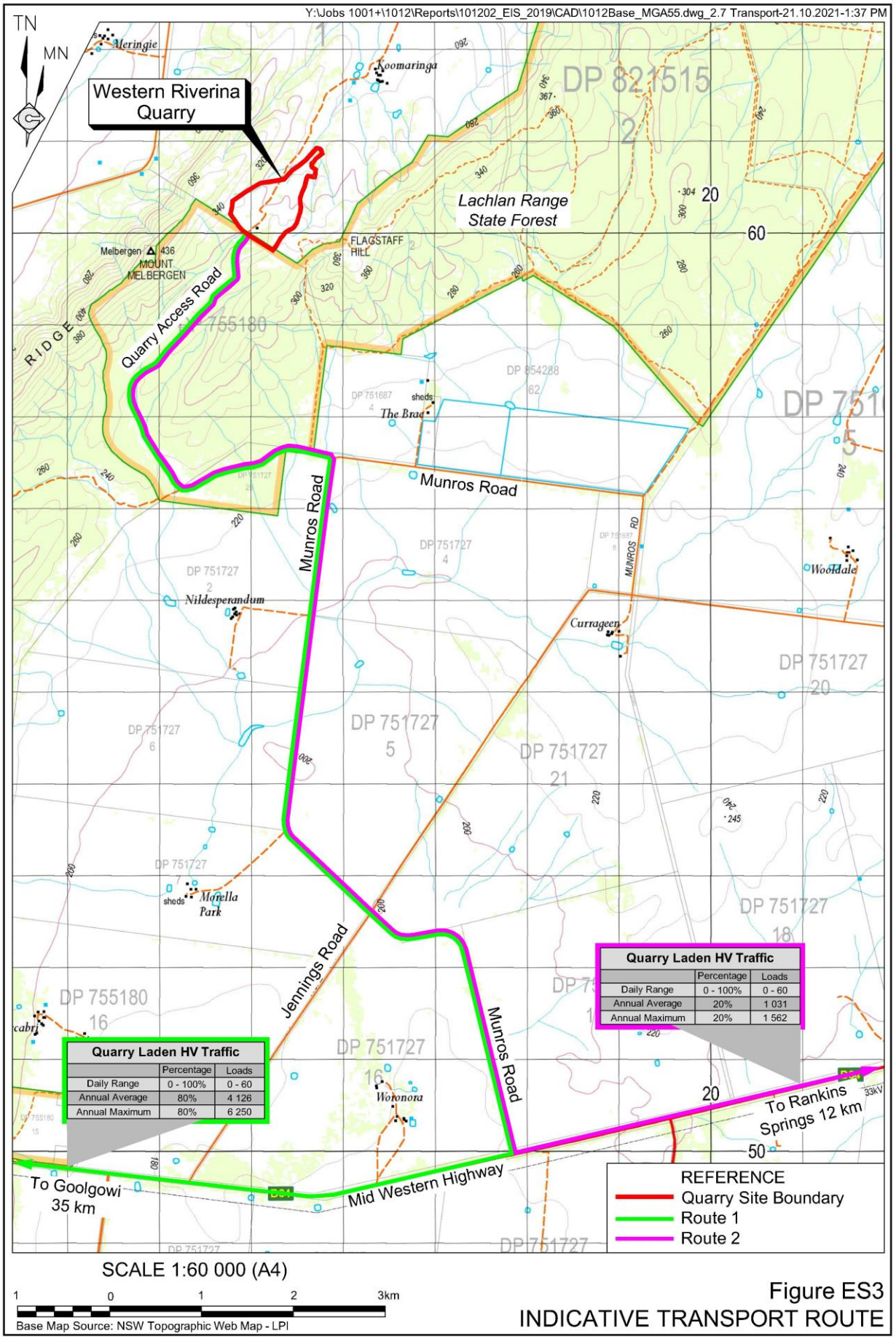


Figure ES2
QUARRY SITE LAYOUT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TN
MN
Western Riverina Quarry
Meringie
Koomaringa
DP 821515
Lachlan Range State Forest
FLAGSTAFF HILL
Melbergen 436
MOUNT MELBERGEN
RIDGE
Quarry Access Road
DP 755180
DP 854288
DP 751687
sheds
The Brae
Munros Road
DP 751727
Nildesperandum
Currageen
Woodlale
Jennings Road
Morella Park
DP 755180 16
Woronora
To Rankins Springs 12 km
To Goolgowi 35 km
Mid Western Highway
Quarry Laden HV Traffic
Percentage
Loads
Daily Range 0 - 100% 0 - 60
Annual Average 80% 4 126
Annual Maximum 80% 6 250
Quarry Laden HV Traffic
Percentage
Loads
Daily Range 0 - 100% 0 - 60
Annual Average 20% 1 031
Annual Maximum 20% 1 562
REFERENCE
Quarry Site Boundary
Route 1
Route 2
SCALE 1:60 000 (A4)
1 0 1 2 3km
Base Map Source: NSW Topographic Web Map - LPI
Figure ES3
INDICATIVE TRANSPORT ROUTE

Impacts within the Quarry Site

The key residual impact of the Proposal would be the removal of approximately 4.23ha of native vegetation comprising approximately 4.13ha of vegetation in poor condition and 0.10ha of vegetation in moderate condition. This vegetation has the potential to provide habitat through foraging areas or breeding habitat. Residual impacts to native vegetation would be offset in accordance with the Biodiversity Offset Scheme. A Biodiversity Development Assessment Report (BDAR) prepared for the Proposal (OzArk, 2024a) has concluded that potential direct (residual) impacts would be suitably offset and potential indirect impacts would be managed through the implementation of measures to avoid or mitigate potential risks.

There would be no serious and irreversible impacts (SAII) or significant impacts to matters of national environmental significance (MNES) as a result of the Proposal.

The Proposal would result in the removal and salvage of three known Aboriginal Sites (Koomaringa IF-03, OS-13 and Koomaringa Anvil 1). These sites are not considered to be archaeologically, aesthetically or historically significant as they have a very limited ability to inform researchers about the nature and extent of previous Aboriginal occupation in the area, exist in a landscape that has been significantly altered, and have no apparent relationship to known historical Aboriginal sites such as missions or massacre sites. Furthermore, implementation of the management measures outlined in OzArk (2024b) and the recommendations of RAPs would ensure that the identified sites are appropriately protected or managed.

The Proposal includes the use of sediment basins and collection drains to manage potentially sediment-laden runoff. Sediment basins would be designed to accommodate predicted runoff resulting from a 90th percentile 5-day rainfall event. The Applicant would continue to manage surface water runoff to limit the potential for sediment-laden runoff to leave the Quarry Site. It is noted that the extraction area has been designed to be internally draining to further minimise the risk of sediment-laden discharge off site.

Given the elevation of the Quarry Site, and the lack of groundwater during current extraction and exploration drilling activities, it is considered that the Proposal would not impact groundwater resources.

Assuming the implementation of appropriate soil management measures, the residual impacts associated with soil removal, handling, storage and re-use would be negligible. In addition, the Proposal would not alter the productive use of surrounding land.

Amenity Impacts

Other residual impacts associated with the Proposal include the generation of traffic, dust and noise.

Assessment of potential traffic-related impacts has determined that, under the Proposal, the Quarry would continue to operate with acceptable impacts on the surrounding road network. Traffic operations for the Proposal have been planned to include a maximum of 12 laden truck movements per hour and 60 laden truck movements per day. The Traffic Impact Assessment undertaken for the Proposal (TTPP, 2022) concluded that the level of service would remain good on the surrounding road network during peak hours with the combined effects of traffic growth and additional Proposal-generated traffic.

The Air Quality Impact Assessment undertaken for the Proposal (Northstar, 2022) concluded that the Proposal is predicted to comply with all impact assessment criteria for annual

average concentrations of TSP, $PM_{2.5}$, PM_{10} and deposited dust. The assessment of 24-hour average $PM_{2.5}$ and 24-hour average PM_{10} applying a Level 2 Contemporaneous Assessment has indicated that there would be no additional exceedances of the assessment criteria as a result of the Proposal (i.e. there would be no exceedances of the criteria other than those predicted by background emissions alone).

The Noise and Vibration Assessment undertaken for the Proposal (MAC, 2022) concluded that operational noise attributable to activities within the Quarry Site and road traffic noise generated by product transport would be within nominated limits and would have minimal impacts at surrounding residences. Air blast overpressure and ground vibration levels would also be well below criteria levels at all surrounding residences.

The Proposal would also result in other negligible adverse impacts principally relating to visual amenity and socio-economic impacts. However, these adverse impacts would be countered by the positive impacts, including economic benefits from the continued operation of the Quarry in the manner proposed.

Conclusions

The Proposal has been designed to permit the ongoing efficient extraction of an important hard rock resource within the Quarry Site. The Proposal incorporates a range of management and mitigation measures to ensure all relevant statutory goals and criteria, environmental objectives and reasonable community expectations are satisfied.

This document and the range of specialist consultant studies undertaken have identified that the Proposal should proceed because it would:

- contribute towards satisfying the demand for Quarry products required for construction and infrastructure projects within the Carrathool LGA and the broader Riverina Region;
- have a minimal and manageable impact on the biophysical environment;
- satisfy sustainable development principles; and
- result in a net benefit for the local community, the Carrathool Shire Council and the State of NSW.

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Section 1

Introduction

PREAMBLE

This section introduces the continued operation and extension of the Western Riverina Quarry ("the Proposal"). This section provides:

- *an outline of the scope and format of the document;*
- *an introduction to the Applicant;*
- *relevant background information about the Proposal;*
- *a summary of the existing quarrying operations;*
- *the intended approach to environmental management and documentation for the Quarry; and*
- *the personnel involved in the design of the Proposal, document preparation and specialist consultant investigations and assessments.*

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1.1 Scope

This *Environmental Impact Statement* (EIS) has been prepared by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Rockwoods Investment Group Pty Ltd ("the Applicant") to support a development application submitted to the Carrathool Shire Council ("Council) for the continued operation and extension of the Western Riverina Quarry ("the Quarry"). The existing quarry is located approximately 17km northwest of Rankins Springs and 61km southeast of Hillston (see **Figure 1.1**).

The Quarry currently operates under Development Consent DA2/91 issued by Council on 19 July 1991. The Quarry currently has consent to extract, process and transport an unspecified quantity of material each year[1].

The Applicant is seeking development consent for the continued operation and extension of extraction operations within the Western Riverina Quarry which would include the following.

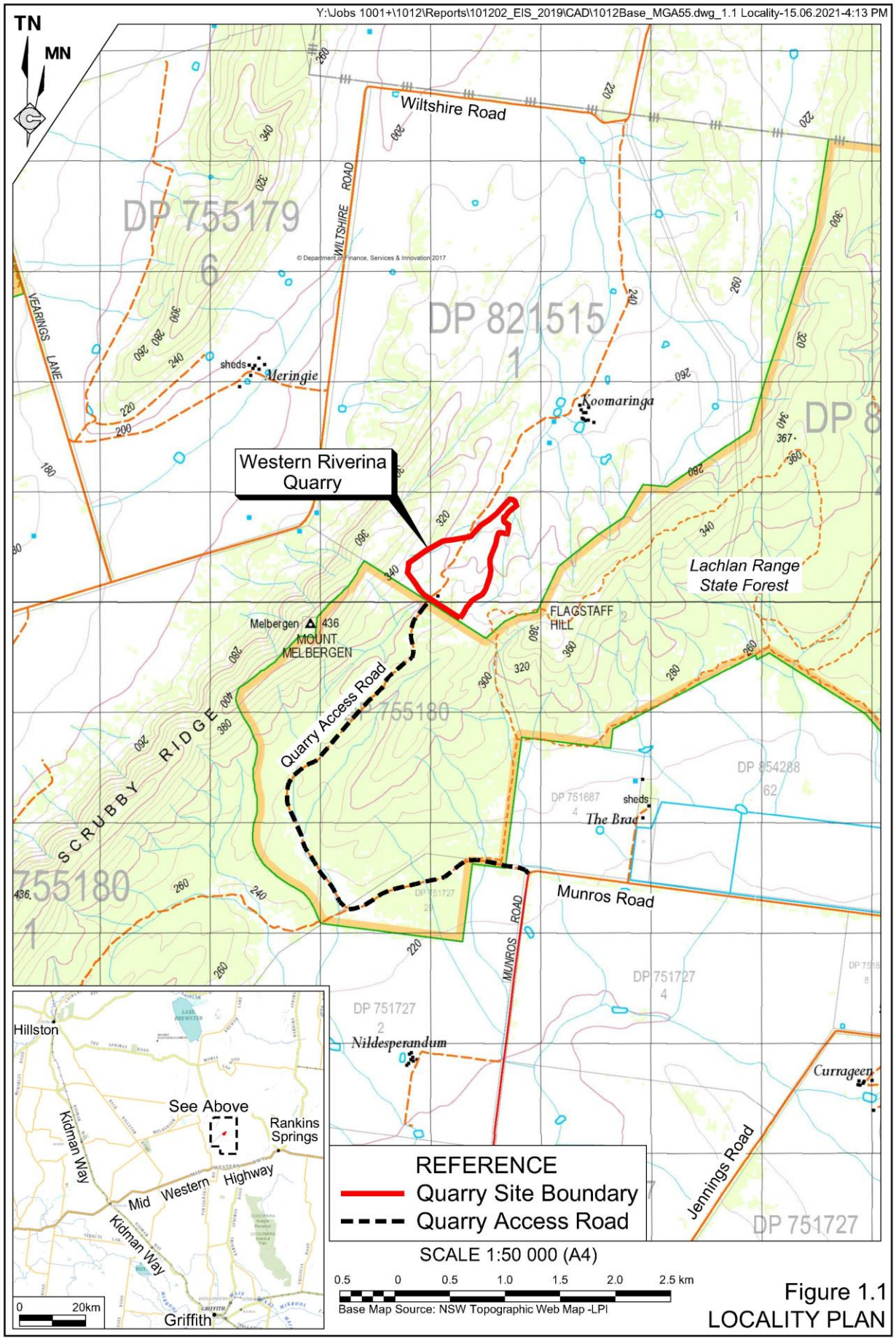
- An extension of operations to include a total disturbance area of approximately 35.5ha.
- An increase in the annual extraction rate to 250 000tpa.
- Importation of up to 1 500tpa of concrete and other building materials for recycling.
- Product transportation involving a maximum of 60 laden heavy vehicle movements per day and a peak of 12 laden heavy vehicle movements per hour.
- Ongoing operations for a period of 30 years from the commencement of operations under the new consent.

These activities are collectively referred to as "the Proposal" and the site of the development referred to as the "Quarry Site". The Quarry Site is located on land owned by E.B. Mawson & Sons Pty Ltd.

1.2 Format of the Report

The information presented in this document covers all aspects of the proposed development, operation, rehabilitation and environmental monitoring of the Proposal. The document has been structured to address the assessment requirements nominated by the Secretary of the DPIE and other State government agencies.

[1] The Environmental Impact Statement (EIS) prepared by T R Pearce Planning (1986) specifies an annual extraction limit of 5 000m^3. However, it is noted that neither the Applicant nor Council have been able to locate a copy of the EIS or Statement of Environmental Effects (SoEE) that accompanied the development application in 1991. It is assumed that a higher extraction limit was approved as part of this application due to the subsequent issuance of Environment Protection Licence (EPL) 3767 which allows extraction of between >30 000tpa and 100 000tpa.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Koomaringa
Western Riverina Quarry
Lachlan Range State Forest
FLAGSTAFF HILL
Melbergen
436
MOUNT MELBERGEN
SCRUBBY RIDGE
Quarry Access Road
DP 755180
DP 751687
sheds
The Brae
DP 754288
62
Munros Road
MUNROS ROAD
DP 751727
4
DP 751727
2
Nildesperandum
Currageen
Jennings Road
DP 751727
Hillston
See Above
Rankins Springs
Kidman Way
Mid Western Highway
Kidman Way
Griffith
0 20km
REFERENCE
Quarry Site Boundary
Quarry Access Road
SCALE 1:50 000 (A4)
0.5 0 0.5 1.0 1.5 2.0 2.5 km
Base Map Source: NSW Topographic Web Map -LPI
Figure 1.1
LOCALITY PLAN

This EIS has been assembled in a single volume with seven sections of text, as well as a glossary, references section and a set of appendices. The format of the EIS is as follows.

Section 1: introduces the Proposal and Applicant and provides background information relevant to the application, the Quarry Site and existing operations. The section concludes with information on the management of investigations undertaken during the preparation of the EIS.

Section 2: provides a description of the Proposal including the objectives of the Proposal, an overview of the proposed activities, approvals required, need for the Proposal and reviews the local geology, resources and Quarry products. Section 2 also describes the proposed operations including extraction and processing operations and associated overburden management. Finally, an overview is provided of the progressive rehabilitation strategy and indicative final landform and land use.

Section 3: reviews the planning and legislative requirements of the Proposal including State Environmental Planning Policies and local planning instruments.

Section 4: presents the environmental setting of the Quarry Site, including information on topography, geology, meteorology, land ownership, surrounding residences and land uses.

Section 5: provides an assessment of potential environmental impacts of the Proposal and, for each matter identified, the existing environment, proposed mitigation and management, assessment of potential impact and maintenance/monitoring requirements.

Section 6: provides a compilation of the environmental management and monitoring measures for the Proposal.

Section 7: evaluates the Proposal in terms of biophysical, economic and social considerations, and the goals and guidelines of Ecologically Sustainable Development and the Objects of the *Environmental Planning and Assessment Act 1979*. A conclusion is provided for the EIS.

Section 8: lists the various source documents referred to for information and data used during the preparation of the EIS.

Appendices: present the following additional information and the specialist consultant technical assessments undertaken to support the development application.

1. The Secretary's Environmental Assessment Requirements (SEARs) and requirements of the consulted government agencies.
2. The coverage of requirements listed in the SEARs and provided by government agencies.
3. Traffic Impact Assessment prepared by The Transport Planning Partnership Pty Ltd.
4. Air Quality Impact Assessment prepared by Northstar Air Quality Pty Ltd.
5. Noise and Vibration Impact Assessment prepared by Muller Acoustic Consulting Pty Ltd.
6. Sediment Basin Storage Requirement Calculations prepared by R.W. Corkery & Co. Pty Limited.

7. Biodiversity Development Assessment Report prepared by OzArk Environmental and Heritage Management Pty Ltd (operating as OzArk Environment and Heritage).
8. Aboriginal Cultural Heritage Assessment Report and Historic Heritage Impact Assessment prepared by OzArk Environmental and Heritage Management Pty Ltd (operating as OzArk Environment and Heritage).

1.3 The Applicant and the Site

1.3.1 The Applicant

The Applicant is Rockwoods Investment Group Pty Ltd, a wholly owned subsidiary of PA Woods & Co Pty Ltd, which is a private company owned and operated by Brett and Chris Woods.

The Applicant proposes that management of all operational components of the Quarry would be managed by E.B. Mawson & Sons Pty Ltd trading as Milbrae. Milbrae is one of a group of companies that operate under the E.B. Mawson & Sons Pty Ltd brand centred around the provision of quarry products and mobile crushing services, as well as a range of ready-mix and precast concrete product. Milbrae operates a network of quarries within the Riverina Region of New South Wales, which together produce a range of hard rock and road base products the bulk of which are used to supply private operators and local councils.

1.3.2 The Quarry Site

The Quarry Site is located on rural land within Lot 12 DP1286927. The Quarry Site has been defined principally to identify an area in which all activities are proposed, recognising that not all land within the Quarry Site would be disturbed. The Quarry Site covers a total area of 46.5ha of which approximately 35.5ha would be disturbed throughout the life of the Quarry. The Quarry Access Road provides access to the Quarry Site from Munros Road and traverses Crown Land (Lachlan Range State Forest) which is leased to Mr Rendall Groat under a perpetual lease agreement. **Figure 1.2** displays the land titles traversed by the Quarry Access Road and within the Quarry Site.

1.4 Background to the Proposal

Operations within the Quarry Site commenced in 1987 by Mr and Mrs G. Neyland under DA1/86 which was issued by Carrathool Shire Council on 25 May 1987. The Quarry currently operates under DA2/91 which was issued by Carrathool Shire Council on 19 July 1991.

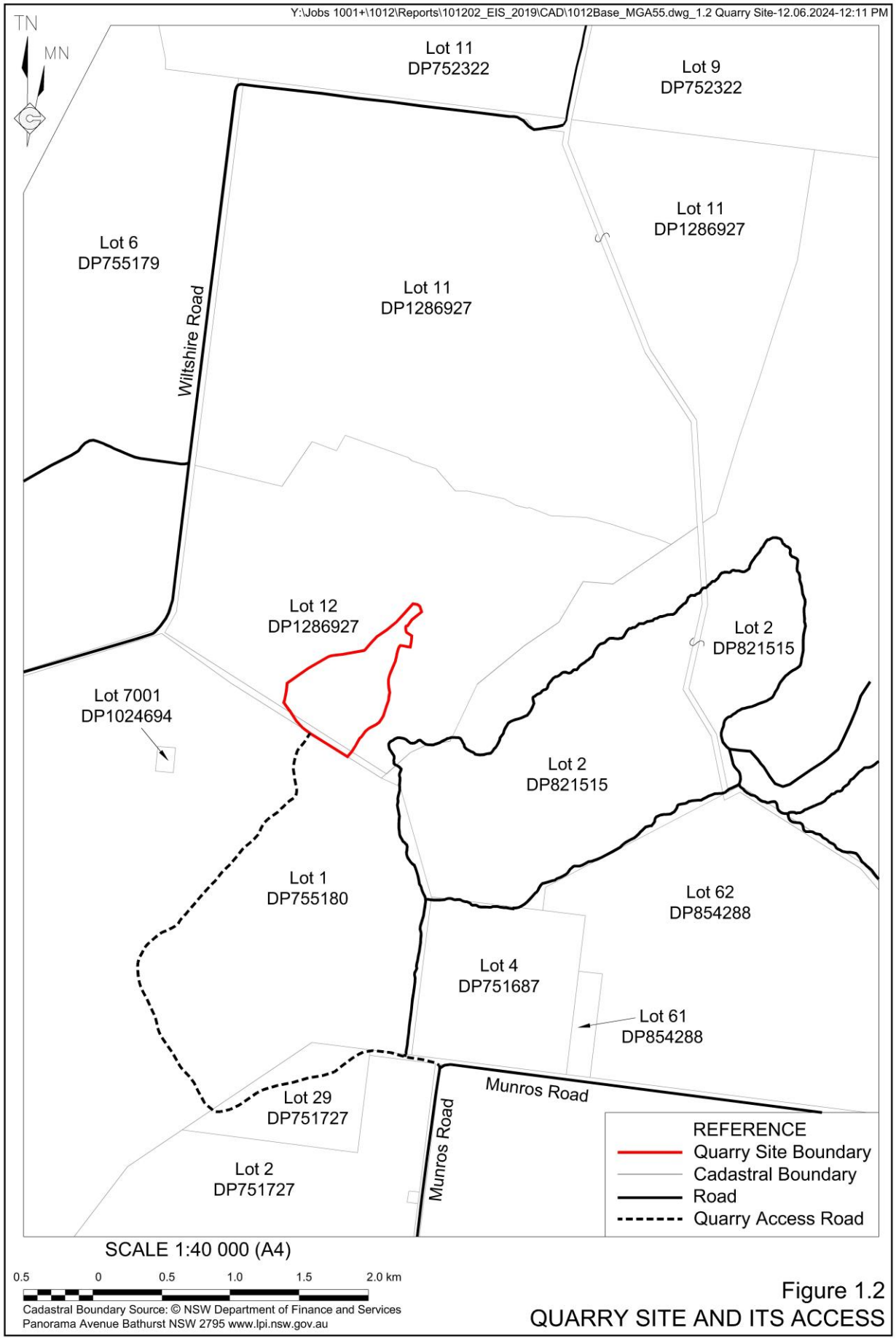

Figure 1.2
QUARRY SITE AND ITS ACCESS

The Applicant has identified a further 4.9 million tonnes of resource adjacent to and beneath the current approved extraction area which would be the target of extraction throughout the Quarry life. The extraction of this material would involve the removal of approximately 800 000m^3 (bcm) of overburden and interburden. The extension of the extraction area would increase the total area of disturbance to approximately 35.5ha of which approximately 4.23ha is remnant native vegetation which would need to be progressively cleared.

In order to efficiently access and extract the identified resource, it is proposed that a new development consent is sought that would supersede the existing development consent. As part of this application, the Applicant proposes to increase the approved maximum extraction rate to 250 000tpa to allow for existing and future market demands to be met.

1.5 Need for the Proposal

The need for hard rock products produced from the materials extracted from Western Riverina Quarry has been demonstrated through the sale of products since operations commenced in 1987. Products from the Quarry have been supplied for a range of infrastructure and construction projects throughout the Riverina Region. Under the Proposal, the Quarry would continue to provide a range of crushed rock products for use in the Carrathool Local Government Area (LGA) and the broader Riverina Region.

1.6 Existing Operations

Figure 1.3 presents the existing layout of Western Riverina Quarry which incorporates an extraction area, processing and product stockpiling area, processing fines stockpiling area, ancillary components area and historical extraction areas.

The following activities are currently undertaken within the Quarry Site.

- Vegetation clearing and soil stockpiling (intermittently).
- Removal and stockpiling of any overburden and interburden.
- Drilling and blasting to fragment raw material.
- Loading and hauling of fragmented rock to the fixed processing plant.
- Processing of fragmented rock to manufacture a range of blue metal aggregates, 5mm and 20mm aggregates, road pavement products, rail ballast and rock spalls.
- Stockpiling of Quarry products within the processing and product stockpiling area.
- Stockpiling of processing fines in the processing fines stockpiling area.
- Pre-coating a small percentage of aggregates prior to despatch.
- Loading and transportation of Quarry products to end points of use.

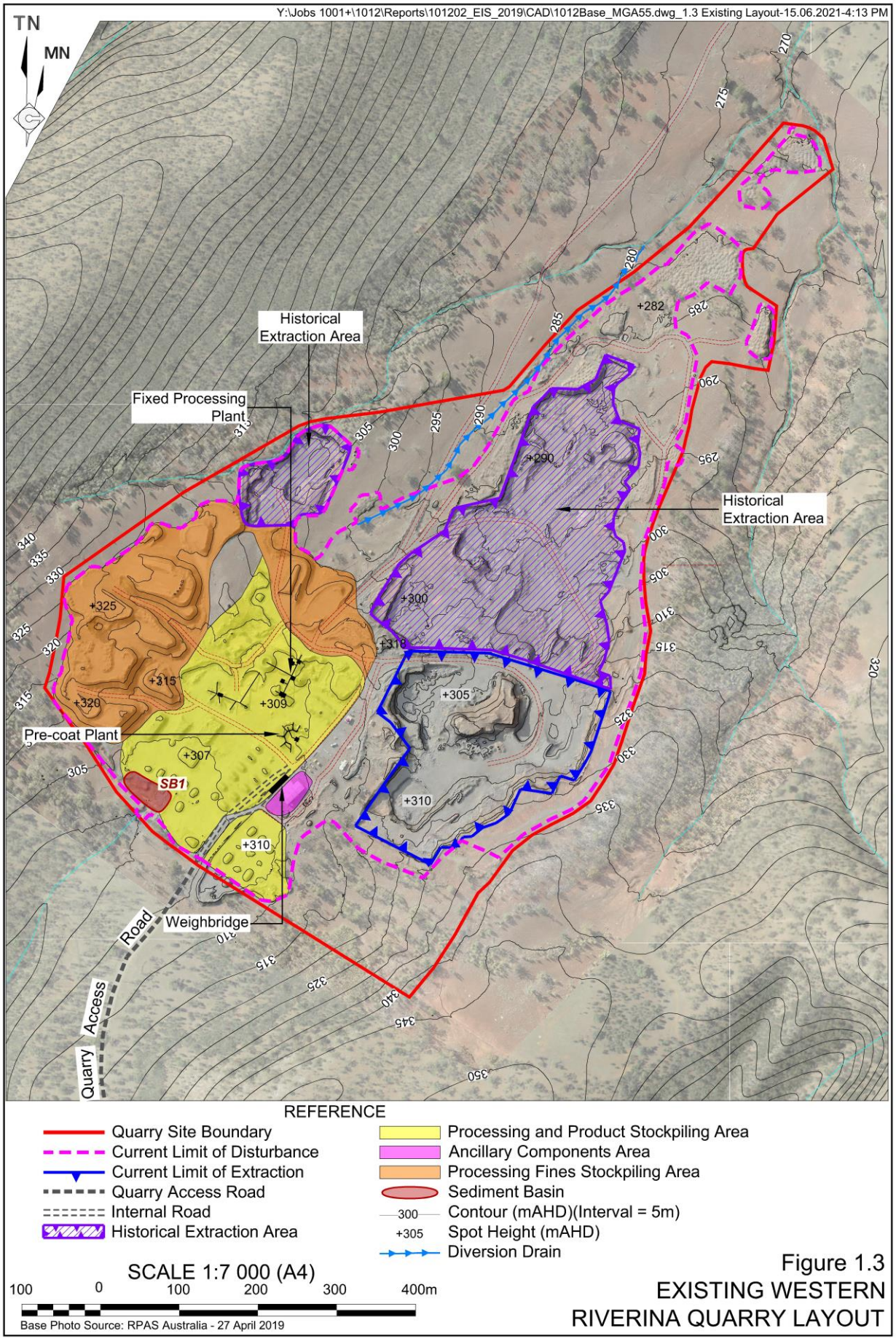

Figure 1.3
EXISTING WESTERN RIVERINA QUARRY LAYOUT

1.7 Consideration of Alternatives

The Proposal would extend existing operations at the Western Riverina Quarry and provide for the professional and efficient operation of the Quarry. As the Quarry is based on the site of the targeted resource and would utilise existing Quarry infrastructure, it is not possible, nor necessary, to relocate the Quarry operations. It is noted that Milbrae operates a network of quarries within the Riverina Region which have been strategically located proximal to end markets in order to reduce costs associated with product transportation. This ultimately ensures that products are supplied to end markets at a competitive price point.

1.8 Environmental Management and Documentation

1.8.1 Environmental Management

Given the size and location of the operation and limited environmental impacts from operations within the Quarry Site, formal monitoring programs have not been required. Ongoing environmental management of the Quarry, including the assessment of the extent of implementation of the commitments made in this document (see Section 6) and the conditions of the development consent or licence conditions, would be the ultimate responsibility of the Applicant. The Quarry Manager would remain responsible for day-to-day on-site supervision including the integrated implementation of all environmental safeguards identified in this document, and all additional documentation as developed throughout the life of the Quarry.

The Applicant proposes that all extraction, processing, transportation and associated activities would be undertaken in a responsible and pro-active manner which is environmentally and socially responsible.

1.8.2 Environmental Documentation

The Quarry is currently operated generally in accordance with DA2/91. The Applicant would assemble a comprehensive Environmental Management Plan for the ongoing management of the relevant environmental issues at the Quarry. The Plan would incorporate an overall Environmental Management Strategy and comprise separate sections relating to:

- Vegetation Clearing;
- Traffic Management;
- Air Quality Management;
- Soil and Water Management;
- Rehabilitation Management; and
- a Pollution Incident Response Management Plan.

The Plan would also include a protocol to manage any complaints (including a Complaints Register) and a Driver's Code of Conduct.

1.9 Consultation

1.9.1 Surrounding Landowners

The Applicant maintains an open-door policy regarding complaints, questions and feedback from its fence-line neighbours and the local community regarding the environmental performance of the existing quarry. The Applicant visited or contacted five neighbours during the preparation of the EIS to explain the proposed operations and discuss any Quarry-related issues. This consultation identified very few issues, however, matters to be addressed within the EIS included increased traffic on the Mid-Western Highway, potential dust emissions from traffic movement on the Quarry Access Road and the risk of sediment-laden runoff from the Quarry onto surrounding properties. These issues are addressed in Sections 5.1, 5.2 and 5.4 respectively.

The Applicant also plans to visit neighbours during the exhibition period for the EIS to discuss the Proposal in more detail and any concerns regarding the ongoing operation of the Quarry.

1.9.2 Government Agencies

A background paper was prepared and distributed to the then Department of Planning and Environment in 2019 with a request for assessment requirements for the Proposal. Responses were received from the following government agencies.

- Department of Planning, Industry and Environment
- Department of Industry – Crown Lands
- Department of Primary Industries – Agriculture
- Department of Primary Industries – Fisheries
- Environment Protection Authority
- Office of Environment and Heritage
- NSW Rural Fire Service
- Roads and Maritime Services
- Water NSW
- Natural Resources Access Regulator
- Department of Planning and Environment - Resources Regulator
- Department of Planning and Environment - Division of Resources and Geoscience
- Carrathool Shire Council (no requirements to be addressed in the EIS provided)

1.10 Management of Investigations

The preparation of this document has involved a study team managed by Mr Caiden O'Connor, B.Sc. (Geology), Senior Environmental Consultant with RWC, Mr Samuel Rosek, B.Sc. (Palaeobiology), G.Dip.CB., Graduate Environmental Consultant with RWC and Dr Mudassar Arsalan, Senior Cartographer / Spatial Analyst with RWC. Mr Rob Corkery, B.Appl.Sc.(Hons), M.Appl.Sc., Principal Environmental Consultant of RWC provided internal peer review of the documentation.

Information concerning the existing and proposed operations was provided by Mr Scott Gillieatt (former Regional Manager), Mr Keith Joy (former Senior Operations Manager), Mr Ryan Barry (former Transport Manager) and Mr Geoff Pigram (former Property Officer) of Milbrae Quarries Pty Ltd.

Quarry design and planning was managed by Mr Michael Yelf of RPM Global Pty Ltd.

A range of environmental investigations has been undertaken to assess the potential environmental impacts of the Proposal and identify operational safeguards and measures. These studies were undertaken by a team of specialist consultants managed by RWC including the following companies and key individuals.

- The Transport Planning Partnership – Traffic Assessment
  - Mr Ken Hollyoak M.Sc. (Transport Planning), B.Sc. (Hons)
  - Ms Penny Dalton B.E.Civil (Hons)
- Northstar Air Quality – Air Quality Assessment
  - Dr Martin Doyle Ph.D, B.Sc. (Hons)
- Muller Acoustic Consulting – Noise and Vibration Assessment
  - Mr Dale Redwood B.Sc. (Hons)
- OzArk Environment and Heritage – Biodiversity Development Assessment Report
  - Dr Crystal Graham Ph.D (Biology), B.BSc. (Hons) Biology
  - Ms Madeline Walsh B.Sc. (Hons) Ecology, B Env Biology
- OzArk Environment and Heritage – Aboriginal Cultural Heritage Assessment Report and Historic Heritage Impact Assessment
  - Dr Alyce Cameron Ph.D, Archaeology, B.A. (Hons)
  - Mr Ben Churcher B.A. (Hons) Dip Ed.

Section 2

Description of the Proposal

PREAMBLE

This section describes the proposed extension of operations at the Western Riverina Quarry ("the Proposal") including:

- *the objectives of the Proposal;*
- *an overview of proposed activities;*
- *a review of local geology, resources and Quarry products;*
- *the proposed extraction and processing activities to be undertaken within the Quarry Site;*
- *the proposed transportation regime for the delivery of Quarry products;*
- *the proposed management of production by-products and non-production wastes;*
- *the proposed infrastructure, utilities and services that would be used within the Quarry Site as well as proposed employment, hours of operation and life of the Proposal; and*
- *the proposed rehabilitation of areas that would be disturbed within the Quarry Site throughout the life of the Proposal.*

The Proposal is described in sufficient detail to provide the reader with an overall understanding of the nature and extent of all activities proposed throughout the life of the Proposal, how the various activities would be undertaken and to enable an assessment of the potential impacts on the surrounding environment.

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2.1 Introduction

2.1.1 Objectives of the Proposal

The Applicant's principal objective is to obtain development consent to enable the planned extension of the Western Riverina Quarry. The Quarry would continue to be operated to meet the following objectives.

1. To provide a source of high-quality Quarry products for use in the Carrathool Local Government Area (LGA) and the broader Riverina Region.
2. To maximise resource recovery within the defined extraction area.
3. To develop and operate the Quarry in an environmentally responsible manner to meet all relevant criteria and satisfy reasonable community expectations.
4. To create a final landform that is safe, stable and provides for grazing and passive biodiversity conservation.
5. To positively contribute to local employment and economic investment.
6. To achieve the above objectives in a cost-effective manner to ensure the Proposal is viable.

2.1.2 Overview of the Proposal

The activities for which the Applicant is seeking development consent would involve the following.

- Extraction of basalt and quartzite from within the proposed extraction area to produce up to 250 000tpa of Quarry products.
- Importation of up to 1 500tpa of concrete washout and other construction materials for recycling and incorporation in products produced within the Quarry.
- Crushing and screening of fragmented rock and imported materials on site using a fixed processing plant.
- Pre-coating of up to 20 000tpa of aggregates.
- Transportation of up to 250 000tpa Quarry products to end points of use within the Carrathool LGA and the broader Riverina Region.
- Ongoing employment of local personnel.
- Progressive and final rehabilitation of the Quarry to develop a final landform suitable for grazing and passive biodiversity conservation.

2.1.3 Approvals Required

Based upon the current design and understanding of relevant environmental issues, the Proposal would require the following approvals.

1. Development consent in accordance with the provisions of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

   The Proposal is classified as "Designated Development" given it is categorised as an "Extractive Industry" and the thresholds would be exceeded for annual extraction of 30 000m^3 per year and land disturbance of more than 2ha as provided in Schedule 3(19) of the *Environmental Planning & Assessment Regulation 2000* (EP&A Reg). As Designated Development for the purpose of extractive industry, the Proposal is also classified as "Regional Development" under Schedule 7(7) of the *State Environmental Planning Policy (State and Regional Development) 2011* (State and Regional Development SEPP) and therefore determination of the development application will be by the Western Regional Planning Panel (RPP). In order to obtain development consent for the Proposal, the development application needs to be accompanied by an EIS. The new development consent would supersede DA2/91 which would be formally surrendered to Council upon commencement of the activities proposed under the new development consent.

2. A variation to Environment Protection Licence 3767 (EPL 3767) approved under the *Protection of the Environment Operations Act 1997* (POEO Act) for the scheduled activity 'Extractive activities' to reflect the increased production and area impacted by the operation. The issuing authority would be the Environment Protection Authority (EPA).

3. An Aboriginal Heritage Impact Permit (AHIP) approved under the *National Parks and Wildlife Act 1974* (NPW Act) to authorise the removal and salvage of three Aboriginal heritage artefacts.

4. A controlled activity approval under the *Water Management Act 2000* (WM Act) to allow for a specified controlled activity on waterfront land.

5. A permit would be required under Section 138 of the *Roads Act 1993* (Roads Act) to seal and widen the left-in bend from the Mid-Western Highway to Munros Road.

The Proposal is classified as "Integrated Development" under Section 4.46 of the EP&A Act because it would require a varied EPL issued under the POEO Act, an AHIP issued under the NPW Act, a controlled activity approval under the WM Act and a permit under Section 138 of the Roads Act.

It is noted that the Applicant holds Water Access Licence (WAL) 28615 to extract up to 10ML of groundwater annually from groundwater bore GW001705 (70CA617191) which is located approximately 1km to the north of the Quarry Site within Lot 1 DP821515. This allocation would continue to be used towards the Proposal's bulk water requirements.

2.2 Quarry Site Layout

The Quarry Site layout displayed in **Figure 2.1** incorporates the following existing and proposed components. The Quarry Site boundary was chosen to minimise impacts on native vegetation and Aboriginal heritage artefacts (see Sections 5.5 and 5.6).

- Extraction Area (18.1ha)

  The extraction area would be centred on the targeted hard rock resource – see Section 2.5 for details of the proposed design and staging of extraction operations.

- Processing and Product Stockpiling Area (5.5ha)

  This area would include the fixed processing and screening plant, pre-coat plant, pugmill and dedicated areas for stockpiling Quarry products and imported material. The Processing and Product Stockpiling Area would be relocated from its existing location to the west of the extraction area to the north of the extraction area prior to the commencement of Stage 3 to allow for the extraction of resource beneath its existing location.

- Ancillary Components Area (0.7ha)

  This area would be located to the west of the processing and product stockpiling area and would comprise the Quarry office, amenities, light vehicle parking, weighbridge and workshop. The Ancillary Components Area would be relocated from its existing location to the west of the extraction area to the north of the extraction area prior to the commencement of Stage 3 to allow for the extraction of resource beneath its existing location.

- "No-go" Areas (1.1ha)

  Designated "no-go" areas would be retained within the northern and southeastern extents of the Quarry Site to preserve Aboriginal heritage sites. The areas would be clearly marked to prevent inadvertent access.

- Rehabilitation Areas (14.8ha)

  Designated areas would be progressively rehabilitated throughout the life of the Proposal – see Section 2.14 for details of rehabilitation activities to be undertaken as part of the Proposal.

- Operational Disturbance Area (35.5ha – inclusive of all Quarry components and associated areas of disturbance)

  Areas would be cleared of vegetation around the extraction area and other Quarry components to allow for the construction of safety bunds, internal roads / tracks and erosion and sediment control infrastructure.

- Quarry Access Road (5.2km)

  The existing Quarry Access Road, which extends from Munros Road to the Quarry Site, would be retained to provide ongoing access to the Quarry Site for both heavy and light vehicles.

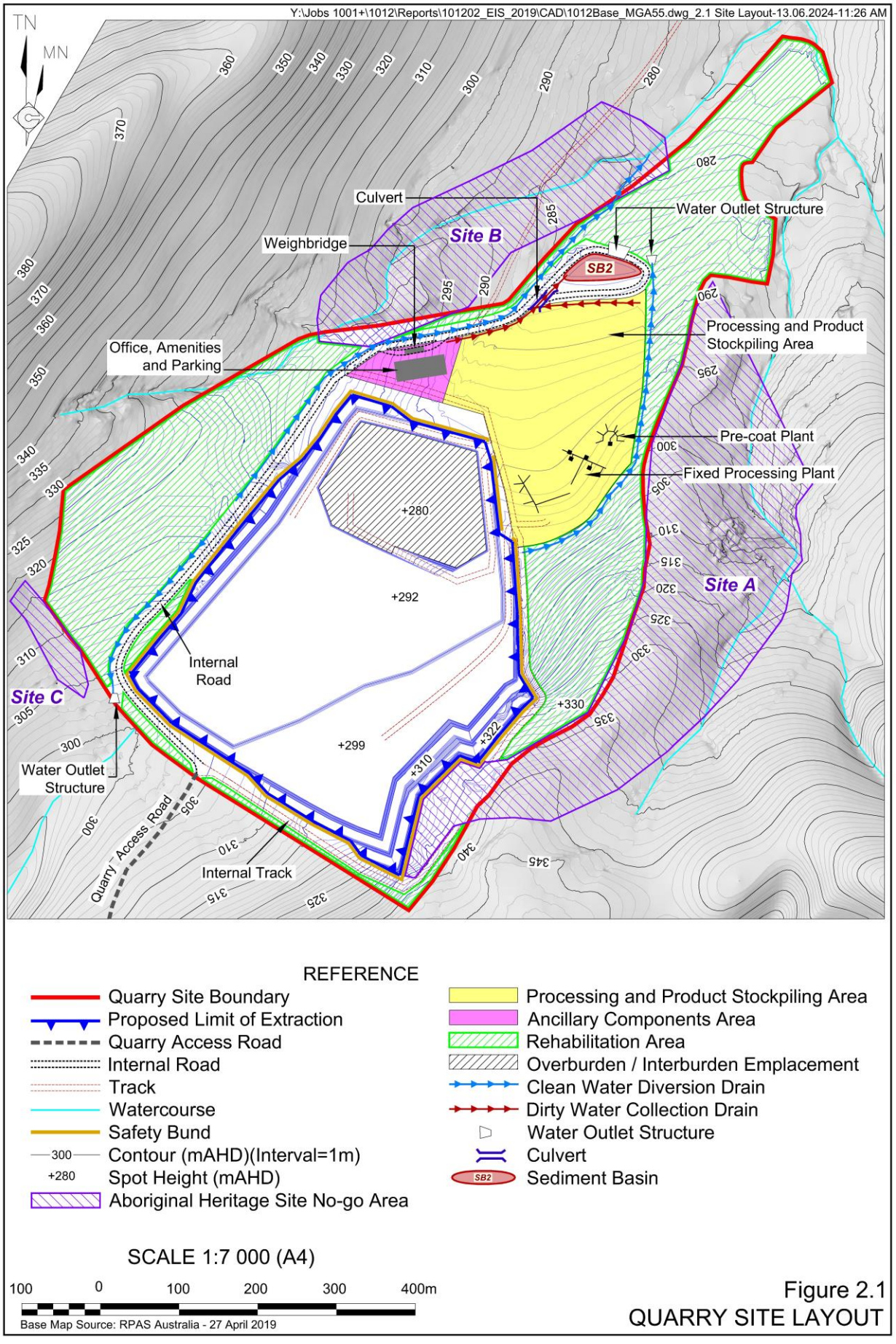


Figure 2.1
QUARRY SITE LAYOUT

2.3 Resources and Products

2.3.1 Geology and Resources

The targeted resource beneath the Quarry Site comprises leucite-rich basalt and quartzite material. Comprehensive drilling programs undertaken by the Applicant to characterise the site geology and define the resource indicate that the basalt resource comprises an upper and lower flow separated across most of the Quarry Site by a red clay (tuff) band. The basalt flows have a cumulative average thickness of approximately 14m within the proposed extraction area with the interburden tuff layer averaging approximately 1m in thickness. The lower basalt flow generally terminates in basement metasediments including quartzite and metasiltstone (Groundwork Plus, 2016).

The material balance and resource volumes within the proposed extraction area are presented in **Table 2.1**. **Figure 2.2** displays the location of exploration drill holes as well as a typical cross section which shows the indicative extent of the lower basalt flow.

Table 2.1
Material Balance and Estimated Resource

Stage	Overburden / Interburden (m^3)	Overburden / Interburden (t)*	Basalt (t)*	Quartzite (t)*	Total Resource (t)*
Stage 1	269 038	699 498	1 468 947	163 216	1 632 163
Stage 2	269 113	699 694	1 469 358	163 262	1 632 619
Stage 3	267 094	694 444	1 458 333	162 037	1 620 370
Total	**805 245**	**2 093 637**	**4 396 637**	**488 515**	**4 885 152**
* Density based on 2.6 t/m^3 (bcm)					
Source: RPM Global					

The Applicant would undertake drilling within the Stage 3 footprint prior to the progression of extraction in this area to better define the resource. Material volumes within this area have been estimated based on the Applicant's knowledge of the local geology.

2.3.2 Products

The principal products produced at Western Riverina Quarry are hard rock aggregates and road pavement products for use in construction and infrastructure projects. The key products that would continue to be produced at the Quarry would include the following.

- Blue metal aggregates for use in concrete and asphalt production, general landscaping and other applications (typically from 5mm to 20mm).
- Rail ballast for drainage materials, rail ballast, gabion baskets and slope stabilisation.
- Rock spall for use in bank stabilisation, access tracks for heavy equipment and lining spoon drains.
- Specified and unspecified road pavement products.

Approximately 20 000tpa of aggregates would be pre-coated with a bitumen-based emulsion prior to despatch. Pre-coated products would be used at end points of use for road construction purposes.

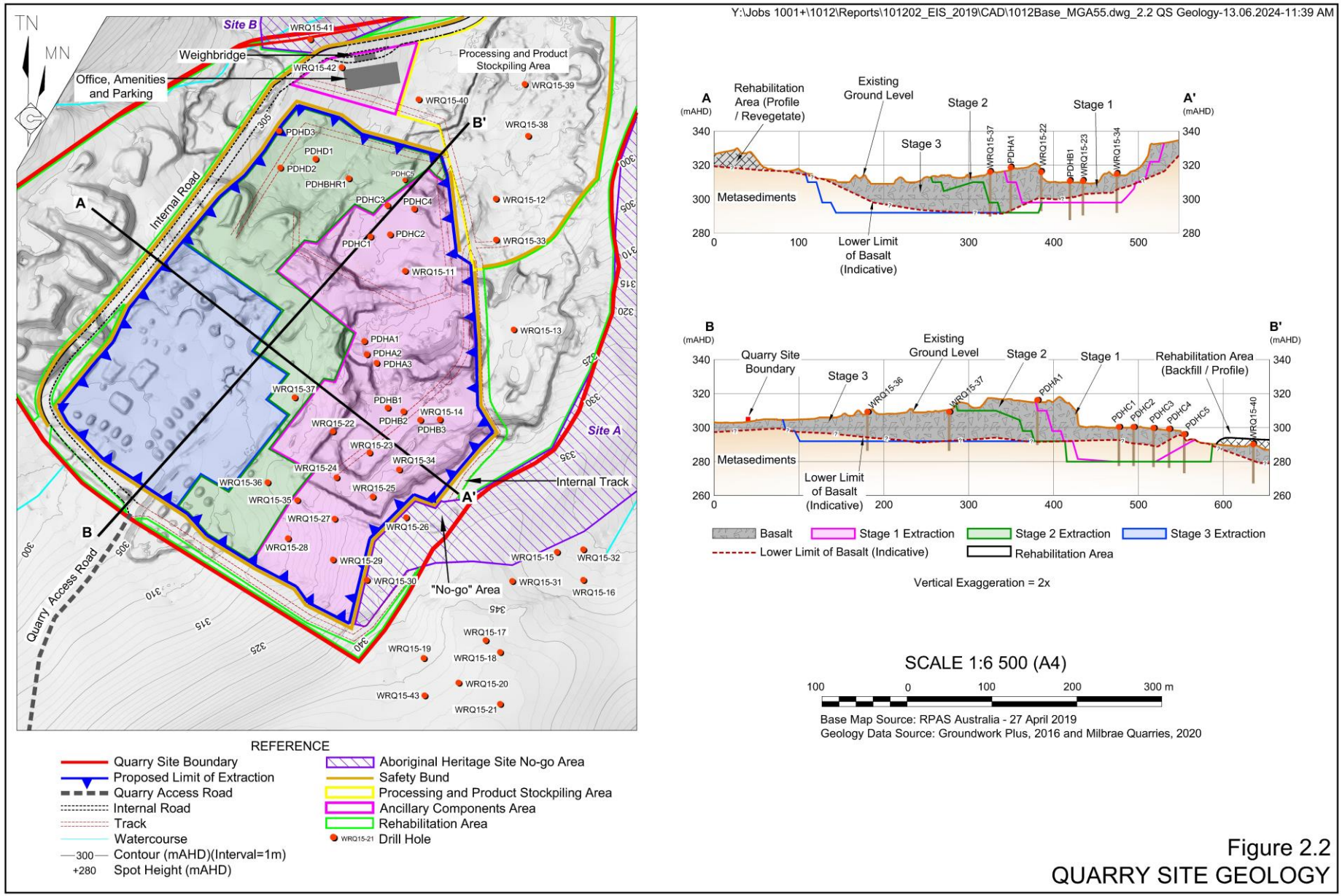


Figure 2.2
QUARRY SITE GEOLOGY

2.4 Development Activities

2.4.1 Introduction

A range of activities would be undertaken concurrently with extraction operations to enable the progressive development and extension of the Quarry. The principal activities would be as follows.

- The marking out of all component areas to be disturbed or avoided during the extension of the Quarry with highly visible permanent markers.
- Progressive construction of water management infrastructure including sediment basins, dirty water collection drains and clean water diversion drains.
- Progressive vegetation clearing and soil removal within the areas approved for disturbance.
- Progressive construction of safety bunds using overburden pushed up from within the extraction area.
- Relocation of the fixed processing plant and pre-coat plant.
- Construction of the new Quarry office and relocation and installation of the weighbridge.
- Construction of internal roads and tracks.

2.4.2 Component Mark Out

Prior to the commencement of any vegetation clearing or earthworks, the Applicant would commission a surveyor to survey and physically mark out the approved areas of disturbance using appropriately labelled and highly visible permanent survey markers such as yellow painted concrete posts. Survey markers would be positioned at the corners of key component areas and along boundaries at distances / spacing that allows visibility of the next marker. All personnel would be made aware of the approved areas of disturbance and the importance of not disturbing any area beyond the approved areas.

2.4.3 Construction of Water Management Infrastructure

Extraction Area – Sediment-laden Runoff

The extraction area would be internally draining with all runoff reporting to a sump located on the floor of the extraction area. The location of the sump would be determined based on operational requirements during each stage.

Areas of Operational Disturbance – Sediment-laden Runoff

Two sediment basins would be constructed to collect and manage sediment-laden runoff, as follows.

- Sediment Basin 1 (SB1)

  SB1 would be located at the southwestern extent of the processing and product stockpiling area during Stages 1 and 2. The existing sediment basin at this location would be upgraded to provide a minimum total capacity of 1 408m^3 comprising a sediment storage zone of at least 178m^3 and a water settlement zone of at least 1 230m^3. Water would overflow from SB1 via a rock-lined spillway. It is envisaged that SB1 would be enlarged during the early stages of development to provide sufficient capacity for sediment-laden runoff from the contributing catchment. SB1 would ultimately be backfilled at the beginning of Stage 3 as the contributing catchment is stabilised with vegetation.

- Sediment Basin 2 (SB2)

  SB2 would be located at the northern extent of the Quarry Site and would be constructed with a minimum total capacity of 784m^3 comprising a sediment storage zone of at least 84m^3 and a water settlement zone of at least 700m^3. Water would overflow from SB2 via a rock-lined spillway to the surrounding environment.

Dirty water collection drains would be constructed to convey sediment-laden runoff from areas of operational disturbance to sediment basins. The construction of these drains would be staged and reflect the progressive development of the Quarry (see Section 2.5.3).

It is noted that other erosion and sediment control measures, such as silt-stop fencing, would be installed downslope of areas of temporary operational disturbance to manage sediment-laden runoff during the development of the Quarry, as required.

The Quarry Access Road crosses a total of six non-perennial watercourses. Inverts would be constructed at each crossing to ensure adequate cross drainage and the maintenance of flow regimes.

Undisturbed Areas – Clean Runoff

Clean water diversion drains or bunds would be constructed to divert clean water away from areas of operational disturbance. The figures in Section 2.5.3 display the indicative locations of clean water diversion drains during the progressive development of the Quarry.

2.4.4 Vegetation Clearing

A total of up to approximately 4.23ha of vegetation in poor and moderate condition would be removed progressively to permit the extension of the extraction and other associated areas of operational disturbance. The vegetation to be cleared would comprise approximately 4.13ha of vegetation in poor condition and 0.10ha of vegetation in moderate condition. All vegetation clearing would be undertaken in accordance with a Vegetation Clearing Protocol which would be included within the Environmental Management Plan for the Quarry.

Vegetation would be cleared within the defined areas of disturbance using an excavator and/or bulldozer, as required. The bulk of the felled trees would either be removed for timber production or mulched with the mulch either stockpiled and used on site or removed from site.

2.4.5 Soil Removal

The soil in areas cleared of vegetation during the development of the extraction area and relocation of the processing plant, office and weighbridge would be stripped following removal of the larger vegetation. The Applicant would remove topsoil, where present, focussing upon the recovery of seed-bearing material, if present. The topsoil recovered would be either transferred directly to areas undergoing rehabilitation or temporarily stockpiled in the processing and product stockpiling area for later use in progressive rehabilitation.

As far as practicable, timing for soil stripping would avoid forecast rainfall to potentially prevent higher levels of soil loss due to erosion. If clearing during wet weather is unavoidable, additional practices would be undertaken to reduce erosion risk, such as placement of sediment controls at one or more locations downslope.

2.4.6 Construction Activities

The following construction activities would be undertaken throughout the life of the Proposal.

- A perimeter safety bund would be progressively constructed around the extraction area by pushing up overburden to a height of approximately 1.5m above the surrounding land surface. Clean water diversion drains or bunds would also be constructed in accordance with the figures in Section 2.5.3. The external surface of bunds (i.e. the surface adjacent to undisturbed catchments) would be stabilised to ensure a safe, secure and non-polluting landform is achieved.
- The fixed processing and screening plant, pre-coat plant and pugmill would be relocated to the north of the extraction area prior to the commencement of Stage 3.
- A new Quarry office and amenities building would be constructed within the ancillary components area to replace the existing Quarry office prior to the commencement of Stage 3. The weighbridge would also be relocated to the ancillary components area prior to the commencement of Stage 3.
- Internal roads and tracks would be constructed throughout the life of the Proposal, as required. Both roads and tracks would be appropriately paved, however, would not be sealed.
- Minor works would be undertaken to seal and widen the left-in bend from the Mid-Western Highway to Munros Road.

2.5 Extraction Operations

2.5.1 Introduction

Extraction operations would be undertaken in a similar manner to existing operations i.e. using conventional drill and blast, load and haul methods. This subsection presents information relating to the proposed extraction operations including design features, extraction sequence, extraction methods, equipment used and extraction rates.

2.5.2 Design Features

The following indicative design features would be adopted for the ongoing operation of the Quarry. It is noted that these parameters would be subject to modifications based on factors such as localised geological conditions and optimal ramp locations.

- Operational Face Height: 5m to 12m
- Operational Bench Width: Variable
- Terminal Bench Width: Variable
- Face Angle: 45° to 80°
- Haul Ramp Gradient: 8° to 10°
- Haul Ramp Width: 8m to 9m

2.5.3 Extraction Sequence

Figures 2.3 to **2.5** display the indicative extraction sequence and cross sections through the extraction area throughout the life of the Proposal. Whilst it is envisaged that extraction would proceed generally in accordance with the staging displayed on these figures, staging would be subject to modifications based on factors such as localised geological conditions and product demand.

Stage 1

Stage 1 extraction operations would involve the progressive development of benches at approximately 322m AHD, 310m AHD, 299m AHD, 292m AHD and 280m AHD. The development of these benches would ultimately extend the footprint of the extraction area to the south and northwest to cover a cumulative area of approximately 7.9ha. During the extension of the extraction area, overburden would be progressively pushed up to the edge of the active extraction area using a bulldozer or excavator to provide access to the targeted resource. Following the removal of overburden, the targeted resource would be extracted using drill and blast methods with fragmented rock loaded and hauled to the fixed processing plant.

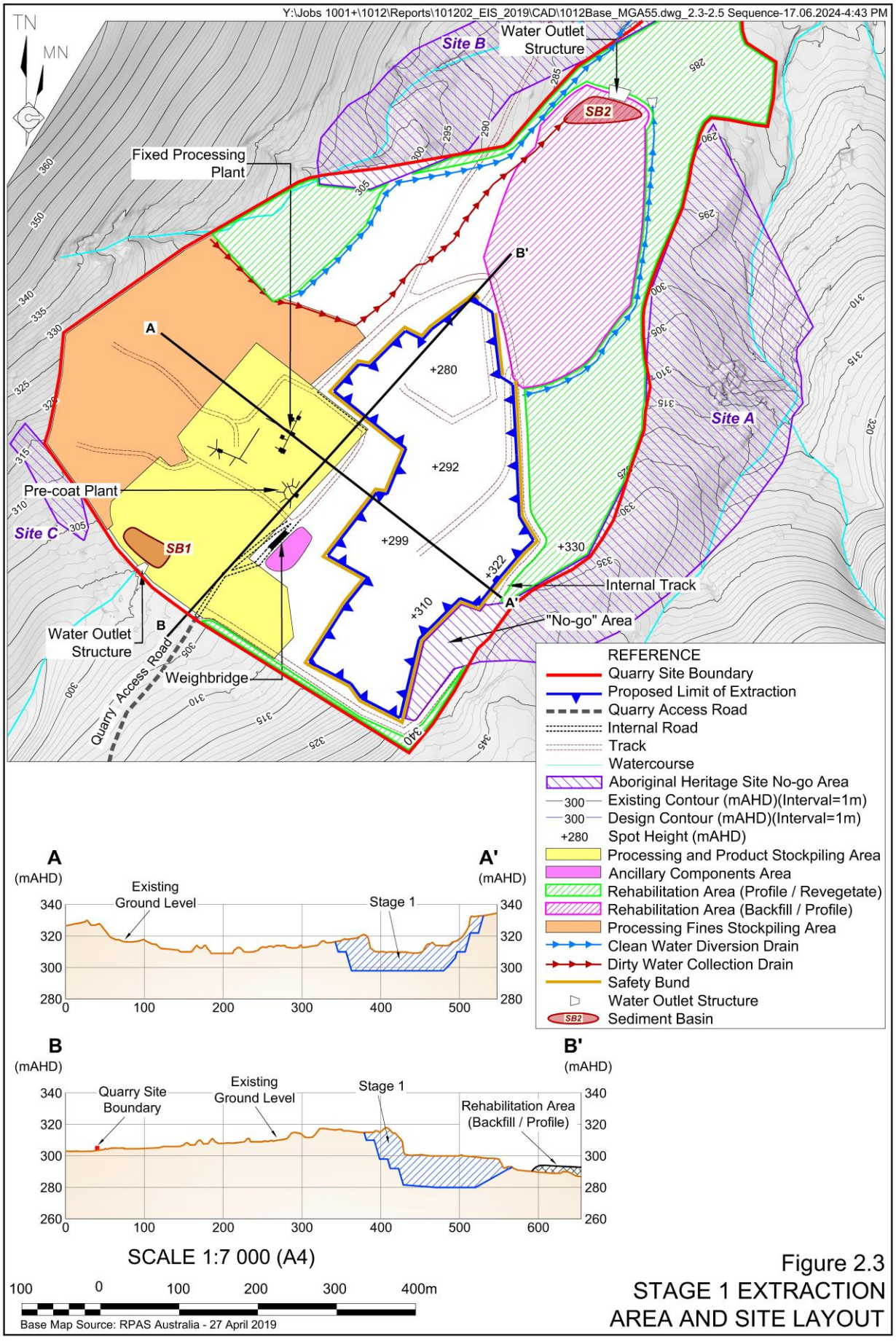


Figure 2.3
STAGE 1 EXTRACTION AREA AND SITE LAYOUT

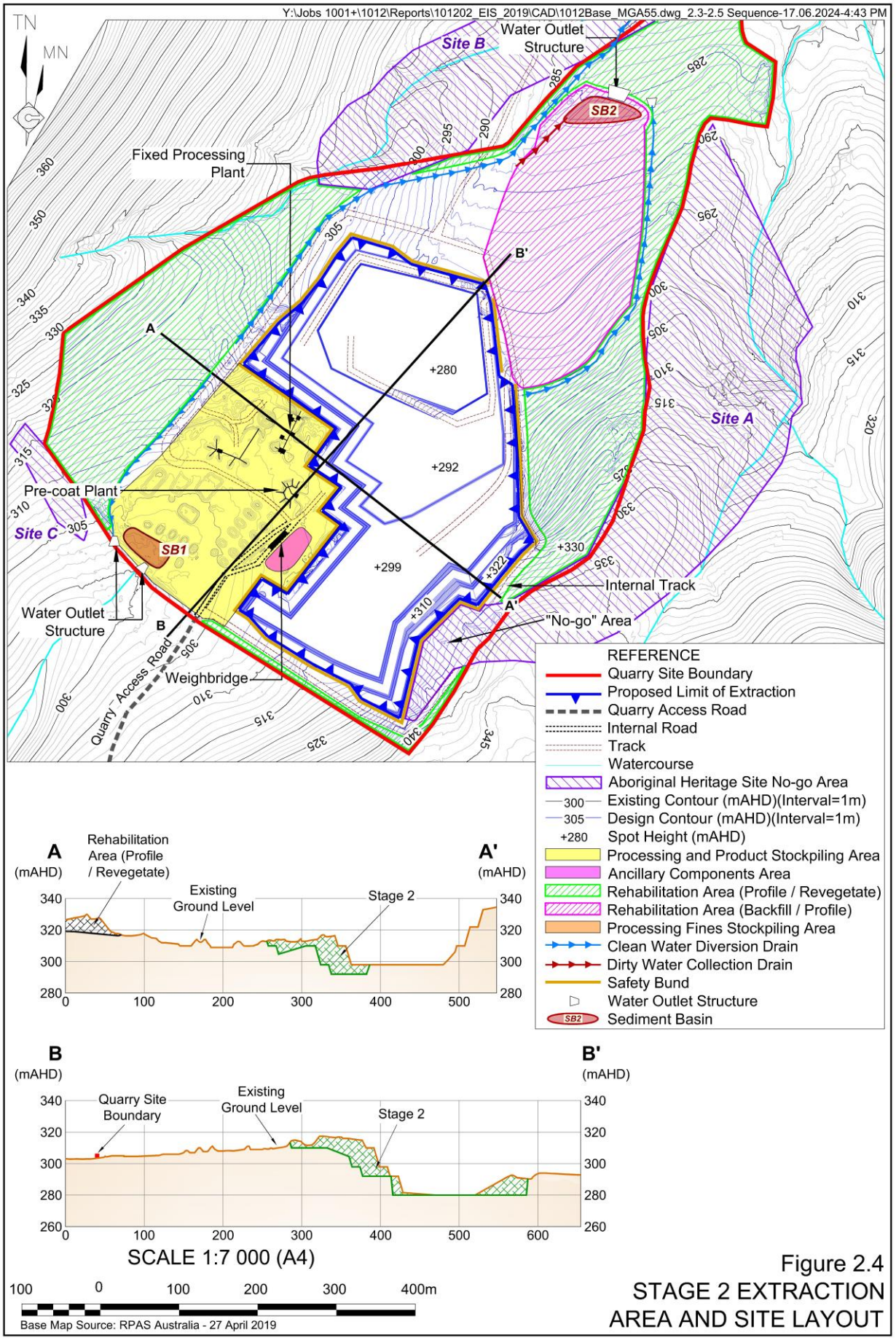


Figure 2.4
STAGE 2 EXTRACTION AREA AND SITE LAYOUT

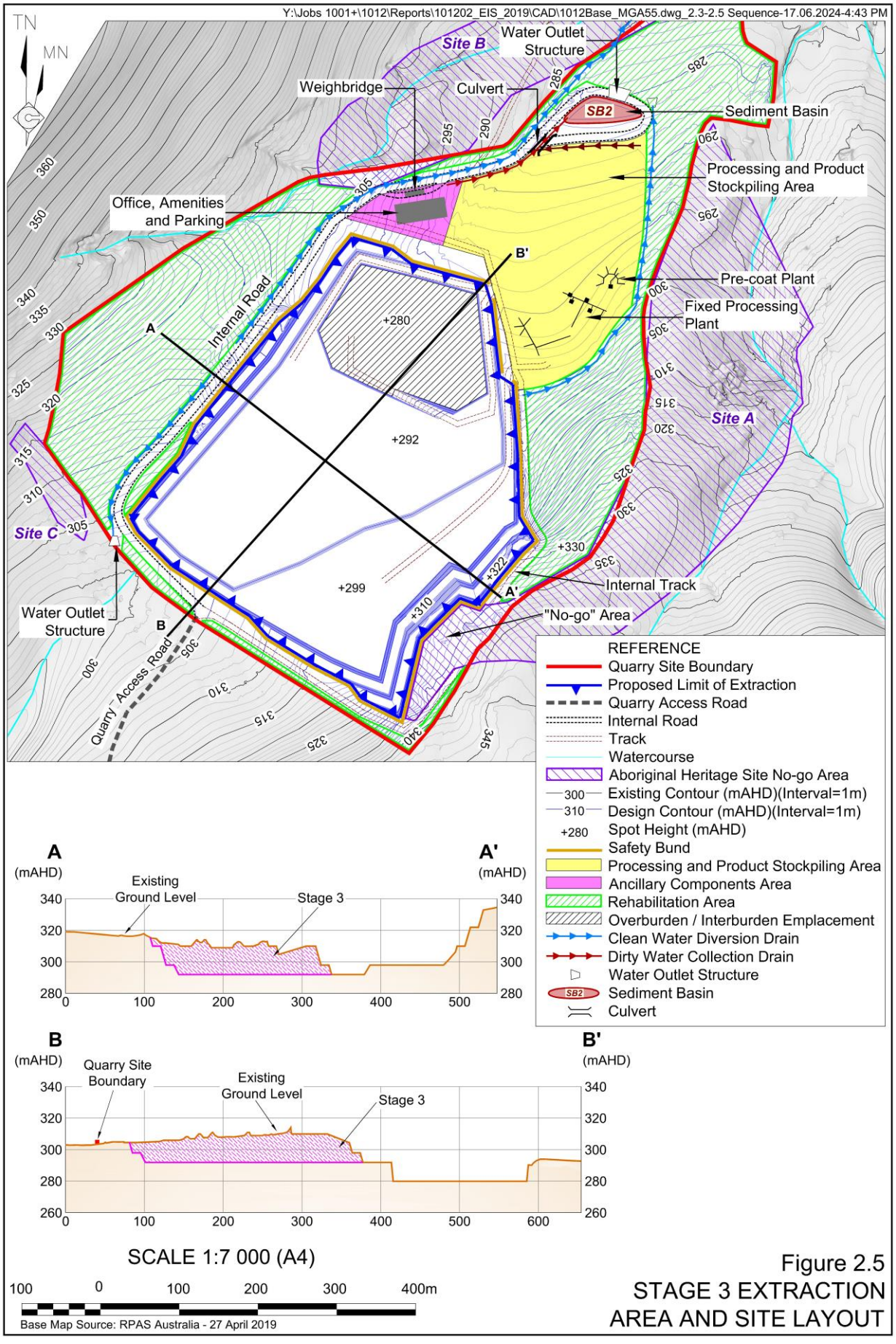


Figure 2.5
STAGE 3 EXTRACTION AREA AND SITE LAYOUT

Stage 2

Stage 2 extraction operations would involve the progressive development of the benches at 310m AHD, 299m AHD, 292m AHD and 280m AHD. The development of these benches would ultimately extend the footprint of the extraction area to the northwest to cover a cumulative area of approximately 13.2ha.

Stage 3

Stage 3 extraction operations would involve the progressive development of the benches at 310m AHD, 299m AHD, 292m AHD and 280m AHD with the Quarry footprint ultimately extending to the southwest to cover a cumulative area of approximately 18.1ha. Extraction would progress within the footprint of the existing processing and product stockpiling area in Stage 3 which would require the relocation of Quarry-related infrastructure to the north of the extraction area.

2.5.4 Extraction Method

Drilling and blasting would continue to be used to extract material from within the extraction area. Each blast would typically fragment up to 50 000t of material although it is noted that smaller blasts would also be undertaken, as required. The design parameters for a typical blast are listed in **Table 2.2**. Blasting would typically occur no more than once per month with a total of between 8 and 12 blasts undertaken per year. However, given the need for flexibility for ongoing operations, blasting no more than once per week (excluding that required in the event of a misfire) is proposed.

Table 2.2
Indicative Blast Design Parameters

Parameter	50 000t Blast
Surface Area	960m^2
Drillhole Diameter	89mm
Depth	12m
Sub-drill	1m
Stemming	2.5m
Burden	2.5m
Spacing	2.5m
Maximum Instantaneous Charge	110kg

2.5.5 Extraction Rate

The extraction rate would be closely aligned to anticipated product demand. Hence, the extraction rate is anticipated not to exceed 250 000tpa. This rate has been selected based on the inferred resource, anticipated demand and allows for peaks in some years. The average annual extraction rate is anticipated to be 165 000tpa.

2.5.6 Extraction Equipment

Table 2.3 lists the range of equipment currently used at the Western Riverina Quarry. The Applicant intends to continue to use this equipment throughout the remaining life of the Quarry noting that some equipment would be replaced, as required.

Table 2.3
Mobile Equipment Fleet

Equipment	Number	Typical Use / Activity
Hydraulic Drill Rig (Atlas Copco 35t)	1	Drilling blast holes (typically used for 7 to 10 days each month)
Excavator (Volvo 38T)	1	Resource extraction, haul truck loading, construction activities (daily use)
Mini Excavator (Cat 6t)	1	Resource extraction, haul truck loading, general earth works (daily use)
Dump truck (Komatsu 35T)	1	Raw material haulage to processing plant (daily use)
Front-end Loader (Cat 966)	1	Haul truck and product truck loading, blending road pavement materials, processing / stockpile management (daily use)
Front-end Loader (Volvo 220)	1	Haul truck and product truck loading, blending road pavement materials, processing / stockpile management (daily use)
Bulldozer (Cat D11)	1	Earthmoving, vegetation clearing and construction activities (once every six months)
Water Cart (15 000L)	1	Dust suppression activities (daily use).

2.6 Processing Operations

2.6.1 Processing Plant Layout

Figure 2.6 displays the layout of the processing plant. The processing plant comprises two complementary plants, namely, the "Top Plant" and the "Bottom Plant".

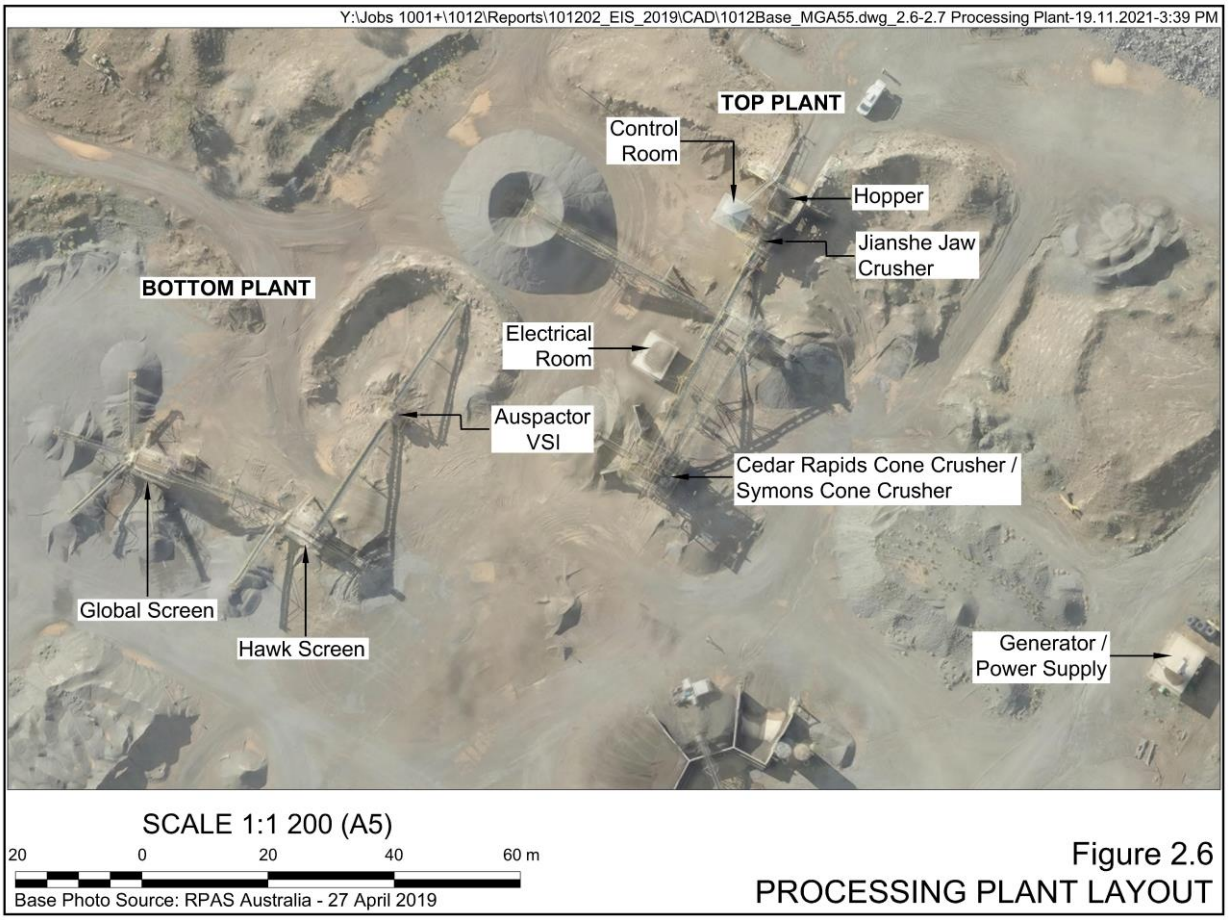
The "Top Plant" comprises the following key equipment.

- 1 x Jianshe Jaw Crusher
- 1 x Cedar Rapids Cone Crusher (4ft)
- 1 x Symons Cone Crusher (3ft)
- 1 x Hawk Screen (twin deck)

The "Bottom Plant" comprises the following key equipment.

- 1 x Auspactor Vertical Shaft Impact Crusher (VSI)
- 1 x Hawk Screen (triple deck)
- 1 x Global Screen (triple deck)

The Applicant would continue to utilise the existing fixed processing plant until the commencement of Stage 3. The processing plant would be relocated to the north of the extraction area prior to Stage 3 to allow for extraction to progress within the footprint of the existing processing and product stockpiling area.



2.6.2 Processing Operations

Fragmented rock would be hauled from the extraction area and tipped directly into the hopper within the "Top Plant" located adjacent to the jaw crusher. The rock would then progress through the sequence of equipment listed in Section 2.6.1 and displayed on **Figure 2.6** to produce spall, ballast and 45mm feed rock for the "Bottom Plant". Material requiring further processing would be transferred from the surge pile to the "Bottom Plant" where it would progress through the remaining equipment to produce 5mm to 20mm aggregates.

A pugmill would also be used on site to produce road pavement products, however, it is anticipated that no more than 10 000tpa would be processed through the pugmill in a typical year.

2.6.3 Operating Capacity and Rates

Table 2.4 presents the maximum and average operating capacities for the "Top Plant" and "Bottom Plant". The theoretical maximum cumulative daily throughput for the plants is approximately 4 740t. However, as the principal output from the "Top Plant" is feed rock for the "Bottom Plant", production is typically limited by the operating capacity of the "Bottom Plant". As such, a maximum cumulative throughput of 3,800tpd[1] has been adopted for the

[1] This assumes a loss of approximately 10% to fines from the "Top Plant".

purposes of this assessment. It is noted that production rates would typically be significantly lower than this with processing activities occurring within but not necessarily continuously throughout the proposed hours of operation.

Table 2.4
Operating Capacity and Rates

	Operating Capacity		Adopted Operating Rates	
Processing Plant	**tph**	**tpd**	**tph**	**tpd**
Top Plant	245	2 940	167	2 000
Bottom Plant	150	1 800	150	1 800
Total	**395**	**4 740**	**317**	**3 800**
tph = tonnes per hour			tpd = tonnes per day	
Source: Rockwoods Investment Group Pty Ltd				

2.6.4 Product Stockpiling

Once produced, Quarry products would be stockpiled within the processing and product stockpiling area. Alternatively, crushed rock would be transferred to the pre-coat plant for treatment. Quarry products would be stockpiled in nominal lots where material testing would be carried out prior to the material being loaded into trucks for despatch.

The average size of each crushed product stockpile would continue to be as follows.

- Aggregates – 1 000t
- Ballast – 5 000t
- Rock Spall – 4 000t
- Road Pavement Products – 4 000t

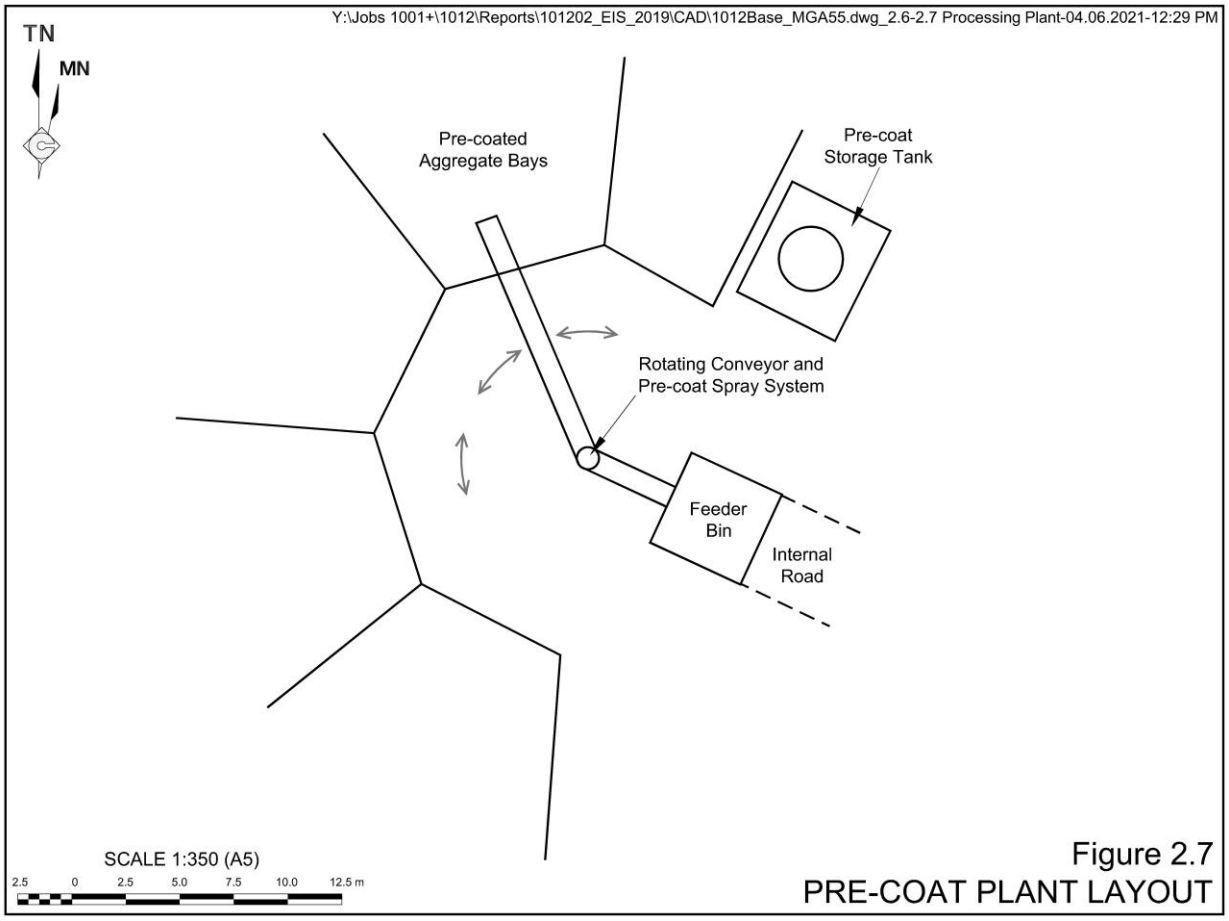
2.7 Pre-Coat Operations

2.7.1 Pre-Coat Plant Layout

The pre-coat plant would be located within the processing and product stockpiling area and would comprise the following components.

- Feeder bin
- Conveyor and pre-coat spray system
- 5 x pre-coated aggregate bays (250t each)
- Pre-coat storage tank (28 000L)

Figure 2.7 displays the layout of the pre-coat plant and its aggregate bays which would continue to be used under the Proposal.



2.7.2 Pre-coat Operations

The Applicant proposes to continue to pre-coat approximately 20 000t of aggregates per year. Aggregates would be loaded into the pre-coat feeder bin and progress through the rotating conveyor and pre-coat spray system prior to storage in the pre-coated aggregate bays. Pre-coated aggregates would be loaded directly from the pre-coated aggregate bays onto product transport vehicles.

It is anticipated that between approximately 100 000L and 120 000L of pre-coat emulsion would be used in the pre-coat plant each year when producing 20 000t of pre-coated products.

2.8 Access, Traffic and Material Transportation

2.8.1 Access

Access for all vehicles to the Quarry Site would be retained via the Quarry Access Road which provides vehicular access from Munros Road.

2.8.2 Transport Routes

Figure 2.8 displays the proposed transport routes which would be used to transport Quarry products from the Quarry Site. For the purposes of assessing traffic-related impacts, it is assumed that up to 100% of heavy vehicle traffic generated by the Quarry would utilise a particular route on a given day depending on demand. It is anticipated that approximately 80% of heavy vehicle traffic would travel westwards on the Mid Western Highway on an annual basis with the remaining 20% travelling eastwards.

2.8.3 Traffic Types and Levels

The bulk of the Quarry products would be despatched from the Quarry Site using truck and dog trailers with a maximum capacity of 38t with the average load being approximately 32t. It is noted that smaller quantities of products would periodically be despatched using other heavy vehicle configurations, however, for the purposes of this assessment truck and dog trailers are relied upon.

Traffic levels would vary substantially on a daily basis throughout the life of the Proposal based on market demands. **Table 2.5** presents the anticipated laden heavy vehicle movements generated by the Proposal.

Table 2.5
Laden Heavy Vehicle Movements

Annual Production Rate	Daily Laden HV Movements		Maximum Hourly Laden HV Movements	Annual Laden HV Movements
	Average	Maximum		
165 000tpa	17.19	60	12	5 157 [1]
250 000tpa	26.04	60	12	7 812 [2]
Note 1: Based on 300 operating days per year, 165 000tpa and an average payload of 32t.				
Note 2: Based on 300 operating days per year, 200 000tpa and an average payload of 32t.				

It is noted that up to approximately five loads of concrete washout and bricks would be imported to the Quarry Site per month. Given that these materials would be backloaded whenever practicable, no additional traffic movements are anticipated.

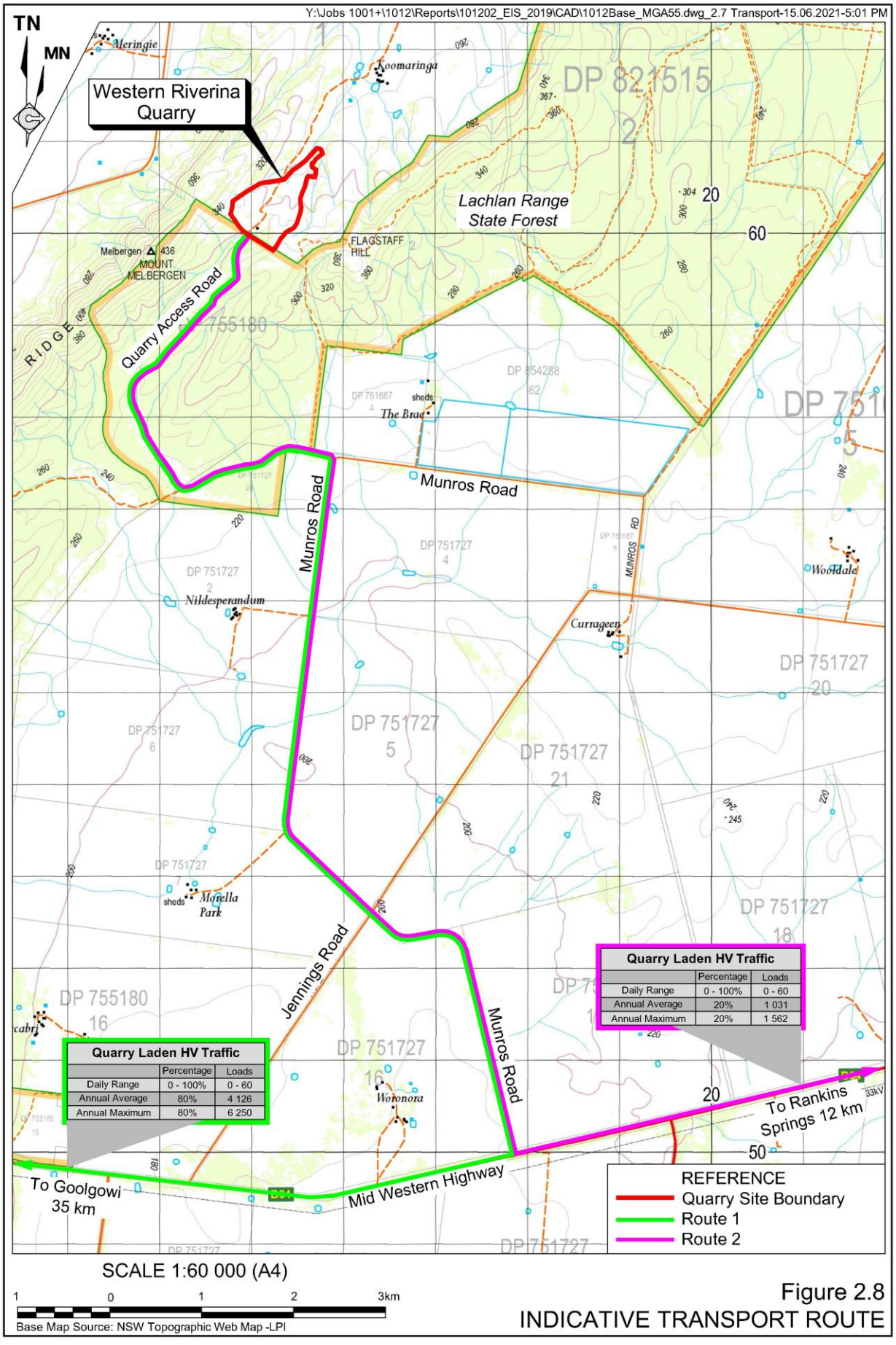


Figure 2.8
INDICATIVE TRANSPORT ROUTE

2.9 Waste Management

2.9.1 Introduction

The SEARs identify "*waste management*" as a key issue for assessment in the EIS. The EPA also requested that all potential waste streams are identified and management arrangements described. The SEARs and the requirements of relevant government agencies are included in full as **Appendix 1**.

The following subsection provides an overview of waste streams that would be generated by the Proposal, approximate volumes and methods of disposal or management.

2.9.2 Production By-products

Overburden and Interburden Management

It is anticipated that approximately 800 000m^3 (bcm) of overburden and interburden would be generated throughout the life of the Proposal (see **Table 2.1**). Overburden and interburden would be used to:

- progressively construct the safety bund around the extraction area and bunds to divert clean water around areas of operational disturbance;
- backfill historical extraction areas; and
- provide a suitable substrate for vegetation on terminal benches or other rehabilitation areas.

Excess overburden and interburden would be emplaced on the floor of the extraction area to ensure that any sediment-laden runoff is contained within the internal drainage network within the extraction area. It is envisaged that overburden and interburden would be preferentially emplaced on the floor of the extraction area at 280m AHD to minimise the sterilisation of the underlying resource, however, these materials may also be emplaced on other benches, as required.

Processing Fines Management

It is anticipated that approximately 65% to 70% of the material processed through the processing plant would generate aggregate products with the remaining 30% to 35% comprising processing fines suitable for a range of other uses. It is anticipated that all processing fines would be used in the production of road pavement products or sold directly to customers. A percentage of fines may also be used in progressive rehabilitation activities to provide a substrate for vegetation.

2.9.3 Non-Production Wastes

The Applicant proposes to continue to manage non-production wastes as follows.

- General domestic waste would be placed in skip bins and removed from the Quarry Site every two to three weeks by a licenced contractor.

- Waste oil would continue to be stored within the workshop in a bunded area containing 8 x 1 000L pods with a combined capacity of 8 000L. This oil would be removed from the Quarry Site periodically by a licenced contractor, as required.
- Used batteries would be stored on a pallet within the workshop and removed from the Quarry Site by a licenced contractor every four to six months.
- Scrap metal would be stored within the processing and product stockpiling area and removed from the Quarry Site once per year.

2.10 Infrastructure, Utilities and Services

2.10.1 Introduction

The Applicant proposes to utilise the existing infrastructure, utilities and services at the Western Riverina Quarry throughout the life of the Proposal. The following subsections provide a brief description of the existing and proposed infrastructure and services that would be utilised at the Quarry.

2.10.2 Buildings and Infrastructure

The Applicant would continue to utilise the existing buildings and infrastructure throughout Stages 1 and 2 which includes the following key components.

- Quarry Office / Breakroom / Amenities
- Light-vehicle car park
- Weighbridge
- Workshop
- Refuelling Area

Prior to the commencement of Stage 3, the above components would be relocated and/or constructed to the north of the extraction area.

2.10.3 Power Supply

Electricity is generated on site with one 750kV diesel generator which is used to power the processing plant. Power is supplied to the Quarry office and workshop, via mains power. It is proposed that the new Quarry office would also be serviced by mains power which would require a minor realignment to power lines.

2.10.4 Telephone

The Quarry is currently serviced by a single telephone line to the Quarry office. It is proposed that the new Quarry office would also be serviced by a telephone line which would require a minor realignment. On-site communications would continue to be undertaken by two-way radio and mobile phones.

2.10.5 Water Supply

Potable Water

Potable water is supplied to the Western Riverina Quarry in 15L bottles which are delivered to the Quarry Site on average every two weeks.

Bulk Water

It is anticipated that bulk water for the Proposal would be sourced from the on-site sediment basins, the extraction area sump and groundwater bore GW001705 located to the north of the Quarry Site within Lot 12 DP1286927. Water allocations from the groundwater bore would be covered under Water Access Licence (WAL) 28615 which allows for 20ML of water to be accessed per year although it is noted that the supply works approval 70CA617191 allows for a maximum of 10ML of water to be accessed from GW001705. The remaining 10ML is accessible under supply works approval 40CA411732 which is located at the Applicant's Cootamundra Quarry. It is anticipated that daily bulk water requirements (including the use of a water cart and misting sprays on the processing plant) would total approximately 33kL. Assuming an average of 300 operating days per year throughout the life of the Proposal, water use requirements are not expected to exceed 10ML per year.

2.10.6 Fuels and Lubricants

Diesel fuel would continue to be stored on site in a 25 000L tank within a bunded storage area. It is estimated that approximately 300 000L of diesel would be used annually to fuel mobile equipment and provide power to the processing plant. The Applicant would continue to limit idle time on mobile equipment in order to minimise fuel usage. It is noted that light vehicles and product transport trucks may also be refuelled on site, with an additional 250 000L to 300 000L of diesel used annually for this purpose.

All lubricants and other small quantities of chemicals used on site would be stored within the workshop on bunded pallets.

All hydrocarbons would be stored in accordance with Australian Standards *AS 1940:2004 – The Storage and Handling of Flammable and Combustible Liquids*.

2.10.7 Sewage and Effluent Disposal

Sewage and effluent disposal would be managed on site using a septic tank and absorption trench system.

2.11 Employment

The Applicant currently employs four full time staff at the Western Riverina Quarry including a Quarry Manager, Supervisor and two Operators. It is anticipated that these employment levels would be maintained throughout the life of the Proposal. Additional personnel (e.g. driller, bulldozer operator) would also work on site periodically.

The Proposal would also provide ongoing employment for between four and twelve truck drivers depending on demand. It is anticipated that an average of eight truck drivers would be employed throughout the ongoing life of the Proposal.

2.12 Hours of Operation and Proposal Life

Table 2.6 lists the proposed hours of operation within which all operational activities would be undertaken throughout the life of the Proposal.

Table 2.6
Proposed Hours of Operation

Activity	Monday to Friday	Saturdays	Sundays or Public Holidays
Site establishment and construction	7:00am – 7:00pm	7:00am – 3:00pm	Nil
Extraction operations	7:00am – 7:00pm	7:00am – 3:00pm	Nil
Blasting operations	10:00am – 3:00pm	Nil	Nil
Processing operations	7:00am – 7:00pm	7:00am – 3:00pm	Nil
Product despatch	7:00am – 5:00pm	7:00am – 3:00pm	Nil
Maintenance	24 hours / day	24 hours / day	Nil

It is anticipated that the Quarry would operate for approximately 30 years from the commencement of operations under the new consent.

2.13 Future Extraction Activities

Towards the end of the 30-year approval period, it is envisaged that the Applicant would assess what resources remain within the Quarry Site and the demand for products from the Quarry. If appropriate, another development application would be submitted to allow for the extraction and processing of the remaining resources of the Quarry. This would likely comprise the development of the extraction area within the footprint of the proposed extraction area, however, design parameters would be determined closer to the time of any future development application.

2.14 Rehabilitation

2.14.1 Introduction

The Applicant's objectives for rehabilitation centre upon creating a final landform that is safe, secure, non-polluting, stable and suitable for grazing and biodiversity conservation. The specific objectives for the long-term rehabilitation program are to:

- provide a low maintenance, geotechnically stable and safe landform with minimal erosion; and
- establish native vegetation or pasture similar to that currently within and surrounding the Quarry Site, as far as practicable.

Emphasis would be placed upon progressive rehabilitation of completed areas within the Quarry Site.

Figure 2.9 displays the indicative final landform for Western Riverina Quarry. It is noted that the final landform presented assumes that Quarry operations would cease at the end of the 30-year approval period.

2.14.2 Designated Rehabilitation Areas

Rehabilitation activities within the designated rehabilitation areas would be staged progressively throughout the life of the Proposal (see **Figures 2.3** to **2.5**). These activities would involve the following.

- Installation of silt-stop fencing downslope of areas under rehabilitation, if required. If surface water runoff causes the erosion of material from within the rehabilitation areas, the material would be salvaged and respread in the rehabilitation areas as soon as practicable.
- Removal of equipment and ripping of compacted areas with an excavator, where required.
- Backfilling of overburden, interburden and processing fines within nominated rehabilitation areas and profiling to progressively create the landform displayed on **Figure 2.9**.
- Seeding of rehabilitation areas with suitable pasture crops. Rehabilitation areas would be watered periodically to ensure the successful establishment of vegetation cover.

2.14.3 Extraction Area

Progressive rehabilitation of terminal benches would be undertaken throughout the life of the Proposal. Where available, overburden and/or interburden would be placed on benches with an emphasis on creating a roughened surface to contain the bulk of rain falling on the benches and to provide a suitable substrate for the growth of native vegetation. Overburden and/or interburden would be progressively placed on each bench once activities cease in that area. This material would form a substrate for the subsequent growth of trees and shrubs which would be planted either through direct seeding or tubestock.

Overburden and/or interburden would be emplaced on the floor of extraction area to provide a suitable substrate for vegetation. It is anticipated that the 280m AHD floor of the extraction area would be backfilled with overburden and/or interburden to approximately 292m AHD. Backfilled material would then be seeded with pasture crops.

Safety bunds would be retained in the final landform to ensure that the final landform does not pose an unacceptable safety risk.

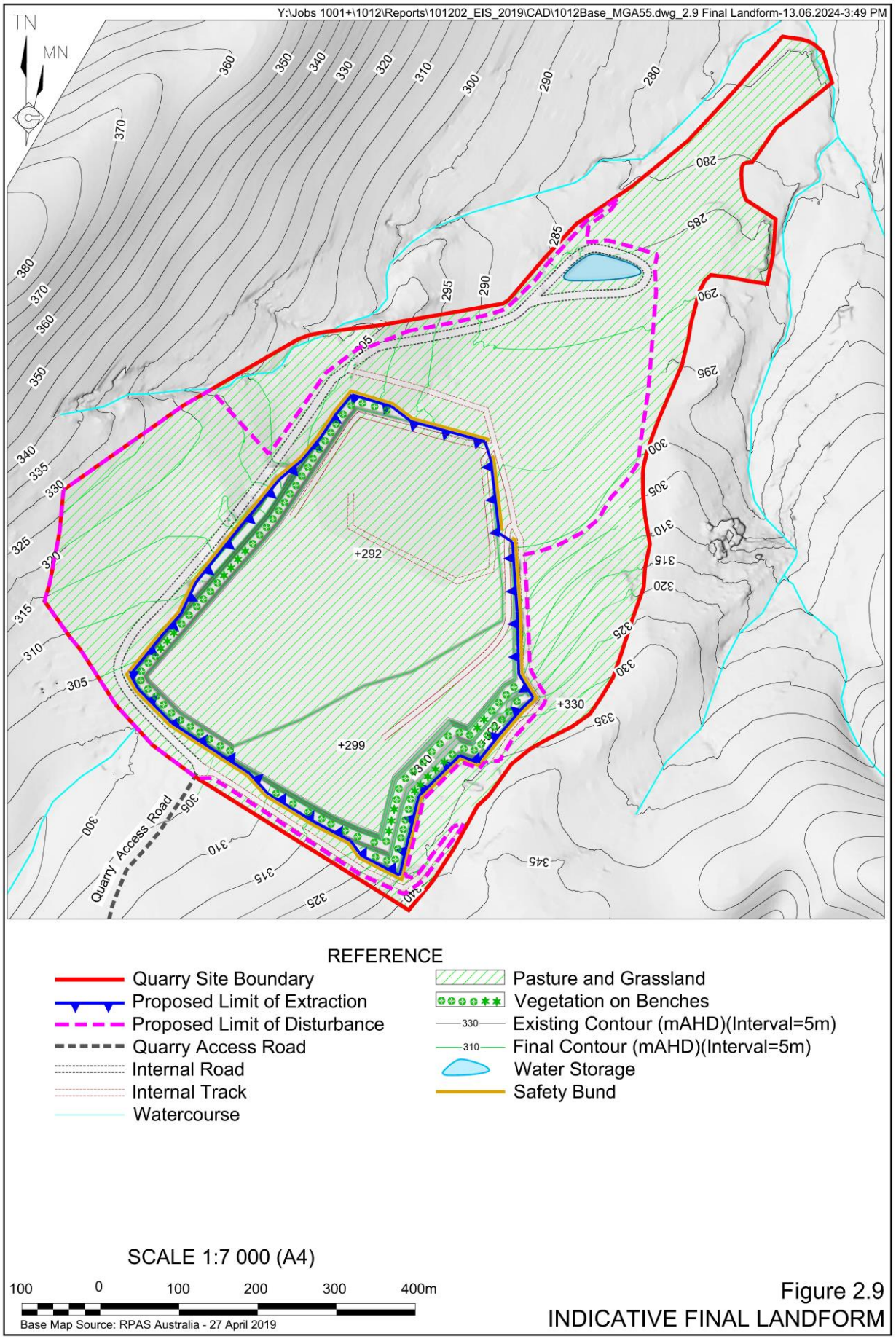


Figure 2.9
INDICATIVE FINAL LANDFORM

2.14.4 Areas of Operational Disturbance

Processing and Product Stockpiling Area

All equipment and infrastructure within the processing and product stockpiling area would be removed following the cessation of extraction and processing operations. All areas would be ripped, where compacted, and covered with overburden and/or interburden mixed with locally sourced organics, prior to seeding and/or planting with pasture crops.

Ancillary Components Area

All equipment and infrastructure within the ancillary components area would be removed following the cessation of extraction and processing operations unless some of the buildings and related structures are suitable for a subsequent land use. All areas would be ripped, where compacted, and covered with overburden and/or interburden mixed with locally sourced organics, prior to seeding and/or planting with pasture crops.

Roads and Ramps

Internal roads, ramps and safety bunds would be retained following the cessation of operations to provide for ongoing, safe access to the Quarry Site for rehabilitation and maintenance activities.

2.14.5 Final Land Uses

It is intended that the Quarry Site would be retained principally for grazing and biodiversity conservation following rehabilitation. The success of rehabilitation and revegetation would be reviewed progressively, with additional soil, seed or tube stock added where revegetation is less successful.

2.15 Biodiversity Offset Strategy

2.15.1 Introduction

The Proposal would involve the removal of approximately 4.23ha of native vegetation and would trigger the entry requirements for the Biodiversity Offset Scheme. As such, a Biodiversity Development Assessment Report (BDAR) has been prepared by OzArk Environment and Heritage (OzArk) and is included as **Appendix 7**. The following subsections describe the Biodiversity Offset Strategy for the Proposal with further assessment of biodiversity values provided in Section 5.5.

2.15.2 Impacts Requiring Offsetting

OzArk (2024a) has identified that impacts to native vegetation would be expected through the direct clearing of approximately 4.23ha of native vegetation. The direct clearing and subsequent development of the proposed area of disturbance would represent a permanent impact, or loss, of this native vegetation and habitat.

2.15.3 Impacts Not Requiring Offsetting

Impacts to those areas identified as "cleared land" would not require offsetting.

2.15.4 Credit Calculations

Following the implementation of all practical measures to avoid or mitigate impacts to native vegetation, it is estimated that the Proposal would result in the removal of approximately 4.23ha of native vegetation which is considered a residual impact of the Proposal. The ecosystem credits required to offset the residual impacts of the Proposal are provided in **Table 2.7** and the species credits are provided in **Table 2.8**.

Table 2.7
Ecosystem Credits Required for Biodiversity Offset

Plant Community Type	Credits Required
PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt	47
PCT 72 – White Cypress Pine – Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	9
PCT 185 – Dwyer's Red Gum – White Cypress Pine – Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	3
PCT 186 - Dwyer's Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion	3
Total	**62**
Source: OzArk (2024a) – Modified after Table 8-2	

Table 2.8
Species Credits Required for Biodiversity Offset

Species	Credits Required
Austrostipa metatoris / A spear-grass (Flora)	2
Diuris tricolor / Pine Donkey Orchid (Flora)	2
Swainsona sericea / Silky Swainson-pea (Flora)	2
Total	**6**
Source: OzArk (2024a) – Modified after Table 8-3	

2.15.5 Securing Biodiversity Credits

It is currently envisaged that biodiversity credits associated with the Proposal would be offset through payment into the Biodiversity Conservation Fund (BCF) or by purchasing credits on the open market.

Section 3

Legislative and Planning Context

PREAMBLE

This section considers the legislative and planning context within which the Quarry would operate and describes any relevant environmental issues that are raised from these instruments that need to be addressed within the EIS. Relevant NSW State environmental planning legislation and local government planning instruments are included in the review as well as any additional policies and guidelines that are relevant to the Proposal.

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3.1 Introduction

A range of legislation and planning instruments apply to the Proposal. These pieces of legislation and statutory instruments were reviewed to identify which environmental aspects require consideration in the EIS. In addition, the SEARs identified a number of guideline documents that could potentially be of assistance during the preparation of the EIS (see **Appendix 1**). A brief summary of the relevant legislation or planning instrument is provided in the following subsections. The relevance of planning instruments to specific environmental issues has been addressed in the relevant specialist consultant assessments (see Appendices) and considered in Section 5 of this document.

3.2 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) covers 'matters of national environmental significance' (MNES) that include:

- world heritage properties;
- wetlands listed under the Ramsar Convention;
- listed threatened species and ecological communities;
- listed migratory species protected under international agreements;
- nuclear actions;
- the Commonwealth marine environment; and
- National heritage places.

Under the EPBC Act, if a project has the potential to have a significant impact on a matter of national environmental significance, it is required to be referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for assessment as to whether it represents a 'controlled action' and therefore requires approval from the Minister for the Environment.

The ecological assessment undertaken by OzArk Environment and Heritage (OzArk) (2024a) has concluded that significant impacts to MNES would not occur and referral of the Proposal to the DAWE is not required. An assessment of potential biodiversity impacts is presented in Section 5.5 and in OzArk (2024a) which is included as **Appendix 7**.

3.3 NSW Legislation

The key NSW legislation relating to the approvals and licences required for the Proposal are identified and discussed as follows.

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Water Management Act 2000* (WM Act)
- *Roads Act 1993* (Roads Act)
- *Biodiversity Conservation Act 2016* (BC Act)
- *National Parks and Wildlife Act 1974* (NP&W Act)

Environmental Planning and Assessment Act 1979

The EP&A Act provides the framework for the assessment and determination of development in NSW and is administered by the Department of Planning, Industry and Environment (DPIE).

Extractive industry is permitted with consent on land zoned RU1 – Primary Production under the *Carrathool Local Environmental Plan 2012*. Development consent for the Proposal is being sought in accordance with Part 4, Division 4.3 of the EP&A Act and will need to be evaluated in accordance with Section 4.15 of the EP&A Act.

As an extractive industry with an annual production rate greater than 30 000m^3 per year, the Proposal is classified as "designated development" under Clause 19 of Schedule 3 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Reg). It is noted that the Proposal would also classify as designated development due to the proposed area of disturbance which exceeds the nominated 2ha threshold for land disturbance. As designated development for the purpose of an extractive industry, the application is also classified as Regionally Significant Development under Schedule 7 of the *State Environmental Planning Policy (State and Regional Development) 2011* and the consent authority for the application will be the Western Regional Planning Panel in accordance with Section 4.5(b) of the EP&A Act.

The Proposal is also classified as 'integrated development' under Section 4.46 of the EP&A Act as it would require a variation to Environment Protection Licence (EPL) 3767, an Aboriginal heritage impact permit (AHIP), a controlled activity approval and a permit under Section 138 of the Roads Act. Therefore, the application will be referred to the EPA, Heritage NSW, NRAR and Transport for NSW (TfNSW) and, in accordance with Section 4.47 of the EP&A Act, Council must obtain general terms of approval from these bodies prior to determining the application. Any consent must be consistent with those general terms of approval.

Protection of the Environment Operations Act 1997

The POEO Act provides the legislative and administrative framework to protect, restore and enhance the quality of the environment in NSW by reducing risks to human health and the preventing the degradation of the environment from development and other relevant activities. The most significant element of the legislation with regard to the Proposal is the requirement for a variation to EPL 3767. As an extractive industry, the existing operation is classified as a 'Scheduled Activity' under Schedule 1(19) of the POEO Act and is therefore required to operate in accordance with EPL 3767. A variation would be required to increase the scale of the Scheduled Activity to reflect the proposed maximum extraction rate of 250 000tpa.

As noted above, Council will refer the development application for the Proposal to the EPA and seek general terms of approval. Should development consent be granted for the Proposal, the Applicant would apply for a variation to EPL 3767 in accordance with the general terms of approval provided by the EPA.

Water Management Act 2000

The WM Act provides clear arrangements for controlling land-based activities that affect the quality and quantity of the State's water resources. It provides for four types of approval, namely:

- water use approval (section 89) – which authorises the use of water at a specified location for a particular purpose, for up to 10 years;
- water management work approval (section 90) – which authorises the construction and use of specified water supply, drainage and flood works;
- controlled activity approval (section 91(2)) – which authorises works carried out within 40m of waterfront land; and
- aquifer interference activity approval (section 91(3)) – which authorises interference of an aquifer.

A controlled activity approval would be required under Section 91 of the WM Act for works within 40m of 'waterfront land' as the Proposal would encroach within 40m of mapped watercourses.

Roads Act 1993

The Roads Act applies to public roads in NSW and, depending upon the type of road, is administered by the Transport for NSW (TfNSW) or local council. Approval is required under Section 138 of the Roads Act for works or structures that disturb the surface of a public road or connect a road to a classified road.

A permit under Section 138 of the Roads Act would be required to seal and widen the left-in bend from the Mid-Western Highway to Munros Road.

Biodiversity Conservation Act 2016

The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

The Applicant has considered opportunities to minimise impacts to native vegetation for the Proposal. Residual impacts to biodiversity would include removal of approximately 4.23ha of native vegetation. This impact triggers the Biodiversity Offset Scheme and therefore the residual impacts have been assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR) prepared by OzArk (2024a). Residual impacts to biodiversity values would be offset in accordance with the BC Act (Section 2.15).

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) aims to manage and conserve nature, objects, places and features that have ecological and cultural value. The NP&W Act is administered and enforced by Heritage NSW within the Department of Premier and Cabinet.

Aboriginal places and objects are protected under the NP&W Act. An AHIP is required for consent to destroy, deface or damage an identified Aboriginal object or Aboriginal place. An AHIP would be required for the Proposal to authorise the removal and salvage of Aboriginal Sites. Aboriginal cultural heritage is further addressed in Section 5.6.

3.4 State Environmental Planning Policies

State Environmental Planning Policy (State and Regional Development) 2011

One of the purposes of this State Environmental Planning Policy (SEPP) is to provide the basis for development to be declared "Regionally significant development" and to further confer the function of a regional planning panel to determine development applications. As designated development for the purpose of extractive industry, the Quarry is classified as regional development under this SEPP and therefore determination of the development application will be by the Western Regional Planning Panel.

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

This SEPP ("the Mining SEPP") was gazetted in recognition of the importance to New South Wales of mining, petroleum production and extractive industries and to provide proper management and orderly and economic use and development of land containing mineral, petroleum and extractive material resources and to establish appropriate planning controls to encourage ecologically sustainable development through environmental assessment, and sustainable management.

The SEPP specifies matters requiring consideration in the assessment of any mining, petroleum production and extractive industry development, as defined in NSW legislation. A summary of the matters that the consent authority needs to consider when assessing a new or modified proposal and where these have been addressed in this document is provided in **Table 3.1**.

Table 3.1
Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Relevant SEPP Clause	Description	EIS Section
12: Compatibility with other land uses	Consideration is given to: • the existing uses and approved uses of land in the vicinity of the development;	4.3.2
	• the potential impact on the preferred land uses (as considered by the consent authority) in the vicinity of the development; and	3.5.1.1
	• any ways in which the development may be incompatible with any of those existing, approved or preferred land uses.	5.7.4
	The respective public benefits of the development and the existing, approved or preferred land uses are evaluated and compared.	5.10
	Measures proposed to avoid or minimise any incompatibility are considered.	N/A

Table 3.1 (Cont'd)
Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Relevant SEPP Clause	Description	EIS Section
12AB: Non-discretionary development standards for mining	Consideration is given to development standards that, if complied with, prevents the consent authority from requiring more onerous standards for those matters	5.2, 5.3
13: Compatibility with existing mining, petroleum production or extractive industry	Consideration is given to whether the development is likely to have a significant impact on current or future mining, petroleum production or extractive industry and ways in which the development may be incompatible.	N/A
	Measures taken by the Applicant to avoid or minimise any incompatibility are considered.	N/A
	The public benefits of the development and any existing or approved mining, petroleum production or extractive industry must be evaluated and compared.	N/A
14: Natural resource and environmental management	Consideration is given to ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure: • impacts on significant water resources, including surface and groundwater resources, are avoided or minimised;	5.4
	• impacts on threatened species and biodiversity are avoided or minimised; and	5.5
	• greenhouse gas emissions are minimised to the greatest extent feasible.	5.2
15: Resource recovery	The efficiency of resource recovery, including the reuse or recycling of material and minimisation of the creation of waste, is considered.	2.9
16: Transportation	The following transport-related issues are considered. • The transport of some or all of the materials from the Quarry Site by means other than public road.	N/A
	• Limitation of the number of truck movements that occur on roads within residential areas or roads near to schools.	5.1
	• The preparation of a code of conduct for the transportation of materials on public roads.	5.1.4
17: Rehabilitation	The rehabilitation of the land affected by the development is considered including: • the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated;	2.14
	• the appropriate management of development generated waste;	2.14
	• remediation of any soil contaminated by the development; and	2.14
	• the steps to be taken to ensure that the state of the land does not jeopardise public safety, while being rehabilitated or at the completion of rehabilitation.	2.14

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

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.

The hazardous substances and dangerous goods 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 document entitled *Hazardous and Offensive Development Application Guidelines – Applying SEPP 33* (DP&I, 2011). Hazardous materials are defined within DP&I (2011) as

substances falling within the classification of the *Australian Code for Transportation of Dangerous Goods by Road and Rail* (Dangerous Goods Code), (National Transport Commission, 2011). The substances relevant to this policy are primarily diesel and ammonium nitrate.

The Proposal would involve the ongoing use of diesel fuel, a Class 3 C1 combustible liquid, and small amounts of other hydrocarbons including lubricating oils and combustible liquids. As diesel would be stored in dedicated bunded areas, away from other Class 3 flammable liquids, SEPP 33 does not require that diesel be considered further.

Ammonium nitrate would not be stored on site, rather it would continue to be transported to the Quarry Site for blasting on the day of each blast. As the quantity required for each blast does not exceed the relevant thresholds for Class 5.1 materials, SEPP 33 does not require that ammonium nitrate be considered further.

State Environmental Planning Policy (Primary Production and Rural Development) 2019

The aims of this SEPP (the "Primary Production and Rural Lands SEPP") are to facilitate development on rural land that is orderly and economic, promotes the social, economic and environmental welfare of the State and avoids land use conflicts with existing agriculture. It also allows government authorities to identify State significant agricultural land and ensure the ongoing viability of agriculture in the State.

Specifically, and as described in Clause 10, the objectives of the Primary Production and Rural Lands SEPP are to provide for the protection of agricultural land;

- *that is of State or regional agricultural significance, and*
- *that may be subject to demand for uses that are not compatible with agriculture, and*
- *if the protection will result in a public benefit.*

The Proposal is considered with respect to these aims.

- The land that would be affected by the Proposal has not been identified as State or regionally significant agricultural land by *Schedule 1* of the Primary Production and Rural Lands SEPP.
- The Proposal would not remove any land currently managed for agriculture. As demonstrated at numerous other quarry sites where agricultural activities are undertaken concurrently within extractive industry, the Proposal would not be incompatible with continued agricultural land use surrounding the Quarry Site.
- The protection of the land that is the subject of the Proposal would not provide any public benefit. In fact, the employment and local economic stimulus that would be generated by the Proposal is considered to be of wider public benefit.

As a result, the Primary Production and Rural Lands SEPP is not considered further in this document.

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)

SEPP 55 aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. In particular, this policy requires consideration of whether a development requires a consent for remediation works or not and, where warranted, requires that remediation works meet certain standards and notification requirements.

As the areas proposed for disturbance within the Quarry Site have previously been used only for extractive industry, agriculture or passive biodiversity conservation, the Applicant is satisfied that no contaminated land occurs on the Quarry Site. This SEPP is therefore not considered further in this document.

3.5 Local Planning Issues

3.5.1 Carrathool Local Environmental Plan 2012

3.5.1.1 Local Zoning Objectives

The Carrathool Local Environmental Plan (LEP) was gazetted in 2012 and guides development in the Carrathool LGA by encouraging the proper management, development and conservation of natural resources and the built environment. The Quarry Site is located on land zoned RU1 – Primary Production under the existing LEP with extractive industries permissible with consent within this zone (see **Figure 3.1**). The objectives of this zone and how the Proposal has been designed to satisfy these objectives are described as follows. It is noted that the access road traverses land zoned RU3 – Forestry, however, it is considered that the ongoing use of this road would not conflict with local zoning objectives.

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

The proposed continued use of the land for extractive industry provides productive use of the natural resource within the Quarry Site. As land within the Quarry Site is not currently used for agricultural activities, it is not expected that the Proposal would adversely impact upon agricultural resources. Following the completion of the Proposal, the land would be rehabilitated to provide for grazing and passive biodiversity conservation.

To encourage diversity in primary industry enterprises and systems appropriate for the area

The Proposal would provide for the continued supply of Quarry products for use in construction and infrastructure projects throughout the Carrathool LGA and the broader Riverina Region. The Quarry would continue to operate alongside a variety of primary industry enterprises in the Carrathool LGA and assist to maintain the economic diversity of the area.

To minimise the fragmentation and alienation of resource lands

The Proposal would allow for the extension and continued operation of the Western Riverina Quarry and would not result in the fragmentation or alienation of resource lands.

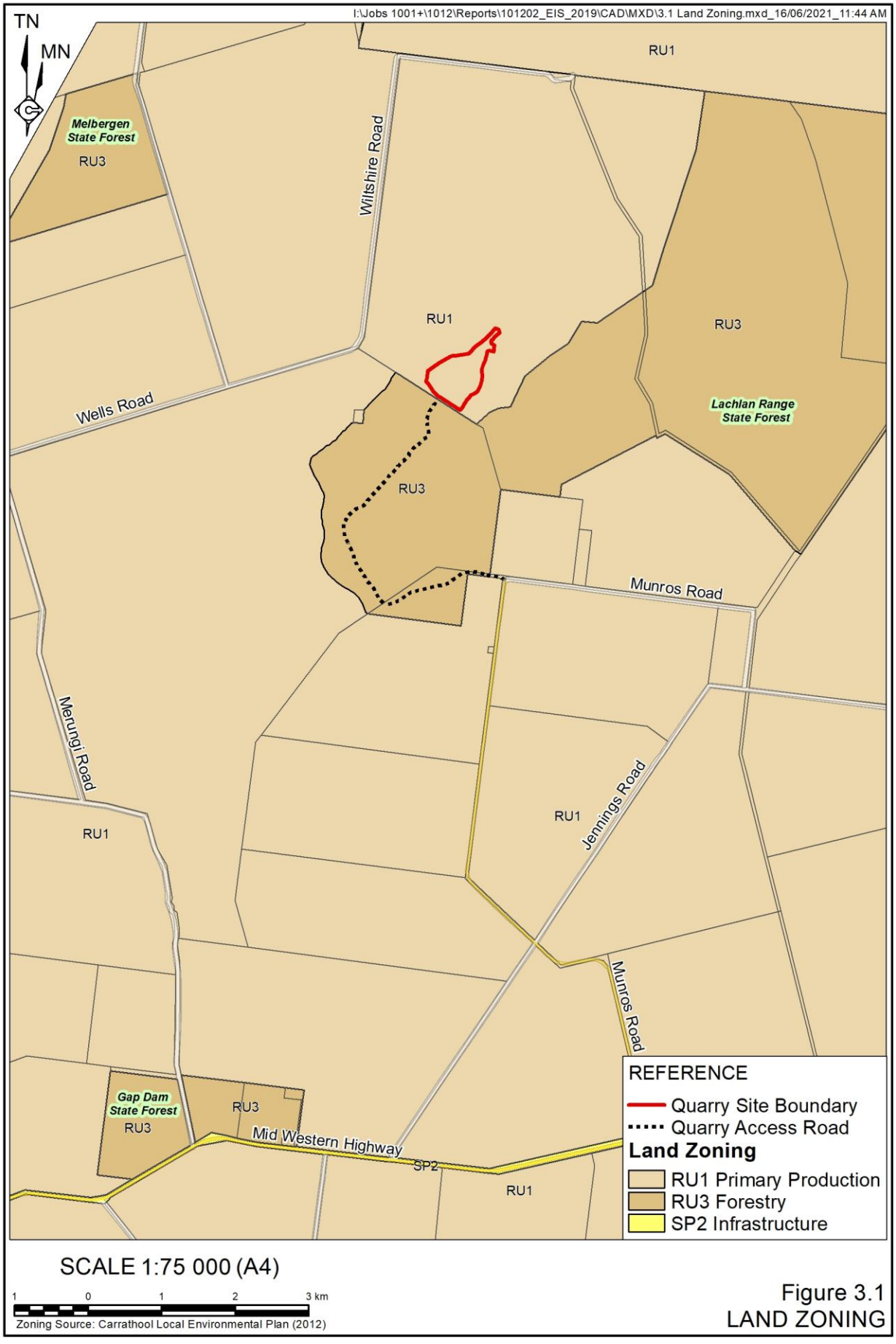

Figure 3.1
LAND ZONING

To minimise conflict between land uses within this zone and land uses within adjoining zones

The land within and immediately surrounding the Quarry Site is zoned RU1 – Primary Production and RU3 – Forestry and is principally used for grazing, dryland cropping and forestry. Land immediately to the north of the Quarry Site comprises agricultural land principally used for grazing with some of the less heavily vegetated land also used for dryland cropping. The Lachlan Range State Forest borders the Quarry Site to the east and south. As the Proposal would not result in any significant off-site impacts, it is considered that the Proposal would not result in land use conflicts with other land uses within land zoned RU1 – Primary Production or RU3 – Forestry.

To facilitate farm adjustments

The Proposal would not limit the achievement of this objective as no land currently managed for agriculture would be removed or impacted upon.

To enable agricultural support facilities to be carried out on land within the zone in a manner which does not significantly reduce the agricultural and horticultural production potential of land in the locality

The Proposal would not limit the achievement of this objective as no land currently managed for agriculture would be removed or impacted upon.

To encourage eco-tourist facilities and tourist and visitor accommodation that minimise any adverse effect on primary industry production and scenic amenity of the area

No tourist or visitor accommodation is located in the area immediately surrounding the Quarry Site. As such, the continued operation of the Western Riverina Quarry would not impact upon the achievement of this objective.

3.5.1.2 Additional Local Provisions

The Quarry Site contains land identified as "Biodiversity" on the Terrestrial Biodiversity Map. Clause 6.3 of the Carrathool LEP identifies that the objectives for land mapped as "Biodiversity" are to maintain terrestrial biodiversity by:

a) protecting native fauna and flora, and

b) protecting the ecological processes necessary for their continued existence, and

c) encouraging the conservation and recovery of native fauna and flora and their habitats

In accordance with Clause 6.3, Council must consider potential impacts on biodiversity prior to determining a development application on land to which the clause applies. It is noted that development consent must not be granted unless the development has considered ways to avoid, minimise or mitigate potential impacts.

The Proposal has been designed to minimise impacts to biodiversity resources as far as practicable. The management of biodiversity is comprehensively addressed in Section 5.5.

3.5.2 Carrathool Development Control Plan

The Carrathool Development Control Plan (DCP) is currently under review and has not been made publicly available. As such, the Carrathool DCP is not considered further in this assessment.

3.6 Other Environmental Policies, Guidelines and Plans

The SEARs require that in assessing the identified key assessment requirements, reference be made to any relevant guideline documents. In addition, a number of the government agencies consulted in relation to the Proposal also required reference to other environment guideline documents. Where appropriate, the relevant guidelines are addressed in the relevant section(s) of this report, including the Appendices.

Section 4

Environmental Setting

PREAMBLE

This section describes the environmental setting within and surrounding the Quarry Site.

Emphasis is placed in this section on providing information about the environmental features that would contribute to or influence the assessment of a wide range of other environmental parameters. Information is provided on the regional and Quarry Site topography, meteorology, land ownership, land uses, bush fire hazards and services.

Other features of the surrounding environment that would or may be affected by the Proposal are detailed in Section 5 in conjunction with the design and operational safeguards and impact assessment for those features.

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4.1 Topography and Drainage

The Quarry Site is located within the southern part of the NSW Cobar Peneplain Bioregion (NPWS, 2003). This region predominantly comprises low undulating plains punctuated by stony ridges and ranges. Topography is largely controlled by the underlying geology with rock outcrops typically associated with structural features (e.g. faults, bedding). Igneous rocks are more common in the southern part of the region with small outcrops of basalt found from Griffith to north of Cobar.

The Quarry Site is located within the Lachlan River Catchment with the Lachlan River located approximately 45km to the north at its closest point. The Lachlan River flows generally to the west towards its confluence with the Murrumbidgee River approximately 205km to the southwest of the Quarry Site. The Quarry Site itself is located in a valley between two southwest-northeast trending ridges. The northern ridge (Mount Melbergen) has a maximum elevation of 436m AHD whilst the southern ridge (Flagstaff Hill) reaches an elevation of approximately 380m AHD. **Figure 4.1** presents the local topography and drainage features surrounding the Quarry Site.

Figure 4.2 displays the topography and drainage within and immediately surrounding the Quarry Site. The Quarry Site comprises the floor of the valley between Mount Melbergen and Flagstaff Hill with the terrain generally sloping gently to the northeast. It is noted that the land slopes gently to the southwest to the south of the drainage line which transects the Quarry Site. A total of three ephemeral drainage features traverse parts of the Quarry Site.

The natural landform within the Quarry Site has been significantly modified through both historical and current extractive operations. These areas of disturbance currently cover an area of approximately 37.2ha. The existing extraction area comprises a single bench with the floor ranging between 315m AHD at the south and 305m AHD at the north. Other modified landforms within the Quarry Site include the processing and product stockpiling area, processing fines stockpiling area and areas used for historical extraction.

4.2 Meteorology

4.2.1 Introduction

Meteorological conditions have the potential to influence a range of Proposal-related impacts at surrounding residences and the environment. This subsection provides a brief overview of the meteorological conditions surrounding the Quarry Site, focusing particularly on those aspects of the climate that are likely to influence the potential Proposal-related environmental impacts.

Meteorological data was processed using information sourced from the Scientific Information for Landowners (SILO) database, managed by the Queensland Department of Environment and Science (DES). The program uses historical Bureau of Meteorology datasets and interpolation techniques to generate continuous daily time step synthetic climate data for any given location in Australia. The SILO dataset for the period 1889 to the present was generated for the Quarry Site on 18 February 2020.

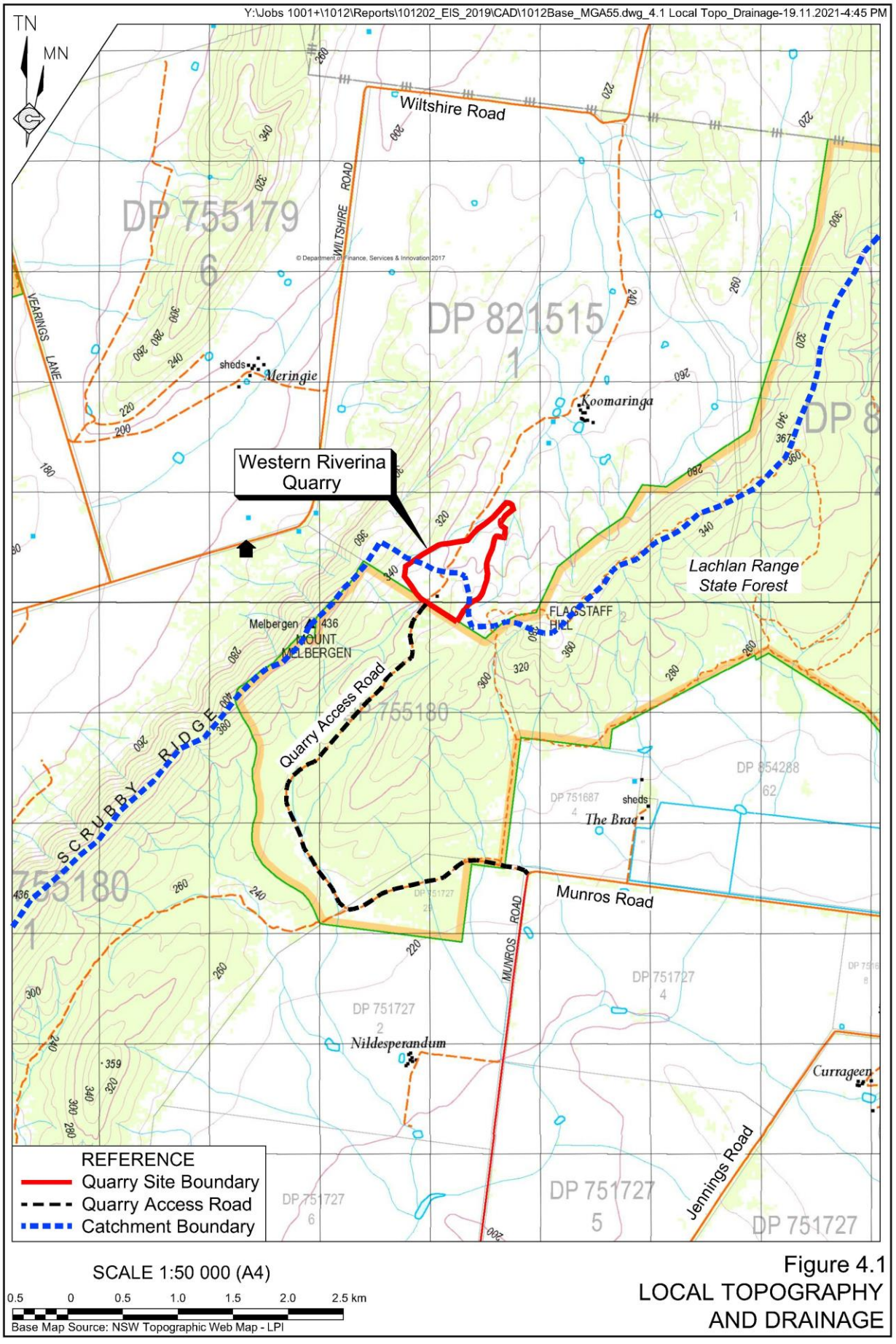

Figure 4.1
LOCAL TOPOGRAPHY AND DRAINAGE

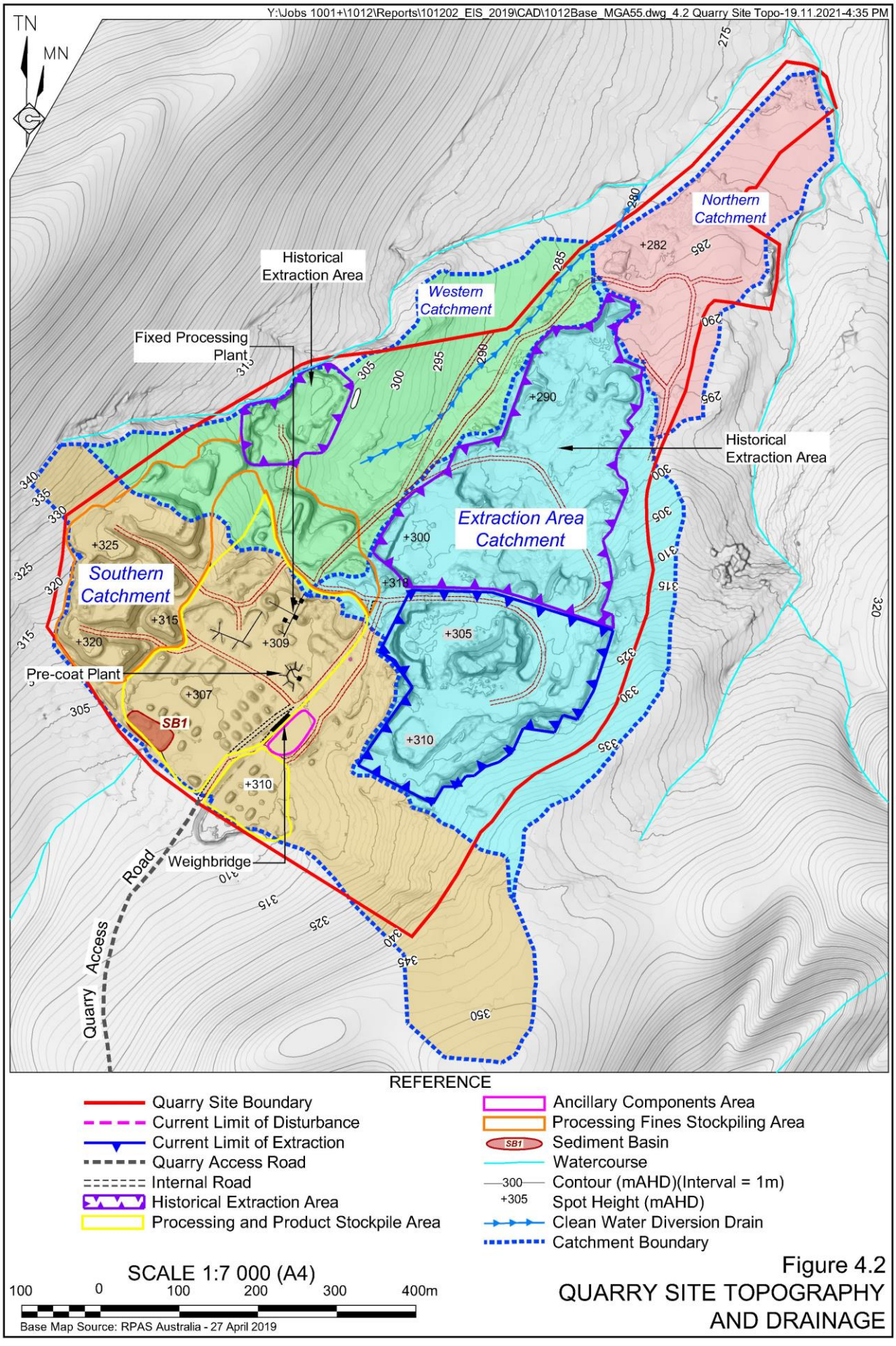

Figure 4.2
QUARRY SITE TOPOGRAPHY AND DRAINAGE

Table 4.1 provides a summary of the climate data which is discussed further in the following subsections.

Table 4.1
Climate Data Summary – SILO (1889 to Present)

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (C°)													
Mean maximum	32.8	32.2	28.7	23.5	18.6	14.7	14.0	16.1	19.8	24.0	28.1	31.1	23.6
Mean minimum	17.3	17.2	14.3	9.9	6.6	4.1	2.8	3.8	6.0	9.4	12.8	15.6	10.0
Rainfall (mm)													
Mean rainfall	36.6	27.9	33.9	30.8	38.1	43.1	36.2	38.7	34.5	40.5	33.3	33.4	427.0
Highest monthly rainfall	243.8	131.1	223.2	184.2	130.3	167.4	106.3	84.9	171.5	137.8	177.9	130.3	810.6
Lowest monthly rainfall	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.1	0.1	0.0	0.0	0.0	163.9
Mean number of rain days	4.1	3.7	4.0	4.1	5.5	7.1	7.0	6.9	5.6	5.7	4.4	4.3	62.2
Highest daily rainfall	78.3	68.1	108.1	46.3	55.0	60.7	41.6	52.9	46.6	60.3	68.8	79.2	108.1
Evaporation (mm)													
Mean monthly evaporation	281.1	229.7	189.6	111.5	64.7	40.4	44.8	67.2	104.0	161.6	214.5	271.7	1780.9
Source: SILO climate database													

4.2.2 Temperature

Temperature patterns follow seasonal expectations with higher mean temperatures during the summer months of December to February and lower temperatures during winter. The mean maximum temperature varies between 14.0°C and 32.8°C while the mean minimum temperature varies between 2.8°C and 17.3°C.

4.2.3 Rainfall and Evaporation

Mean annual rainfall is 427.0mm, with rainfall distributed relatively evenly throughout the year with no distinct dry season. Mean monthly rainfall varies between a maximum of 43.1mm in June and a minimum of 27.9mm in February. Rainfall is typically infrequent with more rain days experienced during winter months. Rainfall can be variable, with infrequent, high intensity rainfall events occurring throughout the year with rainfall received generally being equivalent to between approximately one and three times the average monthly rainfall.

The estimated mean evaporation at the Quarry Site is approximately 1780.9mm per year. Mean daily evaporation varies between 281.1mm per month in January and 40.4mm per day in June. The estimated mean monthly evaporation is higher than mean monthly rainfall in all months other than June resulting in an annual moisture deficit.

4.2.4 Wind

CSIRO prognostic meteorological model TAPM was configured for five complete years between 2014 and 2018 to review prevailing annual wind conditions at the Quarry Site for the purpose of predicting dust dispersion patterns. **Figure 4.3** displays the wind rose predicted by the model for 2014 which is considered representative of the general wind trend across the five-year period.

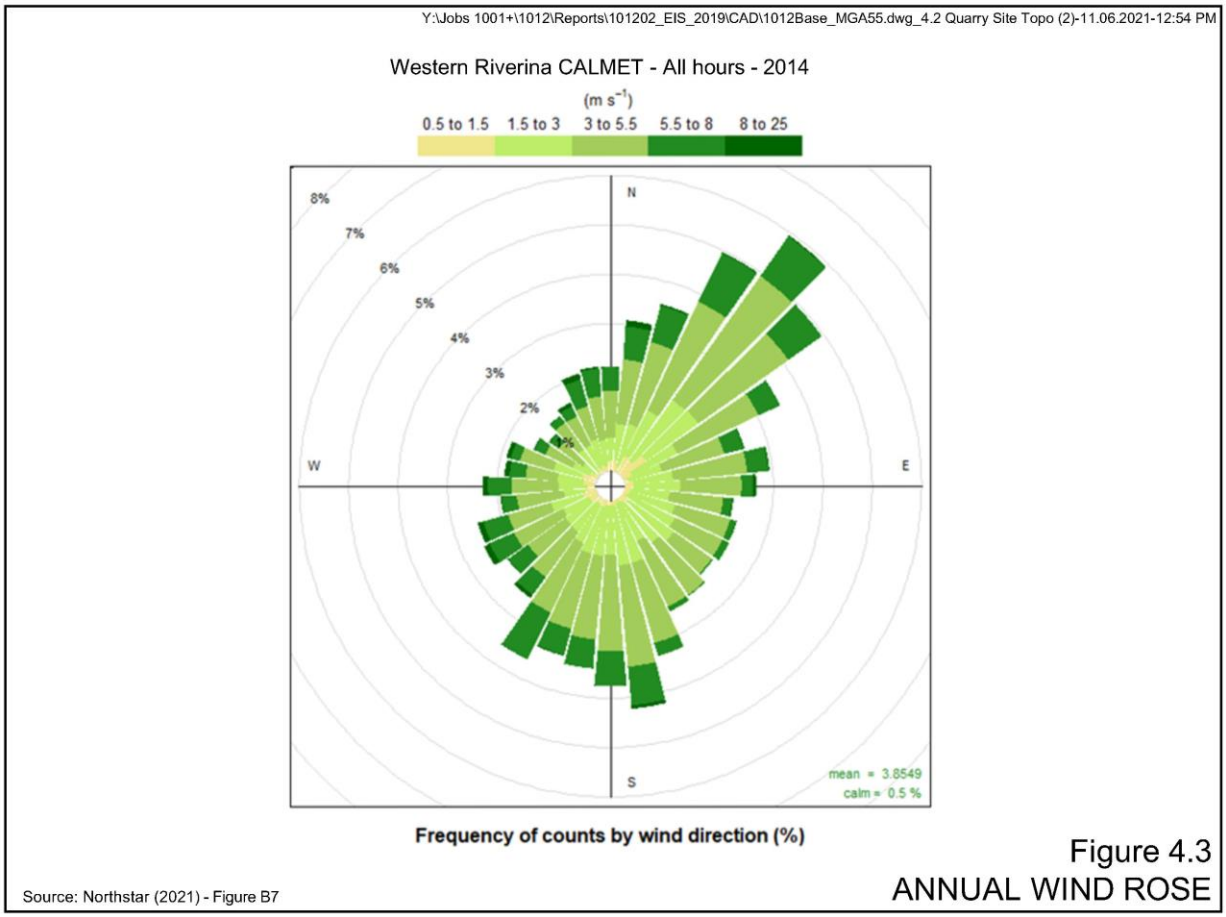

Figure 4.3
ANNUAL WIND ROSE

Prevailing winds experienced at the Quarry Site predominantly originate from the northeastern quadrant with wind speeds most frequently ranging between 3.0m/s and 5.5m/s.

4.3 Land Ownership and Surrounding Residences

4.3.1 Land Ownership

The Quarry Site is located on land owned by E.B. Mawson & Son Pty Ltd. **Figure 4.4** displays the land ownership within and surrounding the Quarry Site. The distances to the closest privately-owned residences from the closest proposed operational area within the Quarry Site are listed in **Table 4.2**.

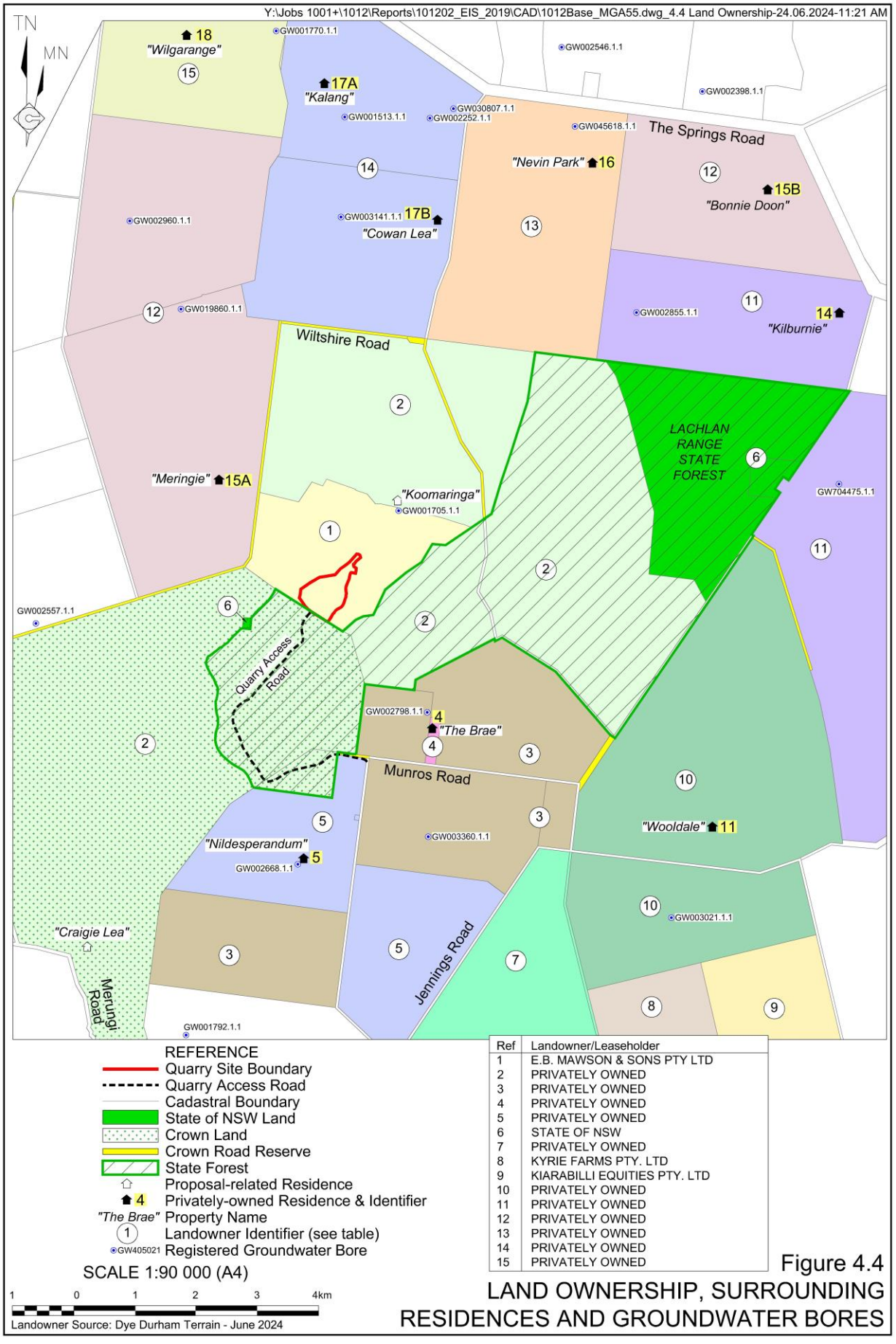

Figure 4.4
LAND OWNERSHIP, SURROUNDING RESIDENCES AND GROUNDWATER BORES

Table 4.2
Distances to Closest Privately-owned Residences

Residence Reference	Distance (km)
4	2.5
5	3.9
11	7.0
14	9.0
15A	2.2
15B	9.2
16	7.7
17A	8.0
17B	5.9
18	9.1

4.3.2 Land Uses

The Quarry Site is used principally for the extraction and processing of the targeted hard rock resource. Land uses immediately surrounding the Quarry Site principally comprise land used for forestry, grazing and dryland cropping. The Lachlan Range State Forest, which grows Cypress pine, covers an area of approximately 3 100ha and borders the Quarry Site to the east and south.

4.4 Bush Fire Hazard

The RFS mapping tool, accessed on 11 June 2021, identifies that the Quarry Site is located within a designated bush fire prone area. Further consideration of bush fire hazard is provided in Section 5.9.

4.5 Services

Figure 4.5 displays the services within and immediately surrounding the Quarry Site.

Services identified within the Quarry Site via a "Dial-Before-You-Dig" (DBYD) search includes power infrastructure comprising a single pole and underground earth or wire which provides power to the Quarry office and workshop. A telephone line also services the Quarry office although this data is not included within the DBYD database.

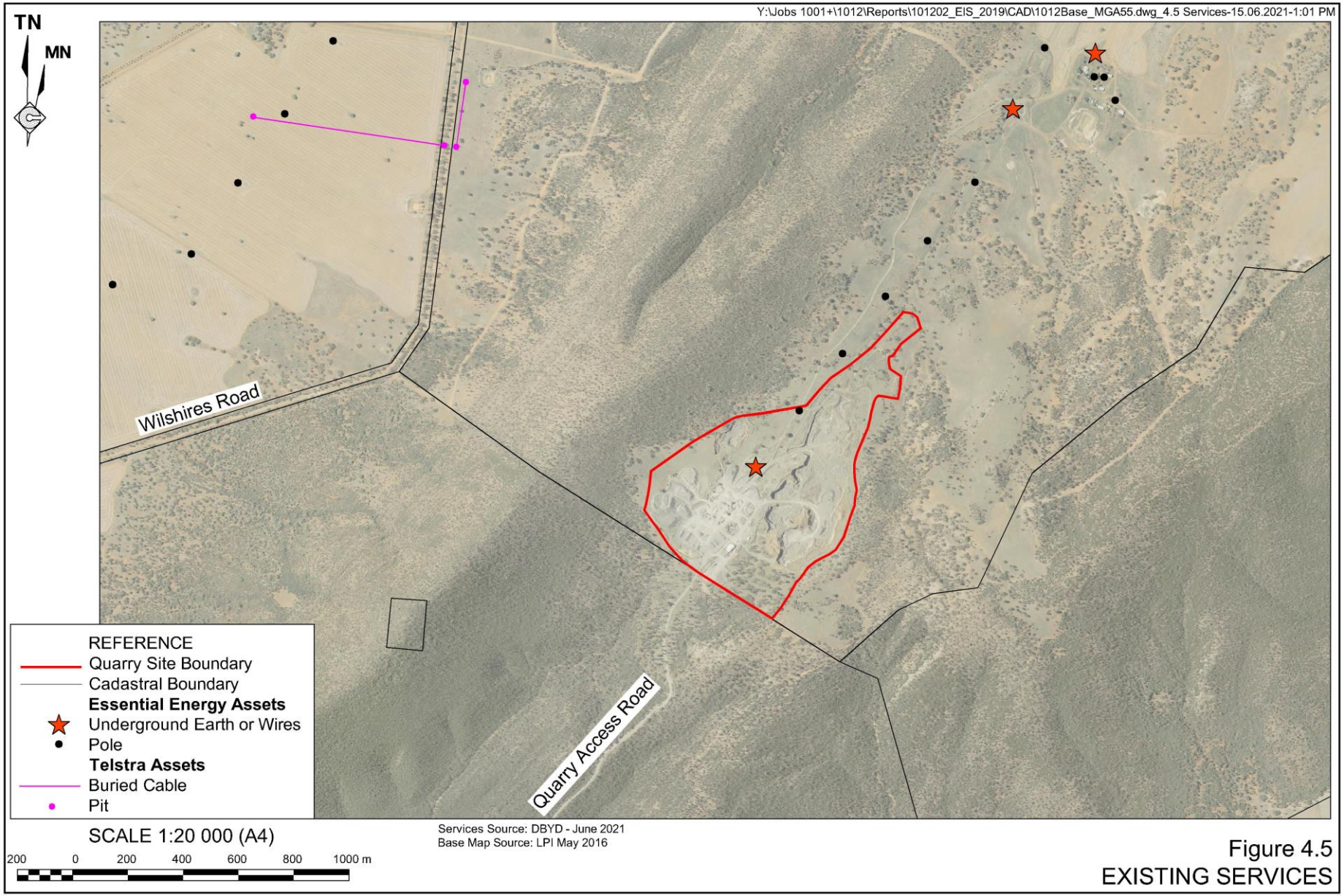

Figure 4.5
EXISTING SERVICES

Section 5

Environmental Features, Safeguards and Impacts

PREAMBLE

This section describes the specific environmental features of the Quarry Site and its surrounds that would or may be affected by the Proposal. Information on existing conditions, proposed management and mitigation measures and potential impacts the Proposal may have following the implementation of these measures is presented for all relevant issues.

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5.1 Traffic and Transport

5.1.1 Introduction

The SEARs for the Proposal require an assessment of potential impacts associated with traffic and transportation 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;
- 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.

In addition, assessment requirements relating to traffic were received from RMS and NSW DPI – Agriculture. **Appendix 2** presents a summary of where all relevant assessment requirements have been addressed in the EIS.

The following subsections describe the setting of the Quarry Site and provide a summary of the Traffic Impact Assessment (TIA) prepared by The Transport Planning Partnership (TTPP, 2022) (**Appendix 3**), and describes the management and mitigation measures to be implemented by the Applicant.

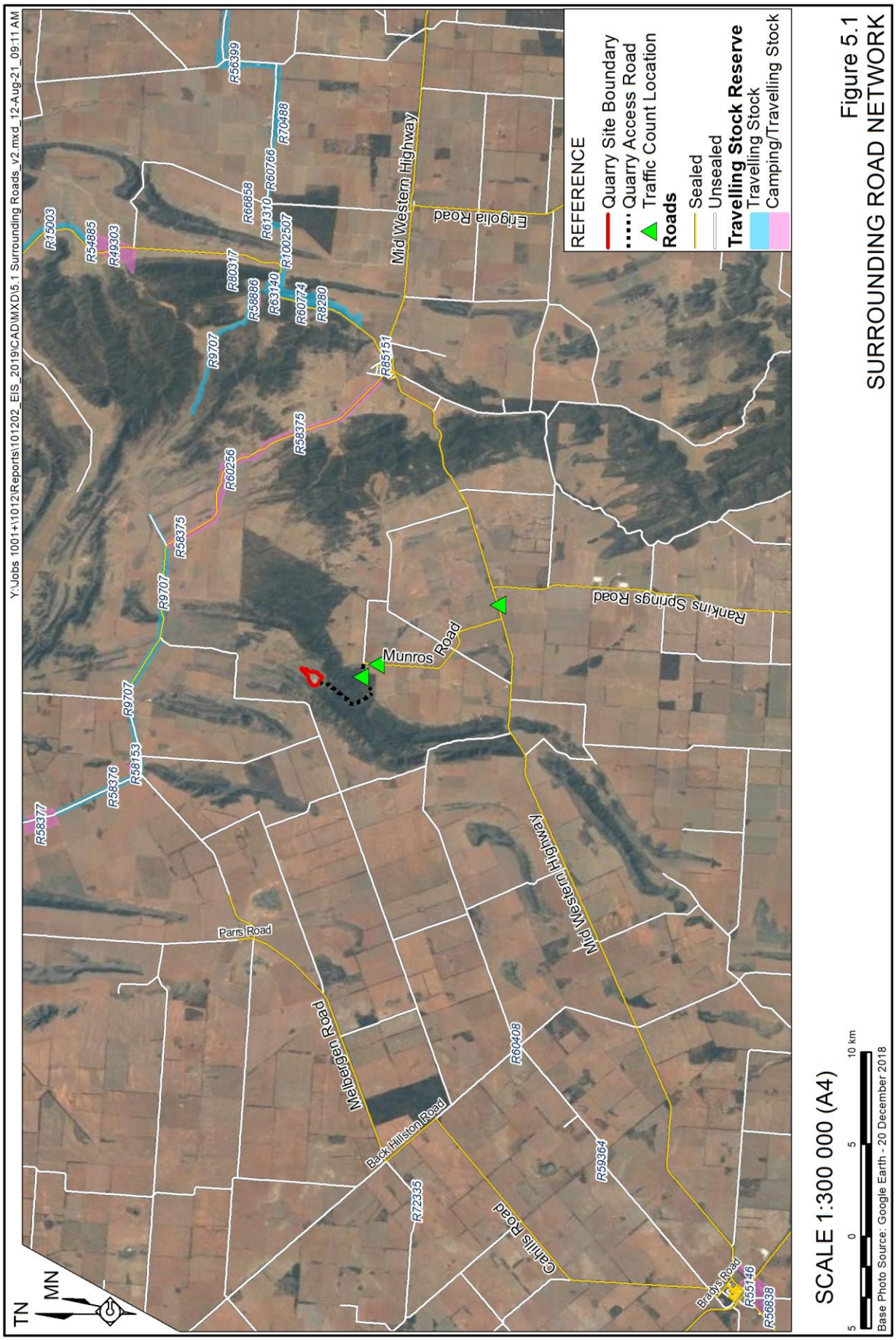
5.1.2 Existing Road Transport Environment

5.1.2.1 Introduction

This subsection provides an overview of the existing road transport environment used by heavy and light vehicles travelling to and from the Quarry. An overview of the existing road conditions and traffic levels is provided as well as a summary of road safety on the surrounding road network.

5.1.2.2 Road Network and Intersections

The road network used by heavy vehicles is displayed in **Figure 5.1**. The existing and proposed routes use both State and local roads with the route varying depending on the destination of the end points of use.


Y:\Jobs 1001+\1012\Reports\101202_EIS_2019\CAD\MXD\5.1 Surrounding Roads_v2.mxd 12-Aug-21 09:11 AM
REFERENCE
Quarry Site Boundary
Quarry Access Road
Traffic Count Location
Roads
Sealed
Unsealed
Travelling Stock Reserve
Travelling Stock
Camping/Travelling Stock
Mid Western Highway
Erigolia Road
Munros Road
Rankins Springs Road
Paris Road
Melbergen Road
Back Hillston Road
Cahills Road
Brady's Road
R15003
R54885
R49303
R56399
R70488
R66858
R60766
R61310
R1002507
R80317
R58886
R63140
R60774
R8280
R85151
R9707
R58375
R60256
R58153
R58376
R58377
R60408
R59364
R72335
R55146
R56838
TN
MN
SCALE 1:300 000 (A4)
5 0 5 10 km
Base Photo Source: Google Earth - 20 December 2018
Figure 5.1
SURROUNDING ROAD NETWORK

Quarry Access Road

The Quarry Access Road is a private road which extends from Munros Road through the Lachlan Range State Forest and is used by all Quarry-generated vehicles. Access to the Quarry Access Road is controlled by a gate west of Munros Road. West of the gate, the Quarry Access Road is a gravel road with a privately sign-posted speed limit of 40 kilometres per hour (km/h). Sight distance in both directions is generally sufficient that drivers have adequate warning of a vehicle approaching from the opposite direction.

Munros Road

Munros Road is a sealed two lane, two-way road with sealed shoulders, and provides for all vehicular access to and from the Quarry Site. Munros Road typically has unbroken edgelines and the centreline varies, including sections with no linemarking, a single broken centreline and double lines on curves. There is no sign-posted speed limit on Munros Road and the rural default of 100km/h is assumed to apply. The travel lanes are approximately 3.5m wide, with a 0.5m wide sealed shoulder on each side. At its intersection with the Quarry Access Road, Munros Road curves through 90 degrees (south and east), and the Quarry Access Road forms the western approach. At its intersection with the Mid Western Highway, Munros Road displays some breakdown of the pavement along the kerbside wheelpath of vehicles approaching the Mid Western Highway.

Mid Western Highway

The Mid Western Highway provides a major east-west link from Hay, via One Tree, Goolgowi, Rankins Springs, Erigolia, Weethalle, North Yalgaogrin, to West Wyalong. In the vicinity of the Quarry Site, the Mid Western Highway has a single travel lane in each direction with sealed shoulders, solid edge lines and a single broken centre line. At its intersection with Munros Road, the Mid Western Highway follows a straight and level alignment and sight distances are good.

5.1.2.3 Traffic Volumes

Daily Traffic Volumes

Traffic counts were commissioned by TTPP (2022) as part of the TIA to establish traffic volumes and vehicle types using the existing road network at the following locations.

- Quarry Access Road (west of Munros Road).
- Munros Road (south of the Quarry Access Road).
- Mid Western Highway (east of Munros Road).

Table 5.1 presents a summary of the daily traffic volumes at the surveyed locations. The results demonstrate that traffic conditions are notably different between weekdays and weekend days with weekdays typified by higher traffic volumes.

Table 5.1
Surveyed Daily Traffic Volumes 2020 (vehicles per day)

Road and Location	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Quarry Access Road	43	45	54	42	25	18	0
Munros Road	55	60	58	41	29	24	4
Mid Western Highway	368	390	395	346	285	238	235
Source: TTPP (2022) – Table 3.2							

Table 5.2 presents the average weekday composition of traffic including light vehicles (e.g. cars, motorcycles) and heavy vehicles (e.g. rigid and articulated trucks). The results demonstrate that heavy vehicles make up a significant proportion of vehicles travelling on the surveyed roads with most of the heavy vehicle traffic on Munros Road south of the Quarry Site generated by the Quarry.

Table 5.2
Surveyed Weekday Average Traffic Volumes and Composition 2020 (vehicles per day)

Road and Location	Light	Heavy	Total
Quarry Access Road	20	22	42
Munros Road	27	22	49
Mid Western Highway	109	248	357
Source: TTPP (2022) – Table 3.3			

Peak Hour Traffic Volumes

TTPP (2022) identifies that the surveyed roads do not display distinct morning and evening peak periods and peak traffic volumes do not coincide on all surveyed roads. Traffic demands on the Mid Western Highway increase steadily throughout the morning and remain steady throughout the day. **Table 5.3** presents a summary of the surveyed peak hourly traffic volumes at the surveyed locations over the average weekday.

Table 5.3
Surveyed Weekday Peak Hour Traffic Volumes 2020 (vehicles per hour)

	AM Peak Hour			PM Peak Hour		
	Hour	Light	Heavy	Hour	Light	Heavy
Quarry Access Road	6:00am	2	3	6:00pm	2	1
Munros Road	6:00am	2	3	3:00pm	3	1
Mid Western Highway	10:00am	10	17	3:00pm	9	17
Source: TTPP (2022) – Table 3.4						

5.1.2.4 Level of Service

Level of Service (LOS) is defined as a qualitative measure describing the operational conditions within a traffic stream as perceived by drivers and/or passengers. A LOS definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. LOS A provides the best traffic conditions, with no restriction on desired travel speed or overtaking. LOS B to D describes progressively worse traffic conditions. LOS E occurs when traffic conditions are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre in the traffic stream. In rural situations, LOS C is generally considered to be acceptable.

The Austroads (2020) *Guide to Traffic Management Part 3: Traffic Studies and Analysis* provides guidelines for the capacity and performance of two lane, two-way rural roads, which in turn, refers to the Highway Capacity Manual (HCM) (Transportation Research Board, 2016). The HCM identifies three classes of roads (Class I, Class II and Class III). LOS on Class I roads is defined in terms of Percent Time Spent Following (PTSF) and Average Travel Speed (ATS), with the worst of these adopted as the criteria. LOS on Class II roads is defined only in terms of PTSF. LOS on Class III roads is defined in terms of Percent of Free-Flow Speed (PFFS), which is the ratio of ATS to the free-flow speed.

The LOS criteria for two lane, two-way rural roads are shown in **Table 5.4**. The existing LOS for the road network in the vicinity of the Quarry Site is considered to be good with the surveyed roads classified as LOS A.

Table 5.4
Level of Service Criteria for Two Lane, Two-way Rural Roads

Level of Service	Class I		Class II	Class III
	Average Speed (km/h)	PTSF (%)	PTSF (%)	PFFS (%)
A	>90	≤35	≤40	>91.7
B	>80 – 90	>35 – 50	>40 – 55	>83.3 – 91.7
C	>70 – 80	>50 – 65	>55 – 70	>75.0 – 83.3
D	>60 – 70	>65 – 80	>70 – 85	>66.7 – 75.0
E	≤60	≥80	≥85	≤66.7
Source: Austroads (2020)				

5.1.2.5 Road Safety

Road crash information was obtained from the Centre for Road Safety (NSW) between the period 1 July 2015 and 30 June 2019 for the road network surrounding the Quarry Site. Throughout the period investigated, a total of four crashes were reported all of which occurred on the Mid Western Highway. Factors such as speed, fatigue and interaction with wildlife were nominated as contributing factors. No crashes occurred on Munros Road or near its intersection with the Mid Western Highway and no crashes involved heavy vehicles operated by the Applicant.

The road crash history does not highlight any clustering of crashes that might suggest an inherent concern with the design of the roads surrounding the Quarry Site.

5.1.2.6 Travelling Stock Reserves

Travelling Stock Reserves (TSRs) are parcels of Crown land reserved under legislation for use by travelling stock. TSRs provide pasture reserves for travelling or grazing stock, and are also used for public recreation, apiary sites and for conservation and are categorised depending on their level and type of use. Use of TSRs requires a permit, and stock are only to be walked over TSRs during daylight hours and yarded at night. When stock are on or near a road, approved warning signs must be displayed for motorists. Category 2 TSRs are principally used for travelling stock, emergency management or biosecurity purposes. Category 3 TSRs are rarely if ever used for travelling stock or emergency management, but are valued for other reasons, e.g. biodiversity conservation, Aboriginal cultural heritage or recreational purposes.

The following TSRs are located adjacent to or near Proposal transportation routes. There are no TSRs adjacent to the local road network between the Quarry Site and the Mid Western Highway.

- Mid Western Highway – Rankins Springs TSR (R85151) is a Category 2 TSR located on the northern side of the Mid Western Highway at Rankins Springs approximately 19km east of its intersection with Jennings Road.
- Mid Western Highway – a series of Category 2 and 3 TSRs are located adjacent to the Mid Western Highway west of Munros Road, the closest being approximately 20km to the west (unnamed) and 40km to the west at Goolgowi (R56838 and R55146).

5.1.2.7 Fire Trails

The Quarry Access Road (Lachlan Range State Forest 08 Trail) is classified as a Category 7 Tactical Fire Trail. The NSW RFS Fire Trail Standards state that Category 7 Tactical Fire Trails are trails which can be safely traversed by a Category 7 firefighting vehicle (i.e. a small truck 6.2m long and 2.04m wide with a height of 3.05m including aerials).

5.1.3 Predicted Changes to the Traffic Environment

5.1.3.1 Baseline Future Traffic Volumes

Changes to existing traffic conditions can be expected to occur which are not directly attributable to any specific development. For the purpose of the TIA, TTPP (2022) assumes an average growth rate of 2.0% per annum which would increase the background peak hourly and daily traffic volumes over time. A future horizon assuming ten years of growth has been adopted for the purposes of this assessment, with the resulting traffic volumes summarised in **Table 5.5**.

Table 5.5
Baseline Future Traffic Volumes (2030)

	AM Peak[1] (vehicles per hour)		PM Peak[1] (vehicles per hour)		Daily (vehicles per day)	
	Light	**Heavy**	**Light**	**Heavy**	**Light**	**Heavy**
Quarry Access Road	2	3	2	1	20	22
Munros Road	2	3	3	1	28	22
Mid Western Highway	12	20	11	21	128	297
Note 1: Time of peak hours at each location are presented in Table 5.3 Note 2: Assumes Quarry operating at 2020 surveyed level of activity. Growth not applied to existing Quarry-generated heavy vehicle movements.						
Source: TTPP (2022) – Table 3.6						

5.1.3.2 Proposal Contribution to Future Traffic Volumes

Section 2.8.3 presents the anticipated traffic volumes for the Proposal. The forecast future peak hourly and weekday traffic volumes, including Proposal-generated traffic, are summarised in **Table 5.6**.

It is noted that the traffic volumes identified in this table incorporate maximum Proposal generated traffic volumes on each approach route simultaneously, however, this would not occur in reality. Furthermore, it assumes that maximum hourly traffic generation would coincide with the background peak hourly traffic on the routes, noting that at several locations, the surveyed peak background traffic occurred outside of the proposed transportation hours.

Table 5.6
Future Weekday Traffic Volumes with Maximum Proposal-generated Traffic

	AM Peak[1] (vehicles per hour)		PM Peak[1] (vehicles per hour)		Daily (vehicles per day)	
	Light	**Heavy**	**Light**	**Heavy**	**Light**	**Heavy**
2020 with Maximum Product Transportation						
Quarry Access Road	2	24	2	24	20	120
Munros Road	2	24	3	24	27	120
Mid Western Highway	10	38	9	40	109	346
2030 with Maximum Product Transportation						
Quarry Access Road	2	24	2	24	20	120
Munros Road	2	24	3	24	28	120
Mid Western Highway	12	41	11	44	128	395
Note 1: Time of peak hours at each location are presented in Table 5.3						
Source: TTPP (2022) – Modified after Table 4.2						

5.1.4 Management and Mitigation Measures

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

- A Driver's Code of Conduct, identifying required driver behaviour and enforcement mechanisms for drivers of heavy vehicles, including subcontractors, regularly accessing the Quarry Site, would be developed and enforced to minimise risks to other road users and livestock.
- A comprehensive Environmental Management Plan for the ongoing management of relevant environmental issues at the Quarry would be developed which would comprise a separate section in relation to Traffic Management.
- A "GIVE WAY" sign would be installed facing drivers exiting the Quarry Access Road at its intersection with Munros Road.
- Minor works would be required to seal and widen the left-in bend from the Mid-Western Highway to Munros Road to ensure the intersection is compliant with the general minimum preferred treatment for rural road intersections.

5.1.5 Assessment of Impacts

5.1.5.1 Level of Service

TTPP (2022) demonstrates that the LOS on the surrounding road network would remain good during the morning and evening peak hours with the combined effects of background traffic growth and additional Proposal-generated traffic with all routes predicted to maintain their LOS A classification. Drivers would experience only minor delays as a result of interaction with other traffic.

5.1.5.2 Intersection Performance

The Proposal would increase the number of vehicles turning into and out of the existing intersection of Munros Road with the Mid Western Highway. As such, intersection performance was assessed by TTPP using SIDRA INTERSECTION, an analysis program which determines characteristics of intersection operating conditions including the degree of saturation, average

delays, and levels of service. The results of this assessment indicate that the intersection is expected to continue to operate at good levels of service during peak periods, with spare capacity and acceptable delays regardless of which direction Proposal-generated vehicles travel on the Mid Western Highway.

5.1.5.3 Travelling Stock Reserves

Traffic generated by the Proposal would, on some days, use those parts of the Mid Western Highway where there are existing Category 2 TSRs. The Proposal would generate a maximum of 24 heavy vehicle movements per hour on any one access route. The additional traffic generated by the Proposal would not have a significant impact on the TSRs on or near those routes, as the use of the TSRs for travelling stock would be subject to the usual permit conditions, with warning signs to be provided to motorists where stock are on or near the road.

5.1.5.4 Fire Trails

The Proposal would not change any aspect of the Quarry Access Road which would continue to be able to be safely traversed by Category 7 firefighting vehicles, if required. TTPP (2022) determines that no upgrades to the Quarry Access Road would be required.

5.1.6 Conclusion

TTPP (2022) concludes that the transportation of up to 250 000tpa of Quarry products from the Western Riverina Quarry, involving a maximum of 12 laden truck movements per hour and 60 laden truck movements per day, would be accommodated on the surrounding road network with acceptable impacts on the capacity, efficiency and safety of the road network. Furthermore, there would be no significant impacts on TSRs or fire trails as a result of the Proposal.

5.2 Air Quality

5.2.1 Introduction

The SEARs for the Proposal require the EIS to include an assessment of the likely air quality impacts of the development in accordance with the NSW Environment Protection Authority (EPA) document *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*. This assessment is required 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 transportation of products.

The assessment requirements identified by the Environment Protection Authority (EPA) were also considered during the preparation of the air quality assessment. A summary of the SEARs and requirements of the EPA are included in **Appendix 2** together with a record of where each requirement is addressed in the EIS.

An Air Quality Impact Assessment (AQIA) for the Proposal was undertaken by Northstar Air Quality Pty Ltd (Northstar). The resulting report is presented as **Appendix 4** and is hereafter referred to as Northstar (2022).

The following subsections provide a summary of Northstar (2022) describing the existing air quality environment, potential emission sources and the criteria adopted for the AQIA. This is followed by an overview of the proposed ongoing operational control measures that would be implemented by the Applicant. Finally, the assessment methodology and results are reviewed and the residual air quality impacts of the Proposal considered following the adoption of a range of safeguards and management measures.

5.2.2 The Existing Environment

5.2.2.1 Sensitive Receivers

The air quality impact assessment (Northstar, 2022) considers potential impacts to air quality at 10 privately-owned residential properties surrounding the Quarry Site. **Figure 4.4** presents details of the residences considered in the AQIA. It is noted that, in addition to privately-owned residences, two Proposal-related residences (R1 and R2) are also considered in the AQIA, however, these residences are not considered further in the following subsections.

5.2.2.2 Meteorological Environment

The weather experienced within a given area invariably governs the generation, dispersion and eventual fate of pollutants in the atmosphere. The general meteorological conditions of the surrounding area were reviewed using observational data from the Griffith Airport automatic weather station (AWS) and site-specific meteorological parameters required for the AQIA (Northstar, 2022) were generated using meteorological modelling using TAPM and CALMET software. A full description of the modelling exercise, methods and input data used to establish site-specific meteorological conditions is presented in Appendix B of Northstar (2022).

A description of the wind data relied upon in this assessment is provided in Section 4.2.4.

5.2.2.3 Air Quality Environment

Regional Air Quality

The existing air quality experienced in the area surrounding the Quarry Site was determined by examining measurements obtained from the NSW DPIE Air Quality Monitoring Network (AQMN). As the Quarry Site is not located in close proximity to any air quality monitoring station (AQMS) within this network, Northstar (2022) determined that data from the Wagga Wagga North AQMS were the most appropriate to determine background regional pollutant concentrations. **Table 5.7** presents a summary of the background air quality used in the AQIA.

Table 5.7
Summary of Background Air Quality Used in the AQIA

Pollutant	Averaging Period	Value	Notes
PM_{10}	24-hour	Daily varying	The 24-hour maximum PM_{10} in 2014 at Wagga Wagga North was measured to be 88.2 µg/m^3
	Annual	20.7 µg/m^3	
$PM_{2.5}$	24-hour	Daily varying	The 24-hour maximum $PM_{2.5}$ in 2014 at Wagga Wagga North was measured to be 27.6 µg/m^3
	Annual	7.6 µg/m^3	
TSP	Annual	48.4 µg/m^3	Estimated on TSP:PM_{10} ratio of 2.3404:1
Dust Deposition	Monthly	2 g/m^{2}month^1	Difference in NSW EPA maximum allowable and incremental impact criterion
Source: Northstar (2022) – Table 7			

Cumulative Impacts

Northstar (2022) undertook a desktop study to determine the potential for cumulative impacts from particulate generating operations conducted in proximity to the Quarry Site. It was determined that, as the area surrounding the Quarry Site is generally agricultural in nature with no significant anthropogenic sources of particulate matter, regional background air quality data would appropriately account for any potential cumulative impacts associated with surrounding land uses.

5.2.3 Criteria for Assessment

Table 5.8 presents the air quality criteria listed in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2017a) which were adopted for the Proposal. It is noted that the criteria are intended to minimise any potential impacts to human health and amenity.

Table 5.8
Air Quality Assessment Criteria

Pollutant	Averaging period	Criterion	Notes
PM_{10}	24 hours	50µg/m^3	Numerically equivalent to the AAQ NEPM[(b)] standards and goals.
	1 year	25µg/m^3	
$PM_{2.5}$	24 hours	25µg/m^3	
	1 year	8µg/m^3	
TSP	1 year	90µg/m^3	
Deposited Dust	1 year[(c)]	2g/m^2/month	Assessed as insoluble solids as defined by AS 3580.10.1
	1 year[(d)]	4g/m^2/month	
Notes: (a): micrograms per cubic metre (b): National Environment Protection (Ambient Air Quality) Measure (c): maximum increase in deposited dust level (d): maximum total deposited dust level			
Source: Northstar (2022) - Table 3			

5.2.4 Potential Sources of Air Contaminants

The following potential sources of operational emissions were considered by Northstar (2022).

- Particulate emissions from overburden and interburden handling.
- Particulate emissions from drilling and blasting.
- Loading and hauling of raw materials to the processing plant.
- Loading of the processing plant with raw materials.
- Processing of raw materials.
- Management of product stockpiles.
- Operation of pre-coat plant and pugmill.
- Loading of product trucks with products.
- Wheel-generated particulate emissions from the transportation of products off site.
- Emissions from vehicle and equipment exhausts.
- Wind erosion of disturbed areas.

5.2.5 Assessment Methodology

Using the site-specific meteorological file generated, air dispersion modelling was used to simulate the dispersion of particulate matter associated with the sources outlined in Section 5.2.4. A range of emissions controls, including the use of a water truck to dampen roads during dry conditions were included in the modelling assessment. Modelling was performed using the NSW EPA approved CALPUFF atmospheric dispersion model in 3-dimensional (3-D) mode.

An assessment of the impacts of activities at the Quarry Site was undertaken to characterise the likely day-to-day operation of the Proposal. This assessment relied upon average and likely maximum operational characteristics to assess the Proposal against longer term (annual average) and shorter term (24-hour) criteria for particulate matter. Two operational scenarios were selected for dispersion modelling (Stages 1 and 3 of extraction operations) as presented in **Figure 5.2**. It is noted that Stages 1 and 3 were selected as these stages were considered to be representative of the progressive development of the Quarry. The modelling scenarios provide an indication of the air quality impacts of the activities being undertaken as part of the Proposal. The regional background air quality was added to these impacts to represent the air quality which may be expected within the area surrounding the Quarry Site.

As the background data for 24-hour $PM_{2.5}$ and PM_{10} used for the assessment includes periods when the standard assessment criteria are exceeded (i.e. the criteria is exceeded within any assumed background level, regardless of the operation of the Quarry), Northstar (2022) assessed 24-hour average $PM_{2.5}$ and PM_{10} using the Level 2 Contemporaneous Assessment Method provided in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2017a). In this approach, the measured background concentrations for each day over a representative year are added to the corresponding predicted incremental particulate matter concentrations from the Quarry to establish the number of additional days (if any) in a representative year when the criteria would be exceeded as a result of the proposed changes. Northstar (2022) performed the AQIA based on air quality and meteorological data from the year 2014 which was determined to be most representative for the area.

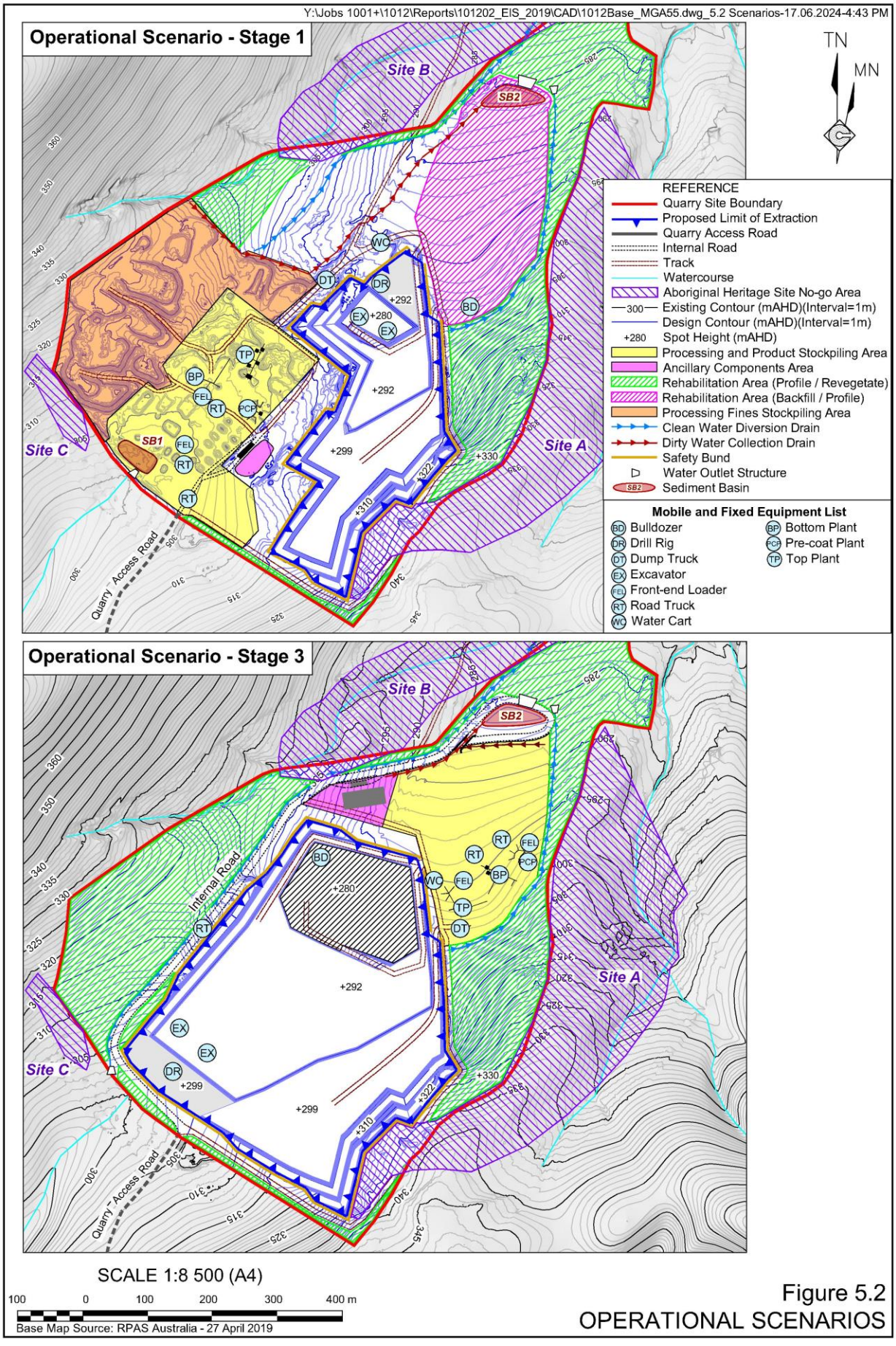


Figure 5.2
OPERATIONAL SCENARIOS

5.2.6 Proposed Management and Monitoring Measures

The Applicant would employ the following best practice mitigation measures to ensure that dust impacts are minimised.

- The dust collection system on the drill rig would be regularly serviced to ensure it remains effective.
- Misting water sprays would be used on crushers and screens within the "Top Plant" and "Bottom Plant".
- All unsealed internal roads would be surfaced with appropriate materials to limit dust lift-off, as required.
- Unsealed roads and unformed tracks and/or surfaces utilised by vehicles (e.g. tracks used by product transport trucks within the extraction area) would be watered, as required.
- Appropriate care would be taken to avoid spillage during loading.
- Load size would be limited, as appropriate, to ensure materials do not extend above truck sidewalls. Each truck cover would be fully extended on laden product transport trucks before each truck leaves the Quarry Site.
- All vehicles travelling on internal unsealed roads or unformed tracks within the Quarry Site would be limited to a speed no greater than 20km/h.
- The Applicant's complaints management system would continue to be maintained to ensure that all complaints are dealt with through investigation and implementation of corrective treatments.

5.2.7 Assessment of Impacts

Particulate Matter – Annual Average

Table 5.9 summarises the annual average predicted particulate matter and deposited dust concentrations at surrounding residences. The results of the dispersion modelling indicate that the emissions attributable to the Proposal would comply with annual average air quality criteria, even when cumulative emissions are considered.

Table 5.9
Summary of Annual Average Particulate Matter Concentrations

Page 1 of 2

Emission Type	PM_{10} ($\mu g/m^3$)		$PM_{2.5}$ ($\mu g/m^3$)		TSP ($\mu g/m^3$)		Dust Deposition (g/m^2/month)	
Criteria	*25*		*8*		*90*		*4*	
Receiver	Proposal	Cumulative	Proposal	Cumulative	Proposal	Cumulative	Proposal	Cumulative
Scenario 1								
R4	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R5	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R11	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R14	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R15A	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R15B	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R16	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1

Table 5.9 (Cont'd)
Summary of Annual Average Particulate Matter Concentrations

Emission Type	PM_{10} ($\mu g/m^3$)		$PM_{2.5}$ ($\mu g/m^3$)		TSP ($\mu g/m^3$)		Dust Deposition (g/m^2/month)	
Criteria	***25***		***8***		***90***		***4***	
Receiver	**Proposal**	**Cumulative**	**Proposal**	**Cumulative**	**Proposal**	**Cumulative**	**Proposal**	**Cumulative**
Scenario 1 (Cont'd)								
R17A	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R17B	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R18	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
Scenario 2								
R4	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R5	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R11	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R14	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R15A	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R15B	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R16	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R17A	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R17B	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
R18	<0.1	20.8	<0.1	7.7	<0.1	48.5	<0.1	2.1
Note 1: See Figure 4.4 for residence locations.								
Source: Northstar (2022) – Modified After Tables 14 to 17								

Particulate Matter – Maximum 24-hour

Table 5.10 summarises the maximum incremental 24-hour PM_{10} and $PM_{2.5}$ concentrations at surrounding residences.

Table 5.10
Predicted Maximum Incremental 24-hour PM_{10} and $PM_{2.5}$ Concentrations

Receiver	Maximum incremental 24-hour average concentration ($\mu g/m^3$)			
	Scenario 1		Scenario 2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
R4	1.1	0.2	1.4	0.2
R5	0.8	0.1	1.0	0.1
R11	0.6	<0.1	0.4	<0.1
R14	0.5	<0.1	0.6	<0.1
R15A	1.9	0.3	2.2	0.3
R15B	0.5	<0.1	0.4	<0.1
R16	0.4	<0.1	0.5	<0.1
R17A	0.9	0.2	1.0	0.2
R17B	0.7	0.1	1.0	0.1
R18	0.3	<0.1	0.3	<0.1
Note 1: See Figure 4.4 for residence locations.				
Source: Northstar (2021) – Modified After Table 18				

The worst-case incremental outcome of modelled predictions for 24-hour PM_{10} and 24-hour $PM_{2.5}$ under the Proposal is for an incremental impact up to 2.2µg/m^3 for PM_{10} and 0.3µg/m^3 for $PM_{2.5}$ which are both predicted to occur at residence R15A. The Level 2 Contemporaneous Assessment of cumulative 24-hour PM_{10} and 24-hour $PM_{2.5}$ indicated that there would be no additional exceedances of the assessment criteria as a result of the Proposal (i.e. there would be no exceedances of the criteria other than those predicted by background concentrations alone).

A comprehensive list of assessment results at residences surrounding the Quarry is presented in Section 6 of Northstar (2022).

Respirable Crystalline Silica

The AQIA also considered potential impacts associated with Respirable Crystalline Silica (RCS). Based on the assumption that 100% of modelled annual average $PM_{2.5}$ impacts would be RCS, impacts were predicted to represent <3.4% of the relevant criterion. As the actual concentration of free silica within the basalt would be negligible, this percentage is extremely conservative.

Greenhouse Gas Assessment

A quantitative assessment of greenhouse gas (GHG) emissions generated by the Proposal was undertaken by Northstar (2022) with emissions compared to national and State totals. Emissions associated with the Proposal would represent approximately 0.0003 % of Australian and 0.0014 % of NSW emissions totals for the year 2018. Emissions are proposed to be reduced further through the implementation of a maintenance program for all plant and equipment.

5.2.8 Conclusion

The results of the AQIA undertaken by Northstar (2022) based on consideration of two operational scenarios (Stage 1 and Stage 3) have concluded that the Proposal is predicted to comply with all impact assessment criteria for annual average concentrations of TSP, $PM_{2.5}$, PM_{10} and deposited dust.

The assessment of 24-hour average $PM_{2.5}$ and 24-hour average PM_{10} applying a Level 2 Contemporaneous Assessment has indicated that there would be no additional exceedances of the assessment criteria as a result of the Proposal.

The GHG assessment concluded that average Scope 1 emissions from the Proposal would represent approximately 0.0003% of Australian and 0.0014 % of NSW GHG emissions which represents a very minor proportion of global GHG emissions. Air quality impacts are, therefore, not predicted to constrain the Proposal.

5.3 Noise and Vibration

5.3.1 Introduction

The SEARs require the EIS to include an assessment of the potential impacts of the Proposal on noise and blasting, including:

- construction and operational noise and off-site transport noise impacts of the development;
- reasonable and feasible mitigation measures to minimise noise emissions;
- monitoring and management measures;
- a description of the proposed blasting hours, frequency and methods; and
- an assessment of the likely blasting and vibration impacts of the development.

The assessment requirements provided by the EPA were also considered during the preparation of the noise and vibration assessment. A summary of the SEARs and requirements of the EPA are listed within **Appendix 2** together with a record of where each requirement is addressed in the EIS.

A noise and vibration impact assessment (NIA) for the Proposal was undertaken by Muller Acoustic Consulting Pty Ltd (MAC). The resulting report is presented as **Appendix 5** and is hereafter referred to as MAC (2022). The following subsections provide a summary of the NIA and describe the operational safeguards and management measures to be implemented by the Applicant.

5.3.2 The Existing Environment

5.3.2.1 Sensitive Receivers

MAC (2022) considers potential impacts to the existing noise environment at 10 privately-owned residences within 2.2km to 9.2km of the Quarry Site. **Figure 4.4** present details of the properties considered in the NIA whilst **Table 4.2** lists the distance between each residence and the closest proposed operational area.

5.3.2.2 Meteorological Environment

The atmospheric conditions most relevant to the NIA are temperature inversions, and source to receiver winds. The *NSW Noise Policy for Industry* (EPA, 2017b) states that wind effects need to be assessed when source to receiver winds (at 10m height) of 3m/s or below occur for 30% or more of the time in any season during any assessment period.

The following points are the most significant with respect to noise propagation and were adopted as parameters for noise modelling.

- A value of 60% Relative Humidity (RH) was adopted for daytime[1] (calm) conditions, while a value of 90% RH was adopted for evening shoulder[2] (inversion) conditions.
- Noise modelling for daytime (calm) conditions assumed a temperature of 20°C and a wind speed of 0.5m/s (source to receiver). Noise modelling for evening shoulder (temperature inversion) conditions was carried under F Class stability conditions (i.e. worst case), and assumed a temperature of 15°C and wind of 2m/s (source to receiver).

5.3.2.3 Existing Acoustic Environment

There is minimal existing industrial noise in the area surrounding the Quarry Site, apart from the existing Quarry, and the areas potentially affected by noise emissions from the Proposal are best described acoustically as rural.

It is anticipated that the daytime background noise levels in the rural areas surrounding the Quarry Site (excluding existing quarrying activities) would be below 30dB(A) and, in accordance with section A1.2 of the NPI, a default minimum daytime background noise level of 35dB(A),L_{90} has been adopted as the basis for determining project-specific noise goals or Project Noise Trigger Levels (PNTLs).

5.3.2.4 Existing Blasting Operations

Blasting operations at Western Riverina Quarry have been carried out since extraction operations commenced in 1987. The Applicant has developed a blasting method suited to the conditions at the Quarry Site. The existing blast schedule includes blasting at approximately bimonthly intervals, however, these intervals can be more frequent during periods of high product demand.

5.3.3 Criteria for Assessment

5.3.3.1 Operational Noise Criteria

Construction Criteria

The Noise Management Level (NML) for construction activities for all residential receivers are as follows.

- Standard Hours – 45dB $L_{Aeq(15min)}$
- Out of Hours – 35dB $L_{Aeq(15min)}$

Construction activities would be restricted to those activities identified in Section 2.4.6 throughout the life of the Proposal.

[1] The daytime period is defined as the period from 7:00am to 6:00pm from Monday to Saturday or 8:00am to 6:00pm on Sundays and public holidays.
[2] The evening shoulder period is defined as the period from 6:00pm to 7:00pm from Monday to Saturday.

Intrusiveness Criteria

The intrusiveness criteria limit Equivalent Continuous Noise Level (Leq) from the industrial source to a value of 'background plus 5dB' averaged over a 15-minute period. That is, the Rating Background Level (RBL) for the time period, plus 5dB(A). The RBL (L_{A90}) is defined as the overall single figure background level representing each assessment period. The intrusiveness criteria for the Proposal are as follows.

- Day – 40dB(A) $L_{eq(15\ min)}$
- Evening Shoulder – 35dB(A) $L_{eq(15\ min)}$

Amenity Criteria

The amenity criteria aim to protect against excessive noise in situations where an area is becoming increasingly developed. The criteria are based on the nature of the receiver area and existing levels of industrial noise. The amenity criteria for the Proposal are as follows.

- Day – 53dB(A) $L_{eq(15\ min)}$
- Evening Shoulder – 48dB(A) $L_{eq(15\ min)}$

Project Noise Trigger Levels

The Project Noise Trigger Levels (PNTLs) are the lower of the intrusiveness or amenity criteria and are the project-specific criteria against which the Proposal is required to be assessed. The PNTLs adopted for the Proposal are, therefore, the intrusiveness criteria.

Maximum Noise Level Criteria

The maximum noise trigger levels apply to transient noise events that have the potential to cause sleep disturbance and would, therefore, apply to any activities undertaken between 10:00pm and 7:00am between Monday to Saturday and 10:00pm and 8:00am on Sundays and public holidays. The maximum noise level trigger levels for the Proposal are as follows.

- 40dB(A) $L_{eq(15\ min)}$
- 52dB L_{Amax}

5.3.3.2 Road Traffic Noise Criteria

In accordance with the NSW *Road Noise Policy (*RNP), the noise and vibration impact assessment has adopted the "Freeway/arterial/sub-arterial road" category for the designated transport routes, consistent with their classification as "principal haulage routes". The criteria adopted for the Proposal are as follows.

- Day (7:00am to 10:00pm) – 60dB(A) $L_{Aeq(15\ hr)}$
- Night (10:00pm to 7:00am) – 55dB(A) $L_{eq(9\ hr)}$

5.3.3.3 Blasting Criteria

Overpressure and vibration levels from blasting are assessable against criteria proposed by the Australian and New Zealand Environment and Conservation Council (ANZECC) in their publication *"Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration – September 1990"*. These criteria are summarised as follows.

- The recommended maximum overpressure level for blasting is 115dB although the level of 115dB may be exceeded for up to 5% of the total number of blasts over a 12-month period, but should not exceed 120dB at any time.
- The recommended maximum vibration velocity for blasting is 5mm/s Peak Vector Sum (PVS) although the PVS level of 5mm/s may be exceeded for up to 5% of the total number of blasts over a 12-month period, but should not exceed 10mm/s at any time.
- Blasting should generally only be permitted during the hours of 9:00am to 5:00pm Monday to Saturday and should not take place on Sundays and Public Holidays.
- Blasting should generally take place no more than once per day, except in the event of a misfire.

5.3.4 Management and Mitigation Measures

5.3.4.1 Noise Design and Operational Safeguards

The Applicant is committed to minimising the noise generated by extraction, processing and transport activities through the implementation of the following operational noise controls and management measures.

- All hours of operation presented in Section 2.12 would be strictly adhered to.
- The maximum number of truck movements per day would be limited to 120 movements per day (60 laden trucks).
- All drivers would be required to sign a Driver's Code of Conduct requiring a high standard of driver performance, avoidance of using exhaust brakes in built-up areas and travel at the required speeds.
- The internal road network would be surfaced, as required, to limit body noise from empty trucks.
- All equipment on the Quarry Site would be regularly serviced to ensure sound power levels of each item remains at or below that nominated for noise modelling purposes.

5.3.4.2 Blast Design and Operational Safeguards

The following operational controls would be implemented to ensure that any potential impacts from blasting are limited and that blasting processes are undertaken efficiently and safely.

- Blasting would be restricted to between the hours of 10:00am to 3:00pm, Monday to Friday, as specified in Section 2.12.

- Blasting would take place no more than once per day as specified in the ANZECC guidelines.
- Blast impacts would be monitored during each blast to ensure that blast characteristics do not result in overpressure or vibration levels that are not consistent with the existing blasting methods.

A blast notification protocol would be implemented, and planned blasting would be pre-emptively discussed with surrounding residents.

5.3.5 Assessment Methodology

5.3.5.1 Inputs and Assumptions

Operational Scenarios

In order to assess the noise impacts for the operation of the Proposal, two worst-case operational scenarios were considered by MAC (2022). The scenarios chosen are displayed in **Figure 5.2** and are representative of the worst-case operational activities during Stages 1 and 3 of operations.

Noise Sources

The sound power levels of the equipment used in the operational scenario are provided in **Table 5.11**.

Table 5.11
Noise Source Sound Power Levels

Noise Source / Item	Number	Sound Power Level dB $LA_{eq(15min)}$
Top Plant	1	120
Bottom Plant	1	117
Pre-coat Plant	1	99
Drill Rig	1	114
Bulldozer	1	117
Excavator (38t)	1	106
Excavator (6t)	1	101
Dump Truck	1	109
Front-end Loader	2	106
Water Cart	1	101
Road Trucks	3	102
Source: MAC (2022) – Modified after Table 17		

Road Transport Conditions

The following inputs/assumptions were included in the assessment of road transport noise levels.

- The closest residences to the transportation routes are located 830m from Munros Road, 35m from the Mid Western Highway (Goolgowie) and 45m from the Mid Western Highway (Rankins Springs).
- At maximum production, up to 60 laden trucks per day and 12 laden trucks per hour could utilise a given transport route.

Blasting Parameters

A total of no more than 8 to 12 blasts would be undertaken per year with no more than one blast per week proposed (excluding that required in the event of a misfire). The indicative blast design adopted for the blasting assessment are presented in **Table 2.2** (50 000t blast).

5.3.5.2 Operational Noise Assessment

Predictive noise modelling was undertaken by MAC (2022) using DGMR (iNoise, Version 2021.1) software to quantify noise emissions from the operational activities identified in Section 5.3.5.1 and **Figure 5.2**. The model incorporated a three-dimensional terrain map, noise source data, ground type, attenuation from barriers and atmospheric information to predict noise levels at the nearest potentially impacted residences.

Construction activities associated with the Proposal would be undertaken during periods of reduced production using equipment generally consistent with that used on site. As such, MAC (2022) considers that construction activities would not contribute to elevated noise levels and no further assessment of these activities is required.

5.3.5.3 Road Traffic Noise Assessment

MAC (2022) undertook an assessment of road traffic noise using road traffic calculation method developed by the US Environmental Protection Agency to predict the LA_{eq} noise levels from Proposal-related trucks travelling past existing residences located adjacent to the product transport routes. This method is an internationally accepted theoretical noise prediction model and is ideal for calculating road traffic noise where relatively small traffic flows are encountered.

5.3.5.4 Blasting Assessment

In order to predict blast overpressure and ground vibration levels, a series of standard equations were applied using the proposed blast parameters. The equations used are discussed in detail in Section 4.4 of MAC (2022).

5.3.6 Assessment of Impacts

5.3.6.1 Predicted Operational Noise Levels

Predicted noise levels for both day and evening shoulder periods for the two modelled scenarios are provided in **Table 5.12**. All modelled results are below the adopted criteria (see Section 5.3.3.1).

Table 5.12
Predicted Operational Noise Levels (dB(A),$L_{eq(15min)}$)

Receiver[1]	Period	Scenario		PNTL
		1 (Stage 1)	2 (Stage 3)	
R4	Day	31	31	40
	Evening Shoulder	30	30	35
R5	Day	<30	30	40
	Evening Shoulder	<30	<30	35
R11	Day	<30	<30	40
	Evening Shoulder	<30	<30	35
R14	Day	<30	<30	40
	Evening Shoulder	<30	<30	35
R15A	Day	30	31	40
	Evening Shoulder	30	32	35
R15B	Day	<30	<30	40
	Evening Shoulder	<30	<30	35
R16	Day	<30	<30	40
	Evening Shoulder	<30	<30	35
R17A	Day	<30	<30	40
	Evening Shoulder	<30	<30	35
R17B	Day	<30	<30	40
	Evening Shoulder	<30	<30	35
R18	Day	<30	<30	40
	Evening Shoulder	<30	<30	35
Note 1: See Figure 4.4 for residence locations				
Source: Modified after MAC (2022) – Table 20				

5.3.6.2 Predicted Road Traffic Noise Levels

Predicted traffic noise levels at the closest residential receptors adjacent to the product transport routes were calculated to determine the potential impacts of the Proposal. **Table 5.13** presents a summary of the predicted operational road traffic noise levels at the closest residences to the respective roads. In all cases, the predicted noise levels would be below the adopted criteria.

Table 5.13
Operational Road Traffic Noise Levels – Residential Receivers

Distance from Road	Assessment Criteria	Traffic Noise (dB $L_{Aeq(period)}$)		Total Change (dB $L_{Aeq(period)}$)
		Existing Traffic	Future Traffic	
Munros Road				
830m	Day 60dB $L_{Aeq(15hr)}$	Negligible	Negligible	N/A
Mid Western Highway Goolgowi				
35m	Day 60dB $L_{Aeq(15hr)}$	45.1	46.3	+1.2
Mid Western Highway Rankins Springs				
45m	Day 60dB $L_{Aeq(15hr)}$	42.4	43.6	+1.2
Source: Modified after MAC (2022) – Table 22				

5.3.6.3 Predicted Blast Impacts

Table 5.14 presents the predicted air blast overpressure and ground vibration levels at the 10 residential properties surrounding the Quarry Site. It is predicted that blasts would satisfy all relevant ANZEC overpressure and vibration criteria at all residences.

Table 5.14
Predicted Blast Overpressure and Ground Vibration

Receiver ID[1]	Distance to Charge (km)	Airblast Overpressure (dBZ Peak)	Criterion (dBZ Peak)	Ground Vibration (mm/s)	Criterion (mm/s)
R4	2.8	103.0	115	0.19	5
R5	4.4	97.3		0.09	
R11	7.3	90.9		0.04	
R14	9.6	87.5		0.03	
R15A	2.5	104.3		0.23	
R15B	9.9	87.0		0.03	
R16	8.2	89.6		0.03	
R17A	8.3	89.4		0.03	
R17B	6.3	92.8		0.05	
R18	9.3	87.9		0.03	
Note 1: Denotes distance from drill rig to receiver location, as per operational scenario.					
Source: MAC (2022) – Table 23					

5.3.7 Monitoring

5.3.7.1 Noise Monitoring

Given the considerable distances between surrounding residences and the Quarry Site, monitoring of noise is not proposed. However, should any substantiated complaint(s) relating to noise be received, the Applicant would commission an independent noise assessment to establish the actual levels and compliance with the criteria set out in Section 5.3.3.

5.3.7.2 Blast Monitoring

The drill and blast contractor would be required to monitor each blast in accordance with existing practices.

5.3.8 Conclusion

Based on the predictive assessments undertaken by MAC (2022), the continued operation of the Western Riverina Quarry in the manner proposed is not expected to exceed the criteria adopted for the operational and road traffic noise assessments or the blasting assessment. Noise and vibration impacts are, therefore, not predicted to constrain the Proposal.

5.4 Water Resources

5.4.1 Introduction

The SEARs require the EIS to include an assessment of the potential impacts of the Proposal on water, including:

- a detailed site water balance and an assessment of any volumetric water licensing requirements;
- identification of any licensing requirements or other approvals required under the *Water Act 1912* (Water Act) and/or *Water Management Act 2000* (WM Act);
- 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; and
- a detailed description of the proposed water management system, water monitoring program and other measures to mitigate surface and groundwater impacts.

In addition, DPI-Agriculture, EPA and WaterNSW included water-related issues for assessment that included demonstration that the operation would have an adequate and secure water source and any licensing requirements be identified for the Proposal.

The following subsections provide an assessment of potential impacts to water resources as a result of the Proposal and describe the management and mitigation measures that would be implemented by the Applicant. As part of the assessment process, R.W. Corkery & Co. Pty Limited (RWC) prepared a report quantifying the sediment basin storage requirements for the Proposal. The resulting report is presented as **Appendix 6** and is hereafter referred to as RWC (2024).

5.4.2 Groundwater

5.4.2.1 Existing Environment

Hydrogeological Environment

The Quarry Site overlies the Lachlan Fold Belt Murray Darling Basin Groundwater Source which is managed under the *Water Sharing Plan for the NSW Murray – Darling Basin Fractured Rock Groundwater Sources 2011*. The Lachlan Fold Belt Murray Darling Basin Groundwater Source is an extensive groundwater system which extends from the Great Dividing Range to the western rangelands near Cobar. This water source provides both stock and domestic groundwater supplies with groundwater stored in fractures, joints, bedding plains, faults and cavities within the rock mass (DPIE, 2019).

Surrounding Groundwater Users

Registered groundwater bores within the vicinity of the Quarry Site are displayed on **Figure 4.4** indicating that the closest private registered bore is located approximately 2.3km to the southeast of the Quarry Site boundary (GW002798).

Groundwater Levels

A series of 33 holes were drilled by Groundwork Plus in 2015 in an exploration program undertaken within and immediately surrounding the Quarry Site. Holes were drilled to a maximum depth of approximately 21.6m below ground level (mbgl) (i.e. between approximately 0.5m to 18.1m below the lower basalt flow) with no groundwater intersected (Groundwork Plus, 2016). Groundwork Plus (2016) notes that any groundwater encountered within the proposed extraction area would be localised, very minor, ephemeral, structurally controlled perched aquifers comprising minor volumes of water. The Applicant has since undertaken further exploration drilling to a depth of up to approximately 23mbgl and has confirmed that no groundwater was intersected.

No groundwater has been intersected during extraction activities undertaken to date.

Groundwater Dependent Ecosystems

The Bureau of Meteorology Atlas of Groundwater Dependent Ecosystems (GDEs) identified areas of low potential terrestrial GDEs within the Quarry Site. No aquatic GDEs have been identified within or immediately surrounding the Quarry Site.

5.4.2.2 Management and Mitigation Measures

Due to the absence of groundwater during previous extraction and drilling activities, specific management and mitigation measures in relation to groundwater are not considered to be required for the Proposal. However, the Applicant would continue to ensure that appropriate management and mitigation measures are implemented in relation to the handling and storage of hydrocarbons to manage the risk of groundwater contamination (see Section 5.9.3) and would visually monitor for any signs of groundwater inflow during extraction operations (see Section 5.4.2.4).

5.4.2.3 Assessment of Impacts

Due to the absence of groundwater during previous extraction and drilling activities to approximately 23mbgl, it is considered unlikely that groundwater would be intercepted through extraction activities. As a result, it is considered that the Proposal would not constrain groundwater used by surrounding residents/land users nor result in contamination of these groundwater resources.

5.4.2.4 Monitoring

Whilst it is anticipated that groundwater inflow to the extraction area would not occur, the Applicant proposes to visually monitor for groundwater inflows. Should it be established that sustained inflow is occurring, the Applicant would arrange for a water access licence to cover groundwater inflow.

5.4.2.5 Conclusion

As it is anticipated that groundwater would not be intersected as part of the Proposal, and given the substantial distances between the Quarry Site and surrounding groundwater users, it is considered that the Proposal would have negligible impacts on groundwater and surrounding groundwater users.

5.4.3 Surface Water

5.4.3.1 Existing Environment

The Quarry Site is located within the Lachlan River Catchment with surface water resources managed under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*. An overview of the regional, local and Quarry Site topography and drainage is presented in Section 4.1. In summary, a total of three ephemeral, first-order drainage features traverse parts of the Quarry Site with flows generally limited to during and immediately following rainfall events.

The Quarry Site is not located near any major watercourses and is not at risk of flooding. As such, flood risks are not considered further in this assessment.

5.4.3.2 Management and Mitigation Measures

The proposed water management system for the Quarry has been developed in a manner that enables the:

- efficient recovery and use of natural resources;
- effective management of available storage volumes that prevents uncontrolled discharge to receiving environments; and
- effective water quality management strategies that prevent discharge of sediment-laden water to receiving environments.

A controlled activity approval under the *Water Management Act 2000* (WM Act) would be required to allow for a specified controlled activity on waterfront land where disturbance would encroach within 40m of waterfront land.

5.4.3.2.1 Catchments and Surface Water Management

Figures 5.3 to **5.5** display representative catchments within the Quarry Site during the development of the Quarry and the proposed water management structures that would be constructed and/or excavated to separate "clean" and "dirty" surface water runoff.

Extraction Area – Sediment-laden Runoff

Rainfall captured within the extraction area would remain in this location, a small proportion of which would ultimately infiltrate towards the regional groundwater table below the extraction floor. The extraction area catchment is expected to reach its maximum extent of 18.1ha at the end of Stage 3 of operations. Runoff during periods of heavy rain would flow to the Quarry Sump which would be progressively enlarged throughout the life of the Quarry, as required. It is anticipated that no discharge would be required from the sump.

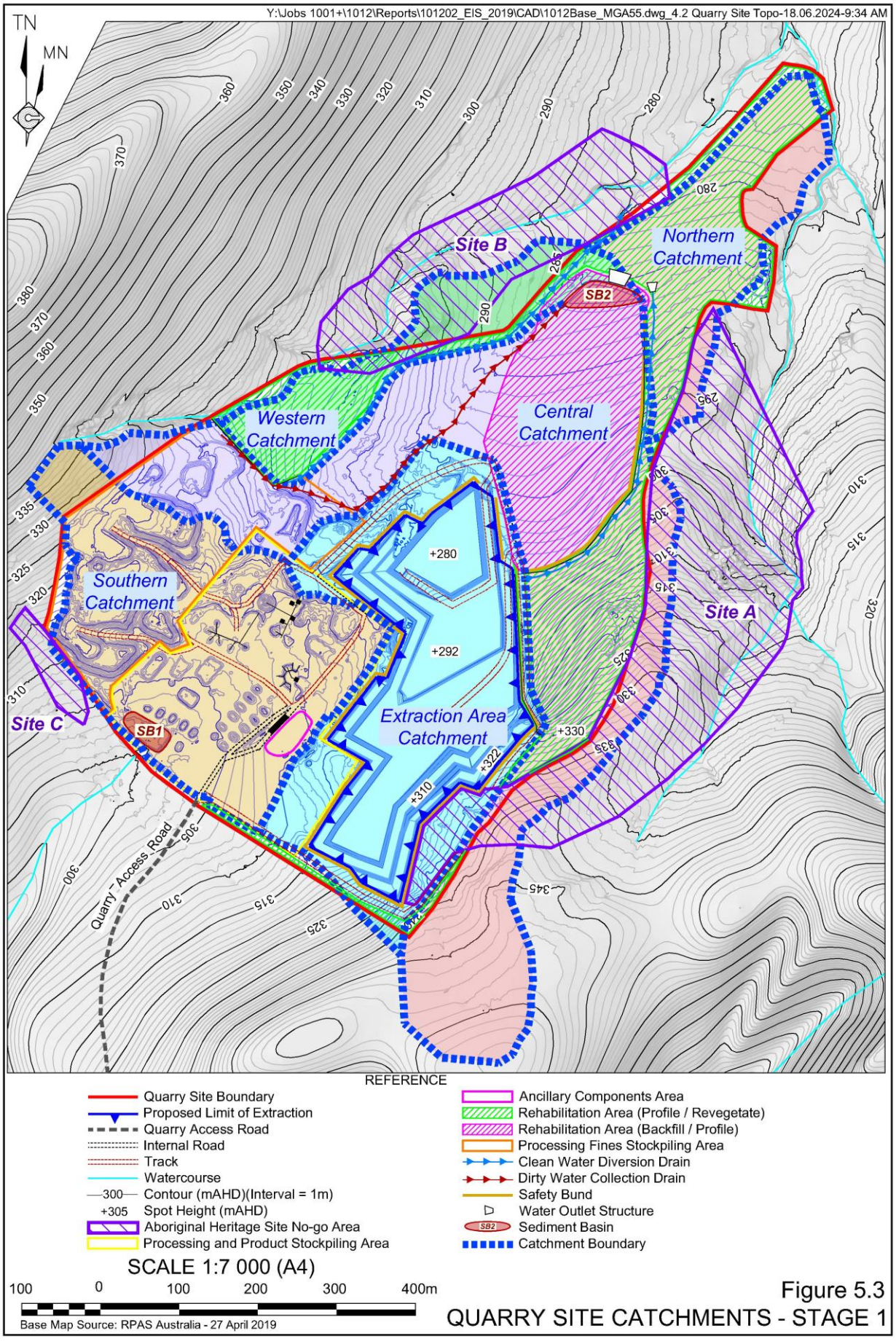


Figure 5.3
QUARRY SITE CATCHMENTS - STAGE 1

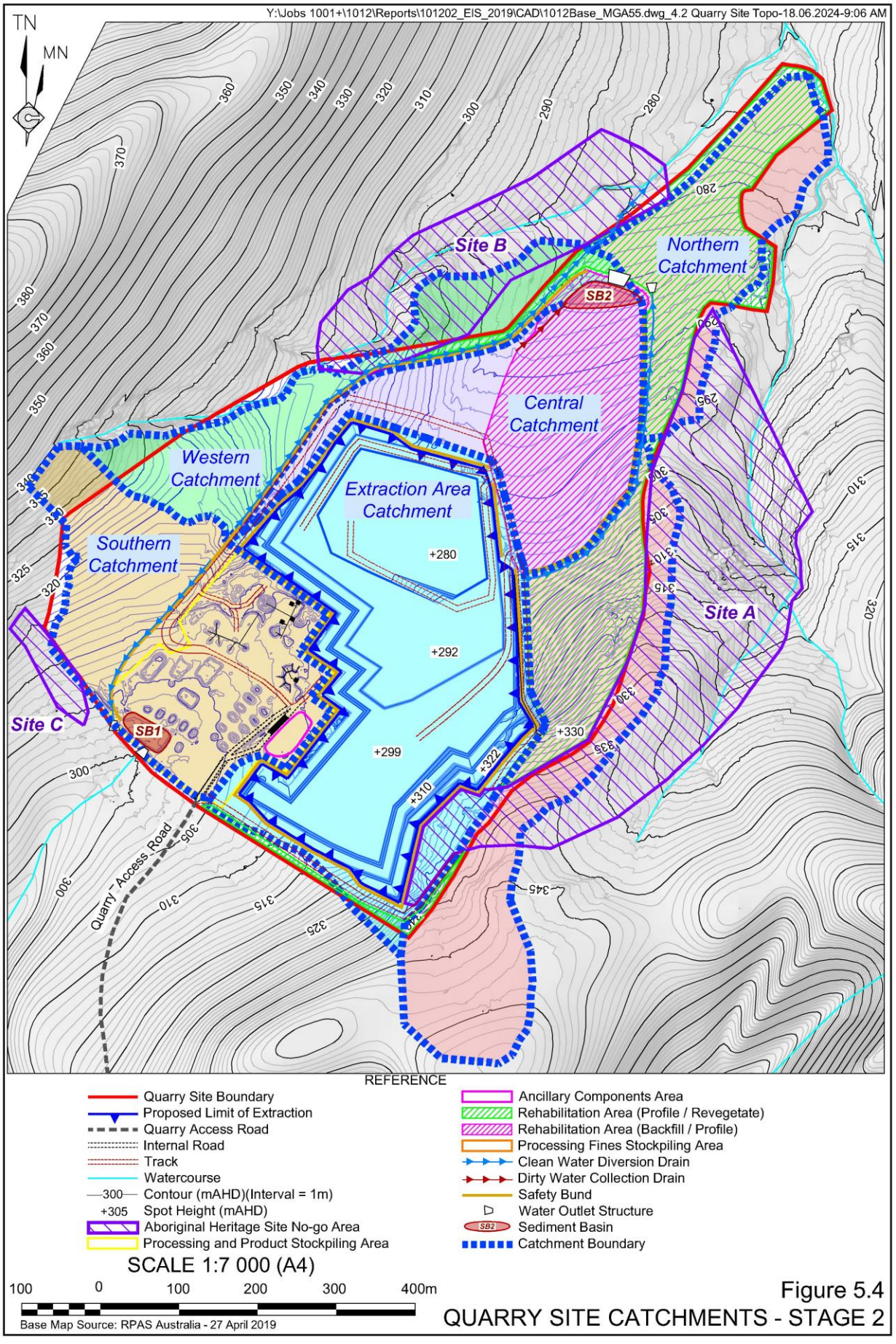


Figure 5.4
QUARRY SITE CATCHMENTS - STAGE 2

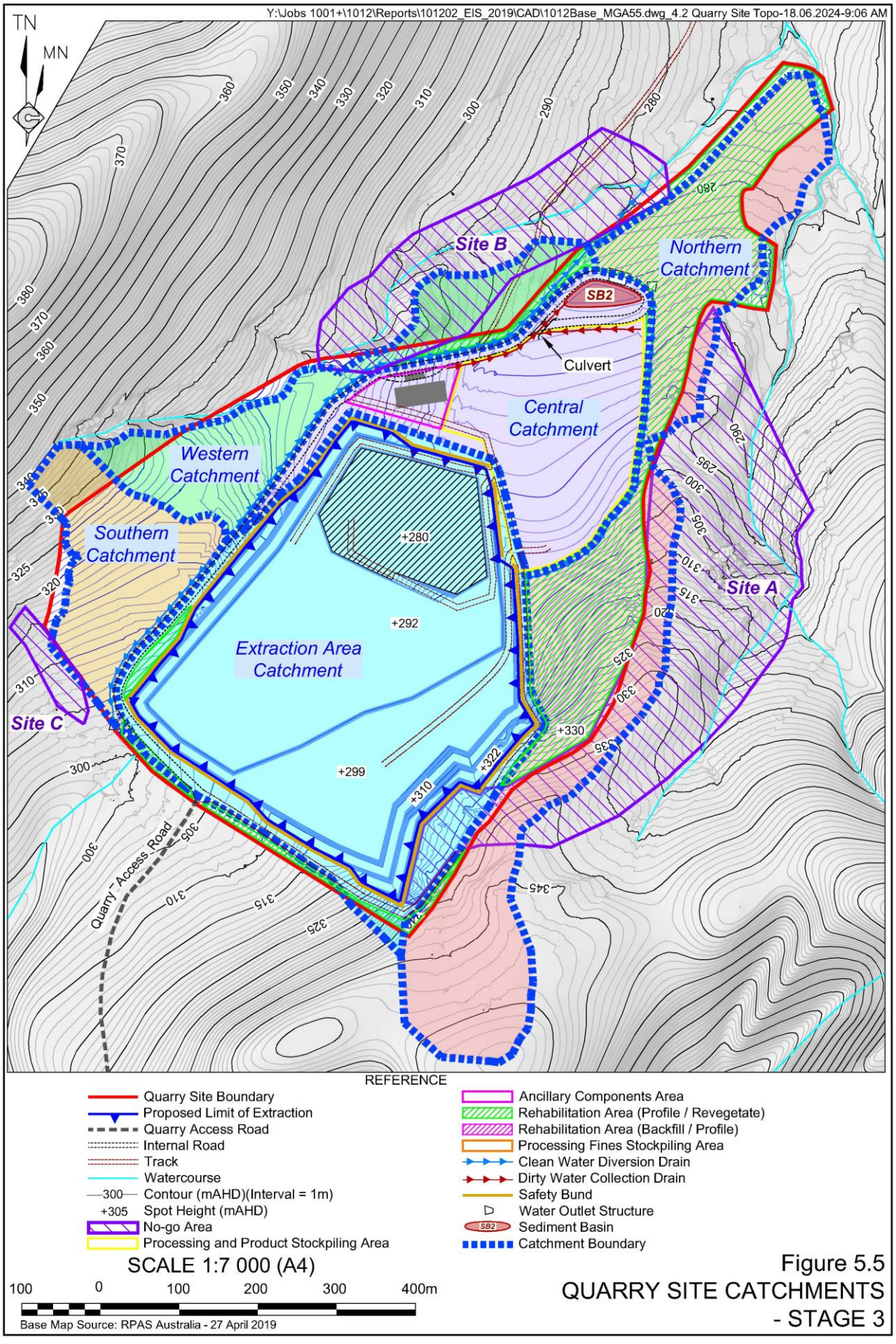


Figure 5.5
QUARRY SITE CATCHMENTS - STAGE 3

Areas of Operational Disturbance Areas – Sediment-laden Runoff

As discussed in Section 2.4.3, sediment basins external to the active extraction area namely SB1 (Southern Catchment) and SB2 (Central Catchment) would be constructed to collect and manage sediment-laden runoff during the life of the Proposal. The sediment basin storage capacity calculations (RWC, 2024) applied estimates of rainfall and erosion data, the soil hydrologic group and the catchment area to determine the maximum required capacity for each sediment basin within the Quarry Site. The capacities comprise the minimum settlement and storage requirements for a 90th percentile 5-day rainfall event i.e. 26.3mm (the design rainfall event specified in Volume 2E of the Blue Book for standard receiving environments (Landcom, 2004). Water would overflow from sediment basins via rock-lined spillways to the surrounding environment. It is noted that the capacity of each sediment basin provides for the maximum area to be disturbed within each catchment throughout the life of the Proposal. The assumptions and final calculations used for each of the catchments are included in **Appendix 6** and a summary of the results provided in **Table 5.15**.

Table 5.15
Settlement and Storage Volume Requirements

Basin	Sediment Basin 1*			Sediment Basin 2		
	Water Settlement Zone (m^3)	Sediment Storage Zone (m^3)	Total (m^3)	Water Settlement Zone (m^3)	Sediment Storage Zone (m^3)	Total (m^3)
Sediment Basins – Existing	1 230	178	1 408	-	-	-
Sediment Basins – Stage 1	750	108	858	700	84	784
Sediment Basins – Stage 2	632	91	723	498	60	558
Sediment Basins – Stage 3	-	-	-	498	72	570
*Sediment Basin 1 would be decommissioned at the start of Stage 3.						
Source: RWC (2024)						

The clean water diversions conveying water in the southern and western catchments would only operate once these areas are vegetated – interim sediment collection and management would be required.

Sediment basins would be maintained such that they would continue to meet capacity requirements. This would involve excavation of sediment when this exceeds the sediment storage zone for each respective sediment basin and stabilisation of drainage and sediment basin walls. Excavated sediment would be stockpiled for incorporation in road pavement products or used in rehabilitation activities.

As discussed in Section 2.4.3, a series of dirty water collection drains would be constructed to convey sediment-laden runoff from areas of operational disturbance to sediment basins. Other erosion and sediment control measures, such as silt-stop fencing, would be installed downslope of areas of temporary operational disturbance to manage sediment-laden runoff during the development of the Quarry.

Undisturbed Areas – Clean Runoff

As discussed in Section 2.4.3, clean water diversions would be constructed and/or excavated to direct runoff from the undisturbed areas upslope of areas of operational disturbance. The construction of these drains would be staged and reflect the progressive enlargement of the extraction area.

5.4.3.3 Assessment of Impacts

Assuming the adoption of the design controls detailed in Section 5.4.3.2, it is anticipated that there would be a low likelihood that sediment-laden water would be discharged to the surrounding environment. The proposed sediment basins would provide sufficient capacity to manage predicted runoff resulting from a 90th percentile 5-day rainfall event.

5.4.3.4 Monitoring

Due to the low risk of sediment-laden discharge to the surrounding environment, regular surface water monitoring is not proposed. However, the Applicant would undertake inspections of all structures to ensure stability and sediment storage capacity is maintained after any significant rainfall event. When it is required, the Applicant would implement measures to remove any excess sediment and/or debris and repair the sediment basins and control structures.

5.4.3.5 Conclusion

It is considered that the Proposal would have negligible impacts on surface water given the proposed management and mitigation measures.

5.4.4 Water Use

Water usage at the Quarry has been conservatively estimated as follows noting that the volumes presented assume that dust suppression would be required on all operating days. Reduced application rates to account for wet weather and periods of lower production have not been considered.

- 0.9ML[3] per annum for misting sprays on the processing plant.
- 9.0ML[4] per annum for application on internal haul roads and unformed tracks.

Based on the above, dust suppression would require no more than 33kL per day throughout the life of the Proposal. Assuming an average of 300 operational days, water use requirements are not expected to exceed 10ML per year.

Groundwater

The Applicant is approved to extract up to 10ML of groundwater annually from groundwater bore GW001705 (70CA617191) under Water Access Licence (WAL) 28615 which is located approximately 1km to the north of the Quarry Site within Lot 1 DP821515. This allocation will continue to be used towards the Proposal's bulk water requirements.

Surface Water

It is proposed that runoff collected within Quarry sump would be used to contribute towards meeting the operation's water demand. It is noted that as the principal purpose of the Quarry sump is for erosion and sediment control, with no contributing catchment, the sump would not contribute to the maximum harvestable rights dam capacity for the property.

[3] Based on the application of 3 000L x 300 operating days per annum.
[4] Based on the application of 30 000L (i.e. 2 x water cart loads) x 300 operating days per annum.

Make-up Water

In the event that additional water is required for dust suppression, water would be carted in for make-up water supplies.

5.5 Biodiversity

5.5.1 Introduction

The SEARs for the Proposal identified biodiversity as a key issue requiring that the EIS include:

- accurate predictions of any vegetation clearing on site;
- a detailed assessment of the likely biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems, undertaken in accordance with Sections 7.2 and 7.7 of the *Biodiversity Conservation Act 2016* (BC Act); 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.

In addition, assessment requirements relating to biodiversity values were received from the then OEH and NSW DPI – Agriculture. **Appendix 2** presents a summary of where all relevant assessment requirements have been addressed in the EIS.

A Biodiversity Development Assessment Report (BDAR) for the Proposal has been prepared by OzArk Environmental and Heritage Management Pty Ltd which is referred to as OzArk (2024a) and is presented as **Appendix 7**. The following subsections describe the setting of the Quarry Site and provide a summary of the BDAR and describes the management and mitigation measures to be implemented by the Applicant.

5.5.2 Assessment Methodology

5.5.2.1 Desktop Assessment

The following information sources were considered in preparation for field surveys of the Quarry Site. This information provided suitable background to inform the type and timing of surveys that would be required and to identify species likely to be present and potentially affected by the Proposal.

- BioNet Vegetation Classification.
- BioNet Threatened Biodiversity Data Collection.
- BioNet Atlas.
- Register of Declared Areas of Outstanding Biodiversity Value.
- State Vegetation Type Map: Central West/Lachlan Region Version v1.4 -VIS_ID 4468.
- NSW DPI threatened fish indicative distribution maps.
- Biodiversity Values Map.

- Mapping of vulnerable lands – steep and highly erodible.
- Acid Sulphate Soils Risk mapping.
- Directory of Important Wetlands Australia.
- NSW wetlands mapping.
- PlantNET.
- Important area mapping for Regent Honeyeater and draft important area mapping for Swift Parrot.
- EPBC Act Protected Matters Search Tool.

5.5.2.2 Field Surveys

OzArk completed field surveys within the Quarry Site on 28 August 2019, 20 September 2019, 31 October 2019, 1 November 2019, 20 May 2022, 30 January 2023, 5 October 2023 to validate predictions made based on the desktop assessment and map potential habitats and identified species within the Quarry Site.

The survey methods are described in full in Section 3.3 of OzArk (2024a) and comprised:

- a total of 13 survey plots consistent with the Biodiversity Assessment Methodology (BAM);
- general habitat searches to identify significant habitat features such as hollow-bearing trees;
- targeted threatened fauna transects;
- incidental threatened flora and fauna searches;
- search for scats / signs of habitat use;
- Diurnal and nocturnal bird surveys; and
- 1 x song meter SM4 acoustic recorder (21 days).

5.5.3 Vegetation Communities and Threatened Species

Field surveys within the Quarry Site identified the following Plant Community Types (PCT).

- PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt.
- PCT 72 - White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion.
- PCT 185 - Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion.
- PCT 186 - Dwyer's Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion.

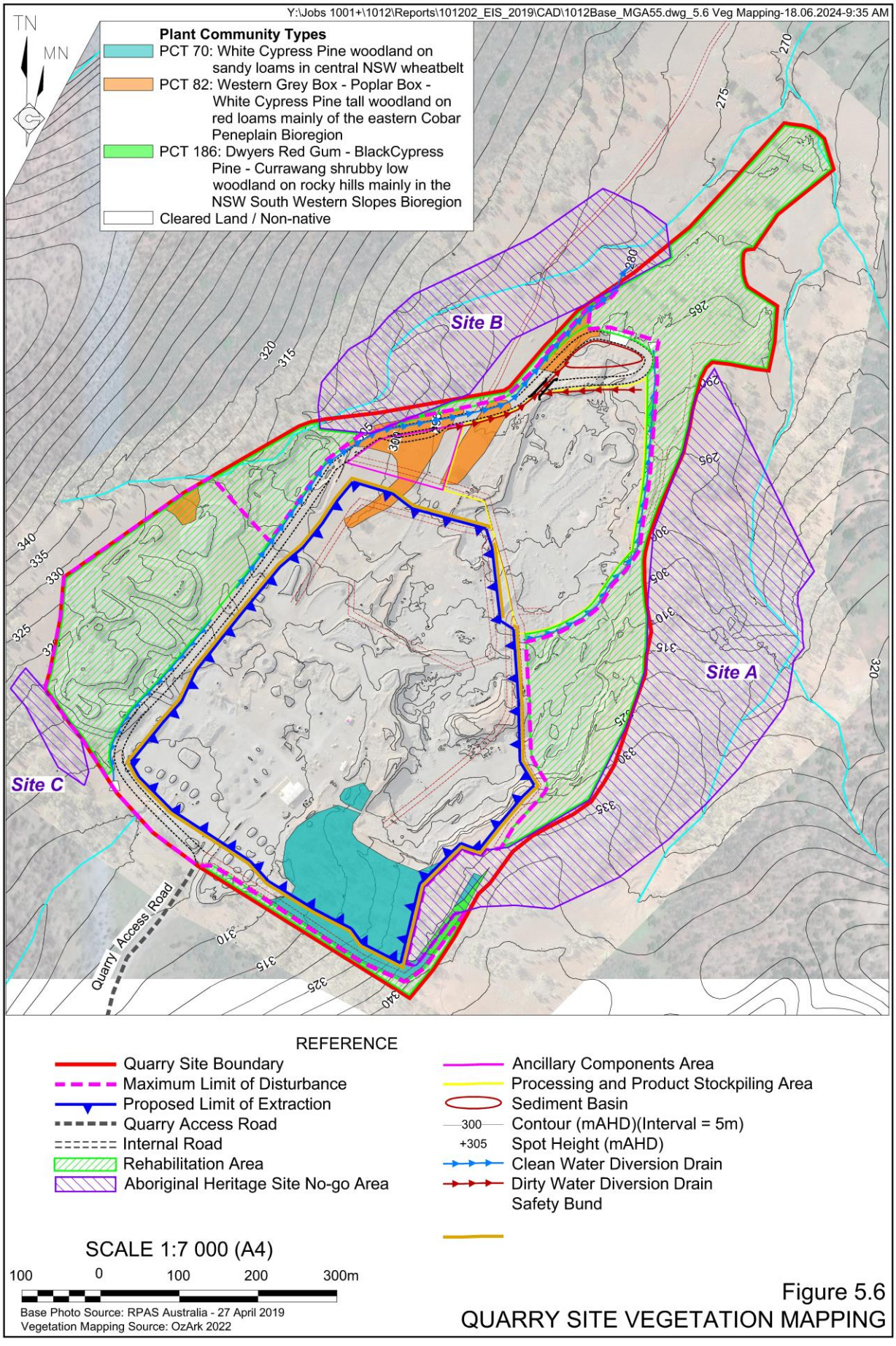


Figure 5.6
QUARRY SITE VEGETATION MAPPING

A total of 4.23ha of native vegetation would be removed by the Proposal comprising approximately 4.13ha of vegetation in poor condition and 0.10ha in moderate condition. **Figure 5.6** and **Table 5.16** present the vegetation types that would be removed by the Proposal together with their respective areas.

Table 5.16
Vegetation Integrity Assessment

PCT	Condition	Area to be Cleared (ha)	Number BAM Plots Completed	Vegetation Integrity
70	Poor	2.66	3	40.8
72	Poor	0.98	4	25.5
185	Poor	0.49	1	18.5
186	Moderate	0.10	3	73.4
Source: OzArk (2024a) – Modified after Tables 5-3 and 8-1				

Biodiversity Credit Calculations

For the purpose of credit calculations, threatened species are listed as either ecosystem credit species or species credit species, where:

- an ecosystem credit species is a species whose likelihood of occurrence can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection; and
- a species credit species is a species whose likelihood of occurrence cannot be predicted by vegetation surrogates and/or landscape features and can be reliably detected by survey.

Ecosystem Credit Species

A total of 26 ecosystem credit species were either confirmed or assumed to frequent the Quarry Site. A total of 62 ecosystem credits were generated for the Proposal. Complete listings of ecosystem are provided in Table 6-1 of OzArk (2024a).

Species Credit Species

A total of three species credits species were either confirmed or assumed to frequent the Quarry Site. A total of six ecosystem credits were generated for the Proposal. Complete listings of species credit species are provided in Table 6-2 of OzArk (2024a).

Threatened Ecological Communities

No threatened ecological communities (TEC) listed under the *Biodiversity Conservation Act 2016* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were present within the Quarry Site.

5.5.4 Management and Mitigation Measures

The Applicant would implement the following management measures to avoid or mitigate the risk of residual adverse impacts on threatened species within the Quarry Site.

Vegetation Clearing

- Areas of proposed disturbance would be clearly marked prior to the commencement of clearing campaigns to minimise the potential for over clearing of vegetation.
- Vegetation would be removed in a manner that avoids damage to surrounding vegetation.
- The following procedures would be adopted to guide the clearing of all mature trees.
  - Where necessary, a qualified or suitably experienced spotter-catcher would be engaged to undertake an initial assessment of the area to be cleared for threatened species.
  - All trees would be checked for the presence of nesting or roosting fauna before felling or pushing.
  - Clearing activities would cease if threatened bat species are detected until after individuals have dispersed.
  - Felled mature trees would be relocated to rehabilitation areas or mulched to enhance habitat.
- Bush rock, tree trunks and major limbs would be used in rehabilitation of disturbed areas within the Quarry Site.
- All personnel and contractors would be inducted and made aware that unauthorised clearing of native vegetation may have legislative consequences.

Fauna Management

- Fauna that has become displaced from vegetation clearing would be allowed to relocate to surrounding remnant vegetation.
- Vehicular access would be limited to formed and marked roads and tracks with speed limits restricted to 40km/h within the Quarry Site to limit the potential for vehicle trauma to wildlife.

Weed Management

- Machinery would be cleaned of soil and weeds before entry to the Quarry Site.
- Weed control programs would be undertaken periodically to manage invasive species.

Topsoil Management

- Stripped soil would be placed directly onto rehabilitation areas or stockpiled for use in progressive rehabilitation activities to maximise the opportunity for retention of the natural seed stock.

Rehabilitation

- Disturbed areas within the Quarry Site would be revegetated as described in Section 2.14.
- Species used during rehabilitation operations would be consistent with vegetation community types located within and surrounding the Quarry Site or other suitable pasture species, as appropriate.

Management measures that are described elsewhere in this EIS would also mitigate impacts to biodiversity values include the following.

- Erosion and sediment controls would be implemented to limit the potential for sediment-laden runoff to leave the Quarry Site.
- Non-production waste would be managed to limit the presence of feral animals and rubbish inadvertently entering areas of remnant vegetation.
- Operational activities would be limited to approved hours of operation.

5.5.5 Assessment of Impacts

5.5.5.1 Impacts to Native Vegetation

A total of 4.23ha of native vegetation would be removed under Proposal (see **Table 5.16**). The removal of native vegetation would be offset in accordance with the Biodiversity Offset Scheme under the BC Act (see Section 2.15). The area that would require clearing has been minimised as much as feasible through the design process.

5.5.5.2 Indirect Impacts

The principal impacts of the Proposal would be contained within the Quarry Site. Disturbance from operational activities would occur (e.g. noise and dust), however, these impacts would be minimised by implementing the management and mitigation measures identified in Section 5.5.4.

5.5.5.3 Serious and Irreversible Impacts

No species present or assumed present within the Quarry Site require assessment for serious and irreversible impacts (SAII).

5.5.5.4 Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, Matters of National Environmental Significance (MNES) and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE).

A total of eight threatened species and three migratory species were determined to have the potential to be impacted by the Proposal. OzArk (2024a) determined that the Proposal would not have a significant impact on MNES or on the environment in general. A complete listing of species and habitats considered in relation to MNES is provided in Appendix G of OzArk (2024a).

5.5.6 Conclusion

The Proposal would include the removal of 4.23ha of native vegetation comprising 4.13ha of vegetation in poor condition and 0.10ha of vegetation in moderate condition. This vegetation has the potential to provide habitat through foraging areas or breeding habitat. Residual impacts to native vegetation would be offset in accordance with the Biodiversity Offset Scheme (see Section 2.15).

It has been concluded that potential direct (residual) impacts would be suitably offset and potential indirect impacts would be managed through the implementation of measures to avoid or mitigate potential risks. There would be no significant impacts to SAII or MNES as a result of the Proposal.

5.6 Cultural Heritage

5.6.1 Introduction

The SEARs for the Proposal identified Aboriginal heritage as a key issue, requiring that the EIS include an assessment of:

- 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; and
- historic heritage in the vicinity of the development and an assessment of the likelihood and significance of impacts on heritage items, having regard to relevant policies and guidelines.

Additional Aboriginal and historic heritage-related requirements from government agencies for inclusion in the EIS were provided by the then Office of Environment and Heritage (OEH)[5]. **Appendix 2** presents an overview of the SEARs and government agency requirements, and where each has been addressed.

The following subsections describe the setting of the Proposal and provides a summary of the Aboriginal Cultural Heritage and Historic Heritage Assessment Report (ACHAR) prepared by OzArk Environment and Heritage (OzArk, 2024b) (**Appendix 8**), and describes the management and mitigation measures to be implemented by the Applicant.

[5] It is noted that the Aboriginal heritage functions of the OEH are now in Heritage NSW.

5.6.2 Aboriginal Cultural Heritage

5.6.2.1 Ethnohistory

The Quarry Site is located within the southeastern extent of the Wiradjuri tribal and linguistic group, with their territory encompassing an area of the Murray Darling Basin from the highlands or central tablelands in the east, the riverine plains in the west, and the transitional western slopes zone in-between. Within the Wiradjuri region, the presence of Aboriginal people has been dated to approximately 40 000 years ago with a spread east into the mountains thought to have occurred between approximately 14 000 and 12 000 years ago (Hope, 1981 as cited in Haglund (1985)).

At the beginning of the nineteenth century, the Wiradjuri group occupied the area to the south of the Murrumbidgee River and east of the Lachlan River (Kass, 2003). The woodland communities of the region provided habitat for possums (used for meat and fur), reptiles and birds (Kabaila, 1995). The Murrumbidgee River was a source of mussels and fish, including the Murray cod (Heritage Office, 1996). The country between the rivers provided seasonal plants, tubers, nuts, seeds, and daisy yams. Larger game such as kangaroos and emus were hunted, contributing to an overall nutritious and varied diet (Heritage Office, 1996).

Wiradjuri social organisation appears to have been based upon extended kinship networks involving totemic designations and associations. The kinship system governed and controlled marriage and determined ceremonial obligations. Individual identity and clan affiliations were expressed partly through skin cloaks and elaborate carvings on wooden implements (White & Cane, 1986).

Common areas favoured by the local Wiradjuri, such as rivers and plains, also attracted colonial settlers and the frontier of colonial settler expansion swept Wiradjuri country throughout the 1830s and 1840s (Kabaila, 1995). This expansion decimated Aboriginal populations, principally through the spread of diseases along the river systems.

5.6.2.2 Archaeological Context

The Quarry Site is located within Koomaringa Aboriginal Place (AP). Koomaringa AP covers an area of approximately 430ha and comprises two distinct sites, “Site A” and “Site B”, where felsite was quarried by Aboriginal people between approximately 5 000 to 2 000 years ago. The AP also covers “Site C”, which is an amalgam of Koomaringa OS-11, Koomaringa PL-01, and Koomaringa Grind Groove 1 MS. **Figure 5.7** displays the locations of Aboriginal sites within and surrounding the Quarry Site.

The non-perennial drainage lines and lack of a permanent water source in proximity to the Quarry Site indicates that occupation by Aboriginals would have likely been short-term and sporadic, depending partly on rainfall and runoff from the surrounding ridgelines to provide water. The presence of felsite, a raw material with good flaking properties, means that occupation of the Quarry Site would have likely been due to specific visits to source and quarry the felsite. When water was available in the drainage lines it is likely that occupation areas were along the banks of the drainage lines as opposed to the rocky areas where quarrying occurred.

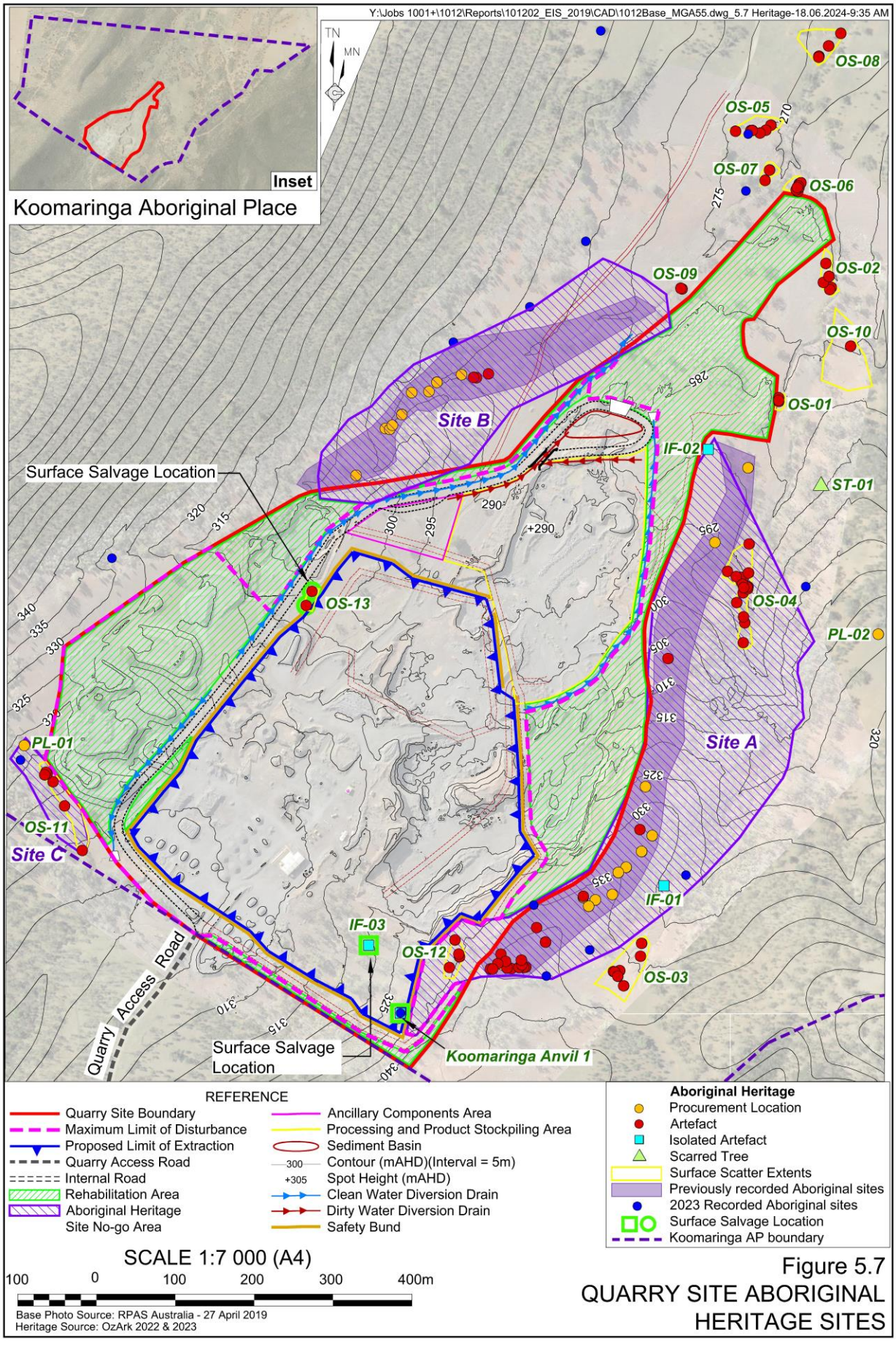


Figure 5.7
QUARRY SITE ABORIGINAL HERITAGE SITES

5.6.2.3 Aboriginal Community Involvement

Aboriginal Community Consultation

Relevant stakeholders from the Aboriginal community were identified using a process consistent with the "*Aboriginal Cultural Heritage Community Consultation Requirements for Proponents*" (DECCW 2010a). Following the completion of Steps 4.1.2 and 4.1.3 of these *Consultation Requirements*, three Aboriginal stakeholders registered as groups or individuals that may hold cultural knowledge relevant to determining the Aboriginal cultural values within the Quarry Site. The three registered Aboriginal stakeholders were:

- Griffith LALC;
- Robert Carroll; and
- Judy Johnson.

The registered Aboriginal parties (RAPs) were provided with information about the Proposal and the proposed Aboriginal cultural heritage assessment process in the form of a proposed methodology. The purpose of the proposed methodology was to explain the Proposal and consultation process in detail, define the roles of the registered Aboriginal parties and the Applicant, identify any protocols for obtaining and using sensitive cultural information and to give the registered Aboriginal parties an opportunity to comment on the proposed assessment method and provide any relevant information on the cultural significance of the Quarry Site.

No feedback was provided by RAPs on the survey methodology.

The draft ACHAR was sent on 7 October 2021 to all RAPs. A 28-day review period was provided closing on 5 November 2021. No comments were received from the RAPs.

It is noted that an additional two RAPs, James Ingram (Bidya Marra) and Mark Saddler (Bundyi Culture) registered in March 2024 following renewed consultation with the Aboriginal consultation.

Aboriginal Community Involvement in the Assessment

The field survey was undertaken by OzArk between 8 and 11 October 2019. The following RAPs or representatives of RAPs participated in the fieldwork.

- Max Harris (Griffith LALC) – participated from 8 to 11 October 2019 as a Site Officer.
- Stephen Collins (Griffith LALC) – participated on 11 October 2019 as a volunteer.

Additional Consultation and Field Work

Following review of the original ACHAR (October 2021), Heritage NSW (HNSW) requested further information on 21 June 2022 in the form of a final Koomaringa AP Management Plan and an updated ACHAR that considered the appropriateness of the proposal within the context of the management plan and values of the AP.

The updated Koomaringa AP Plan of Management (June 2023) and ACHAR (June 2023) were uploaded to the Concurrence and Referral (CNR) portal on 23 June 2023.

On 24 July 2023, HNSW issued a further request for information. This led to renewed consultation and further details about the potential impacts to the AP were added to the ACHAR. Included in this phase of investigation was a site visit on 11 August 2023 by OzArk Principal Archaeologist, Mr Churcher, to map the 1987 site buffer pegs installed by the National Parks and Wildlife Service in 1987 to ensure that the WRQ had not impacted within this buffer.

A revised ACHAR (October 2023) was produced based on the request for information and submitted to HNSW for review. In November 2023, HNSW received a request from a Registered Aboriginal Party (RAP) about the WRQ proposal and HNSW requested that the Applicant undertake additional consultation to ensure that RAPs understood the nature and extent of the proposal within the AP.

This request for further consultation resulted in three site visits to the WRQ:

- 24 November 2023: OzArk archaeologist, Mr Henshaw, and three RAPs (Mark Saddler, James Ingram, and Robert Carroll) met on site to discuss management measures to protect the Koomaringa AP.
- 5 to 7 December 2023: Three RAPs (Mark Saddler, James Ingram, and Robert Carroll) spent three days at site determining where protective fencing should be placed and investigating the Koomaringa AP surrounding the WRQ. Fencing was subsequently installed by the Applicant around Sites A, B and C.
- 20 to 22 December 2023: Three RAPs (Mark Saddler, James Ingram, and Robert Carroll) spent three days at site ensuring the fencing had been correctly installed and further inspecting the Koomaringa AP.

The Revision 2 ACHAR incorporated the results of this further consultation that occurred at the end of 2023.

After the Revision 2 ACHAR was submitted on 5 March 2024, HNSW wrote to the Carrathool Shire Council on 14 March 2023 requesting additional information. The HNSW letter noted that "during the site inspection (undertaken by stakeholders in December 2023) the stakeholders identified and registered a further 14 sites on AHIMS (the Aboriginal Heritage Information Management System): 42-5-0062 to 42-5-0075. These sites have not been described or mapped in the most recent reports received as the AHIMS search pre-date the registration of these sites. The reports must identify, map, describe and assess all recorded Aboriginal sites in regard to potential impacts from the proposal". It is noted that the 14 sites were registered by RAP Mr Saddler at a time when OzArk was not present.

Following receipt of the HNSW request for further information, OzArk Principal Archaeologist, Mr Churcher, wrote to HNSW noting that "as OzArk was not there when the sites were recorded, we can certainly map them, describe them based on site card information, and assess them in the context of other sites in the area (or any information on the site card)". No response was received from HNSW, and it is assumed that using the information on the site cards is sufficient to "describe and assess" the 14 sites recorded by Mr Saddler. It is also noted that the 13 March 2024 HNSW letter made no further requests for information beyond incorporating the sites recorded by Mr Saddler into the ACHAR.

The Revision 3 ACHAR (OzArk, 2024b) incorporates the results of a renewed AHIMS search and the mapping, description, and assessment of the 14 recently registered sites.

5.6.2.4 Desktop Review and Predictive Model

A desktop search was conducted to identify any potential previously recorded heritage values within and immediately surrounding the Quarry Site. The results of this search are summarised in **Table 5.17**.

The predictive model developed for the Quarry Site, based on the environmental context and results of the desktop review, indicated that the site types most likely to be located within the Quarry Site included stone procurement sites, isolated finds, open artefact scatters and scarred trees. OzArk determined that the presence of burial sites would be unlikely.

Table 5.17
Aboriginal Cultural Heritage Database Search Results

Database	Date	Search Area / Type	Comment
Commonwealth Heritage Listings	03/10/2019	Carrathool LGA	No places listed on either the National or Commonwealth Heritage lists are located within the Quarry Site
National Native Title Claims Search	03/10/2019	NSW	No Native Title Claims cover the Quarry Site.
AHIMS	12/09/2019	20km x 20km centred on the Quarry Site	Seven sites within the search area.
AHIMS	09/08/2021	20km x 20km centred on the Quarry Site	26 sites within the search area.
AHIMS	24/05/2023	20km x 20km centred on the Quarry Site	36 sites within the search area.
AHIMS	21/03/2024	20km x 20km centred on the Quarry Site	50 sites within the search area.
Local Environmental Plan (LEP)	03/10/2019	Carrathool LEP of 2012	None of the Aboriginal places noted occur near the Quarry Site.
Source: Modified after OzArk (2024b) – Table 5-3			

5.6.3 Survey and Results

5.6.3.1 Effective Survey Coverage

An archaeological survey of areas within the Quarry Site not subject to active extraction or operational disturbance, including all mature native trees with the potential to contain Aboriginal scarring, was undertaken on foot by OzArk and Mr Max Harris.

Table 5.18 calculates the effective survey coverage within the Quarry Site including a breakdown of the ground surface visibility (GSV) and ground surface exposure (GSE) at any location within particular landform units.

Table 5.18
Effective Survey Coverage within the Quarry Site

Survey Unit	Landform	Survey Unit Area (m^2)	Visibility (%)	Exposure (%)	Effective Coverage Area (m^2)	Effective Coverage (%)
1	Slopes	34 522	20	40	2 762	8
2a	Slopes	54 514	30	40	6 542	12
2b	Ridgeline	20 987	40	50	4 197	20
2c	Drainage line	23 194	40	60	5 567	24
3	Slopes	13 789	20	40	1 103	8
4a	Slopes	21 544	40	50	4 309	20
4b	Flats	73 028	40	40	11 684	16
4c	Drainage lines	40 025	30	70	8 405	21
5a	Slopes	16 268	30	50	2 440	15
5b	Drainage lines	10 977	30	70	2 305	21
6	Slopes	31 363	50	40	6 273	20
Source: OzArk (2024b) – Modified after Table 6-1						

5.6.3.2 Aboriginal Sites

Previously Recorded Aboriginal Heritage Sites

Previously recorded Aboriginal sites were located during the archaeological survey, as follows.

- "Site A" (42-5-0004) – located along the top of a small ridgeline running north to south through the southeastern part of the Koomaringa AP, this site consists of procurement locations, artefacts, a water hole/holder and potential grinding grooves. In total, 31 separate felsite outcrops were recorded at "Site A", with at least 14 outcrops showing evidence of having been used as stone procurement locations.
- "Site B" (42-5-0004) – extends along the northern and southern sides of a drainage line to the northwest of the Quarry Site. This site consists of procurement locations, artefact scatters and water holes/holders.

Aboriginal Heritage Sites Recorded by OzArk

A total of 19 new Aboriginal sites were recorded by OzArk during the archaeological survey noting that 16 of these sites are located beyond the Quarry Site boundary. **Table 5.19** and **Figure 5.7** present the location of the newly recorded Aboriginal cultural heritage sites.

Table 5.19
Newly Recorded Aboriginal Cultural Heritage Sites

Site Name	Feature(s)	Survey Unit / Location	Landform
Koomaringa IF-01	Isolated find	Outside Quarry Site	Drainage line and banks
Koomaringa IF-02	Isolated find	Outside Quarry Site	Slopes
Koomaringa IF-03	Isolated find	6	Drainage line and banks
Koomaringa OS-01	Artefact scatter	Outside Quarry Site	Drainage line and banks
Koomaringa OS-02	Artefact scatter & PAD	Outside Quarry Site	Drainage line and banks
Koomaringa OS-03	Artefact scatter	Outside Quarry Site	Drainage line and banks
Koomaringa OS-04	Artefact scatter	Outside Quarry Site	Drainage line and banks
Koomaringa OS-05	Artefact scatter & PAD	Outside Quarry Site	Drainage line and banks & flats and gentle slope
Koomaringa OS-06	Artefact scatter & PAD	Outside Quarry Site	Drainage line and banks
Koomaringa OS-07	Artefact scatter & PAD	Outside Quarry Site	Drainage line and banks
Koomaringa OS-08	Artefact scatter & PAD	Outside Quarry Site	Drainage line and banks & flats and gentle slope
Koomaringa OS-09	Artefact scatter	Outside Quarry Site	Drainage line and banks
Koomaringa OS-10	Artefact scatter & PAD	Outside Quarry Site	Drainage line and banks & flats and gentle slope
Koomaringa OS-11	Artefact scatter	Outside Quarry Site	Drainage line & slopes
Koomaringa OS-12	Artefact Scatter	1	Slopes
Koomaringa OS-13	Artefact scatter	6	Slopes
Koomaringa PL-01	Procurement location (quarried felsite bedrock)	Outside Quarry Site	Drainage line and banks
Koomaringa PL-02	Procurement location (quarried felsite bedrock)	Outside Quarry Site	Slopes
Koomaringa ST-01	Scarred tree	Outside Quarry Site	Slopes
Source: Modified after OzArk (2024b) – Table 6-3			

Aboriginal Heritage Sites Recorded by Registered Aboriginal Parties

In December 2023, RAPs recorded 14 sites within the Koomaringa AP during a site visit arranged by the Applicant. The 14 sites registered on AHIMS by Mr Saddler were recorded at a time when OzArk was not present. Based on information from the site cards, the location and description of the 2023 site recordings are detailed in **Table 5.20** and **Figure 5.7**.

Table 5.20
RAP Recorded Aboriginal Cultural Heritage Sites

Site ID	Site Name	GDA Zone 55 East	GDA Zone 55 North	Site Description
42-5-0062	Koomaringa Grind Groove 1 MS	414725	6260185	Single grinding groove
42-5-0063	Koomaringa Hearth 1	415274	6260715	Burnt clay nodules
42-5-0064	Koomaringa Anvil 1	415207	6259864	Single anvil
42-5-0065	Koomaringa Hammer Stone 1	415447	6259944	Broken hammer stone with pitting
42-5-0066	Koomaringa Scar 1	415569	6260039	Single scar in box tree
42-5-0067	Koomaringa PAD 2 MS	415648	6260979	PAD with visible artefacts
42-5-0068	Koomaringa PAD 1 MS	415645	6260907	PAD with visible artefacts
42-5-0069	Koomaringa Large White Core 1	415721	6260405	Core, potential manuport
42-5-0070	Koomaringa Anvil 22.12.23	414841	6260441	Single anvil
42-5-0071	Koomaringa Scar Tree 21.12.23	415461	6261110	Single scar in box tree
42-5-0072	Koomaringa PAD Site 21.12.23	415442	6260843	PAD with over 200 artefacts
42-5-0073	Koomaringa Large Core Stone 1	415371	6260760	Large core
42-5-0074	Koomaringa Axe Blank 1	415392	6259911	Axe blank
42-5-0075	Koomaringa Stock Plie 1	415376	6260001	Rock tool mound
Source: OzArk (2024b) – Table 6-4				

Following the site inspection by Mr Saddler "Site C", an amalgam of Koomaringa PL-01 (42-5-0023), Koomaringa OS-11 (42-5-0020), and 42-5-0062 (Koomaringa Grind Groove 1 MS) was identified and fenced.

5.6.3.3 Historic Heritage Sites

No historic heritage sites, archaeologically sensitive areas, or potential historical archaeological deposits were identified during the archaeological survey.

5.6.4 Management and Mitigation Measures

The Applicant would implement the following management and mitigation measures within the Quarry Site in order to avoid or mitigate the potential for impacts on heritage-related values.

- Fencing would be maintained to preserve buffers to Sites A, B and C.
- The three Aboriginal Sites (Koomaringa IF-03, OS-13 and Koomaringa Anvil 1) located within the proposed disturbance footprint would be recorded and salvaged. The salvaged artefacts would be relocated at an agreed upon location decided with input from the RAPs. The artefacts would be relocated as close as possible to their original locations, likely inside the site extent of "Site A" for Koomaringa IF-01 and Koomaringa Anvil 1 and "Site B" for Koomaringa OS-13.

- Koomaringa OS-12 would be conserved *in situ* within a "no-go zone" which would be maintained with star pickets and high visibility fencing to prevent inadvertent access.
- Appropriate signage nominating "environmental areas" or "no-go zones" would be installed facing towards Quarry operational areas adjacent to identified Aboriginal sites.
- All Quarry staff and personnel involved in activities with the potential to result in disturbance would be made aware of the legislation protecting sites and places of heritage significance and the associated penalties for disturbance of these sites. Work crews would also undergo cultural heritage induction to ensure they recognise Aboriginal artefacts that may be found within the Quarry Site.
- The following would be implemented in the event that unexpected finds are discovered during works.
  - All work would cease in the immediate vicinity of the find.
  - A 10m buffer (50m buffer for human skeletal remains) would be taped off with high visibility tape or fencing noting that works would proceed outside of the buffer area.
  - Heritage NSW would be contacted immediately (and the NSW Police for human skeletal remains).

5.6.5 Significance Assessment of Sites Recorded by OzArk

All Aboriginal objects located in NSW are afforded protection under the *National Parks and Wildlife Act 1974*, but decisions about appropriate management of individual artefacts or sites are usually based on their assessed significance as well as the likely impact in the context of the proposed development. *The Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) and *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) requires that a significance assessment be undertaken in accordance with the processes set out in the *Burra Charter* (Australia ICOMOS 1988, 1999). Cultural, scientific, aesthetic, and historical significance are identified as baseline elements of significance assessment, and it is through the combination of these elements that the overall cultural heritage values of a site, place or area are resolved.

Social or Cultural Value

The assessment of cultural or social value relates to 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.

Based on comments from Site Officers in the field and because the sites are located inside Koomaringa AP, high social and cultural value has been assigned to all Aboriginal sites recorded during the assessment.

Archaeological or Scientific Value

Assessing the archaeological or scientific value of a site 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, content and representativeness.

The scientific significance of Koomaringa IF-01, IF-02, IF-03, OS-09, OS-10, OS-13 is assessed as low. These sites have low scientific values because they have little or no research potential and a very limited ability to inform researchers about the nature and extent of Aboriginal occupation in the area. All sites are highly representative of other sites in the region.

The scientific significance of Koomaringa OS-01, OS-03, OS-06, OS-11 and OS-12 is assessed as low–moderate. These sites have low–moderate scientific values as they have little research potential and a limited ability to inform researchers about the nature and extent of Aboriginal occupation in the area. The sites are lower density surface artefact scatters with no or little likelihood of potential archaeologic deposits (PADs) and have limited variation in artefact types.

Koomaringa PL-01, PL-02 and ST-01 are assessed as having moderate scientific/archaeological values. Koomaringa PL-01 and PL-02 are assessed as moderate scientific values as there are no PADs associated with the sites and a limited density of artefacts. Both sites have been affected by water wash. However, the sites are procurement locations and show evidence of Aboriginal quarrying on a smaller scale than at “Site A” and “Site B”. Koomaringa ST-01 has been assessed as having moderate scientific values due to its rarity in the region of the Quarry Site. However, Koomaringa ST-01 does not have any associated PADs or additional features such as associated artefact scatters and therefore has limited research potential.

Koomaringa OS-02, OS-04, OS-05, OS-07, and OS-08 are assessed as having moderate–high scientific significance. This level of scientific/archaeological significance is based on the sites having higher density of artefacts present, a greater variety of artefact types, and the potential for associated PADs.

Aesthetic Value

Aesthetic value 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).

Koomaringa IF-01, IF-02, IF-03, OS-01, OS-06, OS-09, OS-11, OS-12, OS-13, and PL-01 are assessed as having low aesthetic values. None of these Aboriginal sites have significant aesthetic value as the integrity of the sensory landscape has been altered in the recent past.

Koomaringa OS-02, OS-03, OS-04, OS-05, OS-07, OS-08, OS-10, ST-01, PL-02 are assessed as having moderate aesthetic values due to these sites being situated further away from operations. The landscape at these sites has also undergone minimal or no modification.

Historic Value

Historic value refers to the associations of a place with a historically important person, event, phase, or activity in an Aboriginal community.

None of the Aboriginal sites recorded have an apparent direct relationship to known historical Aboriginal sites (such as missions or massacre sites). To that end, all recorded sites are assessed as having no historic value.

Summary of Significance Assessment of Sites Recorded by OzArk

Table 5.21 provides significance ratings for the newly recorded Aboriginal sites identified during the archaeological survey.

Table 5.21
Significance Ratings of Sites Recorded by OzArk

Site Name	Cultural Value	Scientific Value	Aesthetic Value	Historic Value
Koomaringa IF-01	High	Low	Low	Low
Koomaringa IF-02	High	Low	Low	Low
Koomaringa IF-03	High	Low	Low	Low
Koomaringa OS-01	High	Low–moderate	Low	Low
Koomaringa OS-02	High	Moderate–high	Moderate	Low
Koomaringa OS-03	High	Low–moderate	Moderate	Low
Koomaringa OS-04	High	Moderate–high	Moderate	Low
Koomaringa OS-05	High	Moderate–high	Moderate	Low
Koomaringa OS-06	High	Low–moderate	Low	Low
Koomaringa OS-07	High	Moderate–high	Moderate	Low
Koomaringa OS-08	High	Moderate–high	Moderate	Low
Koomaringa OS-09	High	Low	Low	Low
Koomaringa OS-10	High	Low	Moderate	Low
Koomaringa OS-11	High	Low–moderate	Low	Low
Koomaringa OS-12	High	Low–moderate	Low	Low
Koomaringa OS-13	High	Low	Low	Low
Koomaringa PL-01	High	Moderate	Low	Low
Koomaringa PL-02	High	Moderate	Moderate	Low
Koomaringa ST-01	High	Moderate	Moderate	Low
Source: OzArk (2024b) – Table 8-1				

5.6.6 Significance Assessment of Sites Recorded by Registered Aboriginal Parties

During the site inspection undertaken by RAPs in December 2023, a further 14 sites were identified on AHIMS: 42-5-0062 to 42-5-0075. The 14 sites were registered by RAP Mr Saddler at a time when OzArk were not present. As such, the assessment of their significance is based on the context of other sites in the area and any information on the site card. **Table 5.22** provides significance ratings for the Aboriginal sites identified by RAPs in December 2023.

Table 5.22
Significance Ratings of Sites Recorded by RAPs

AHIMS ID	Site Name	Cultural Value	Scientific Value	Aesthetic Value	Historic Value
42-5-0062	Koomaringa Grind Groove 1 MS	High	Contributory	Moderate	Low
42-5-0063	Koomaringa Hearth 1	High	Contributory	Moderate	Low
42-5-0064	Koomaringa Anvil 1	High	Contributory	Moderate	Low
42-5-0065	Koomaringa Hammer Stone 1	High	Contributory	Moderate	Low
42-5-0066	Koomaringa Scar 1	High	Contributory	Moderate	Low
42-5-0067	Koomaringa PAD 2 MS	High	Contributory	Moderate	Low
42-5-0068	Koomaringa PAD 1 MS	High	Contributory	Moderate	Low
42-5-0069	Koomaringa Large White Core 1	High	Contributory	Moderate	Low
42-5-0070	Koomaringa Anvil 22.12.23	High	Contributory	Moderate	Low
42-5-0071	Koomaringa Scar Tree 21.12.23	High	Contributory	Moderate	Low
42-5-0072	Koomaringa PAD Site 21.12.23	High	Contributory	Moderate	Low
42-5-0073	Koomaringa Large Core Stone 1	High	Contributory	Moderate	Low
42-5-0074	Koomaringa Axe Blank 1	High	Contributory	Moderate	Low
42-5-0075	Koomaringa Stock Plie 1	High	Contributory	Moderate	Low
Source: OzArk (2024b) – Table 8-2					

5.6.7 Assessment of Impacts

Table 5.23 presents a summary of impacts to the sites identified within the area of the archaeological survey, including all newly recorded and previously recorded sites. The Proposal would result in a total loss of value for three known sites (Koomaringa IF-03, OS-13 and Koomaringa Anvil 1). The remaining recorded sites would not be impacted by the Proposal.

Table 5.23
Impacts on Recorded Sites

Page 1 of 2

Site Name	Type of Harm	Degree of Harm	Consequence of Harm
Koomaringa IF-01	None	None	No loss of value
Koomaringa IF-02	None	None	No loss of value
Koomaringa IF-03	Direct	Total	Total
Koomaringa OS-01	None	None	No loss of value
Koomaringa OS-02	None	None	No loss of value
Koomaringa OS-03	None	None	No loss of value

Table 5.23 (Cont'd)
Impacts on Recorded Sites

Site Name	Type of Harm	Degree of Harm	Consequence of Harm
Koomaringa OS-04	None	None	No loss of value
Koomaringa OS-05	None	None	No loss of value
Koomaringa OS-06	None	None	No loss of value
Koomaringa OS-07	None	None	No loss of value
Koomaringa OS-08	None	None	No loss of value
Koomaringa OS-09	None	None	No loss of value
Koomaringa OS-10	None	None	No loss of value
Koomaringa OS-11	None	None	No loss of value
Koomaringa OS-12	None	None	No loss of value
Koomaringa OS-13	Direct	Total	Total
Koomaringa PL-01	None	None	No loss of value
Koomaringa PL-02	None	None	No loss of value
Koomaringa ST-01	None	None	No loss of value
Site A	None	None	No loss of value
Site B	None	None	No loss of value
Koomaringa Grind Groove 1 MS	None	None	No loss of value
Koomaringa Hearth 1	None	None	No loss of value
Koomaringa Anvil 1	Direct	Total	Total
Koomaringa Hammer Stone 1	None	None	No loss of value
Koomaringa Scar 1	None	None	No loss of value
Koomaringa PAD 2 MS	None	None	No loss of value
Koomaringa PAD 1 MS	None	None	No loss of value
Koomaringa Large White Core 1	None	None	No loss of value
Koomaringa Anvil 22.12.23	None	None	No loss of value
Koomaringa Scar Tree 21.12.23	None	None	No loss of value
Koomaringa PAD Site 21.12.23	None	None	No loss of value
Koomaringa Large Core Stone 1	None	None	No loss of value
Koomaringa Axe Blank 1	None	None	No loss of value
Koomaringa Stock Plie 1	None	None	No loss of value
Source: OzArk (2024b) – Table 8-4			

5.6.8 Conclusion

While the Proposal would result in removal and salvage of three sites, these sites are not considered to be archaeologically, aesthetically or historically significant and are relatively common in the vicinity of the Quarry Site. The Applicant acknowledges the significance of these sites to the Aboriginal community and would implement the management recommendations outlined in OzArk (2024b) to protect identified sites in the landscape and to appropriately manage unknown sites that may be identified.

The heritage values associated with the Quarry Site are derived from practices which are unlikely to have physical remains, such as grazing. No historic remnants of activities associated with grazing or agricultural practices were recorded during the survey, except for some trees which had been ring barked.

5.7 Soil and Land Resources

5.7.1 Introduction

The SEARs for the Proposal identified Land Resources as a key issue requiring that the EIS include an assessment of:

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

The following subsections present a summary of the land resources for the Quarry Site, identifying specific constraints and opportunities that might affect the proposed design, establishment, operation and post-operative rehabilitation of the Proposal.

5.7.2 Site Soils

Australian Soil Classification

The Quarry Site contains Rudosols and Tenosols as defined by the Australian Soil Classification (ASC). Rudosols and Tenosols have negligible to weak pedologic organisation and typically comprise young soils that have had little time to modify parent rocks or sediments. These soils generally have low fertility and low water-holding capacity. The soils within the Quarry Site are further subclassified as Lithosols which typically comprise unconsolidated mineral materials which are dominated by rock or mineral fragments.

Land and Soil Capability

The Quarry Site is located in an area with an estimated Land and Soil Capability (LSC) of Class 8. LSC Class 8 land is considered to have extreme limitations and is incapable of sustaining agricultural production. **Figure 5.8** displays the land and soil capability within and immediately surrounding the Quarry Site.

5.7.3 Management and Mitigation Measures

The Applicant's approach to vegetation clearing, soil stripping and stockpiling procedures have been discussed in Section 2.4.5. A summary of these and other soil management procedures and safeguards which would be implemented are provided as follows.

- Clearly mark areas for stripping and stockpiling.
- Refrain from stripping or placing soil during wet conditions.
- Strip soil from all areas of disturbance and place within designated rehabilitation areas or store in stockpiles no more than 2m high oriented parallel to the contours.
- Ensure that soil stockpiles are constructed with side slopes of 1:3 (V:H) or less.
- Ensure that the soil stockpile surfaces have a surface that is as 'rough' as possible, in a micro-scale, to assist in surface water runoff control and seed retention and germination.
- Spread seed of a suitable cover crop on all soil stockpiles to facilitate revegetation.
- Signpost soil stockpiles and limit operation of machinery on stockpiles to minimise compaction and further degradation of soil structure.

5.7.4 Impact Assessment

Soils Resources and Land Capability

Adherence to the recommended soil stripping, handling, stockpiling procedures and other management practices, together with appropriate rehabilitation practices, would result in minimal impacts to soils and land and soil capability within the Quarry Site.

The Proposal would not significantly impact upon the agricultural potential of the land within the Quarry Site due to the prevalence of soils with severe limitations. It is noted that all disturbance would occur within areas with an LSC Class of 8. As described in Section 2.14, much of the land within the Quarry Site would be returned to grazing following the life of the Proposal.

Salinity

Due to the elevation of the Quarry Site and surrounding area, it is considered that the Proposal would not contribute to any salinity in the area, nor impact access and quality of groundwater from existing bores.

Erosion and Sediment Control

Section 5.4 describes the erosion and sediment control measures that would be implemented to manage sediment-laden water within the Quarry Site. It is considered that, with the implementation of these measures, the risk of erosion and off-site sedimentation would be minimal.

Land Uses

As described in Section 4.3.2, the land surrounding the Quarry Site is principally used for forestry. It is considered that the Proposal would not alter the productive use of this land. This is supported by the historical operation of the existing quarry operation.

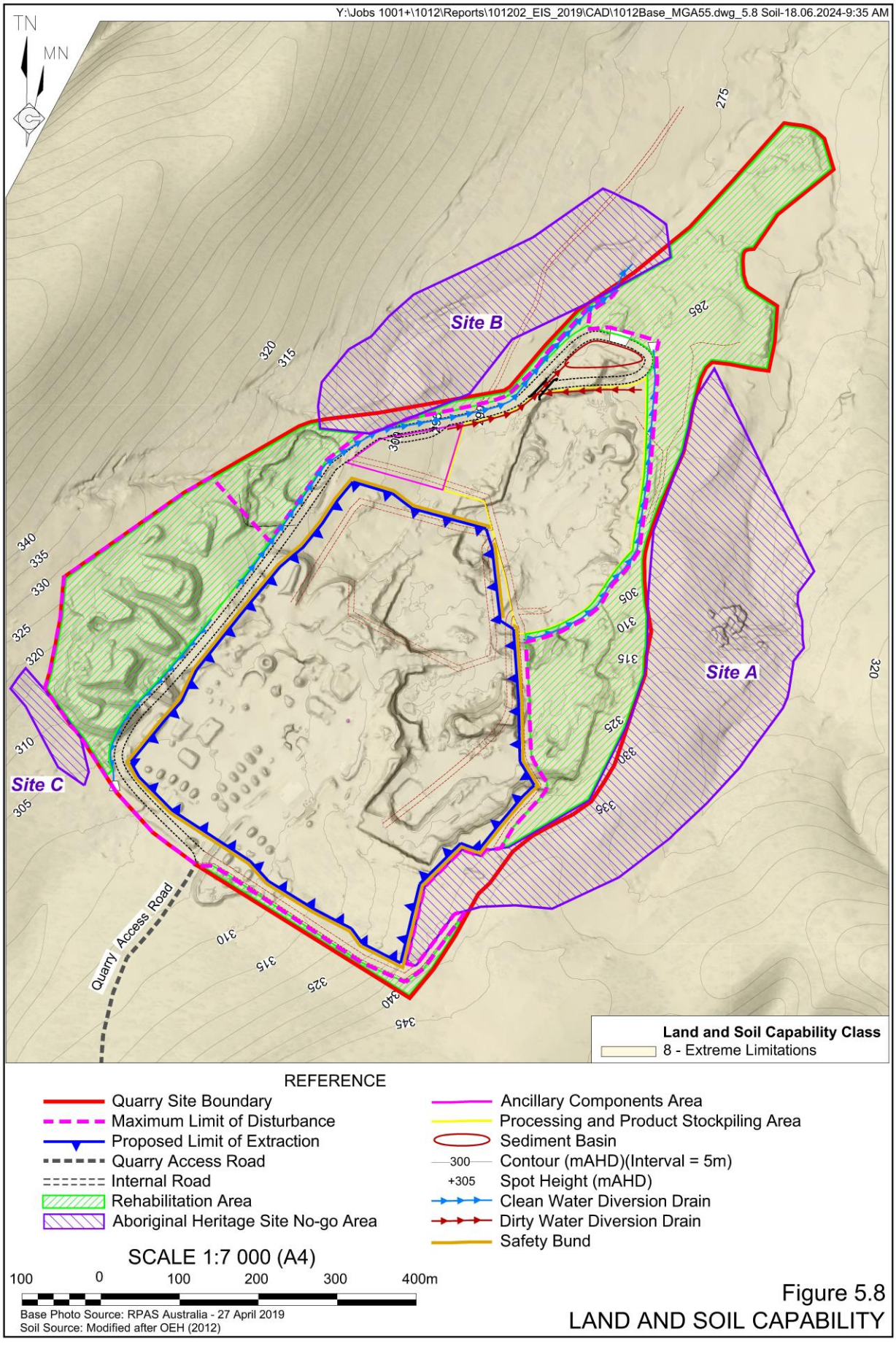


Figure 5.8
LAND AND SOIL CAPABILITY

5.8 Visibility

5.8.1 Introduction

The SEARs for the Proposal require the EIS to include an assessment of potential impacts to visual amenity, 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.

The following subsection describes the visual environment and considers the visibility of the proposed activities throughout the life of the Proposal.

5.8.2 The Existing Visual Landscape

The existing visual landscape surrounding the Quarry Site varies with the following features of the local setting.

- The Quarry Site is located in a valley between two southwest / northeast trending ridges and is surrounded by remnant vegetation and/or cypress pine plantations within the Lachlan Range State Forest. Vegetation is generally well established although it is sparser to the north of the Quarry Site where land has been cleared for grazing.
- Infrastructure in the form of powerlines, local roads and the Mid Western Highway are features of the local visual setting. Opportunities to view existing operations from local roads and the Mid Western Highway are unavailable due to intervening topography and vegetation.
- There is no visibility of the Quarry Site from surrounding privately-owned residences.

5.8.3 Management and Mitigation Measures

The Proposal has been designed to minimise potential impacts to visual amenity with any residual visual impacts to be mitigated through the implementation of a range of operational practices, throughout the life of the Proposal. The following measures would form part of the Proposal.

- Remnant vegetation located within the northern part of the Quarry Site would not be disturbed.
- The perimeter safety bund around the extraction area and terminal benches would be progressively rehabilitated throughout the life of the Proposal to assist in providing a long-term acceptable landform in addition to obtaining the ecological benefits of retaining a range of native species.

5.8.4 Changes to Visual Amenity

The Proposal would result in the creation of an approximately 18.1ha sized void in the landscape. This modification to the landform would, however, would be screened from surrounding land by intervening topography and remnant and planted vegetation. The proposed rehabilitation of the

Quarry Site has also been developed with an objective to minimise the visual intrusiveness of the operations and progressively generate a final landform which, to the greatest extent practicable, is in sympathy to the surrounding landforms and landscape.

5.8.5 Assessment of Impacts

There would be no visibility of the Quarry Site from surrounding residences with the closest residence located approximately 2.2km from the Quarry Site.

The visibility of the Quarry Site from local roads and the Mid Western Highway are limited by intervening topography and remnant and planted vegetation. It is considered that the proposed mitigation measures would effectively screen the Quarry Site from local vantage points for the life of the Proposal resulting in minimal impacts to visual amenity.

5.9 Public Safety Hazards

5.9.1 Introduction

The SEARs for the Proposal require the EIS to include an assessment of potential 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.

The following subsections identify potential hazards associated with the Proposal and the management and mitigation measures that would be implemented to reduce any potential impacts.

5.9.2 Bush Fire Hazards

5.9.2.1 Introduction

The Rural Fire Service (RFS) mapping tool, accessed on 12 February 2021, identifies the Quarry Site as being within a designated bush fire prone area. Section 4.14 of the EP&A Act details the requirement for developments located within bush fire prone land to conform to the specifications and requirements of the document entitled "*Planning for Bush Fire Protection*" (RFS, 2019). The procedure detailed in that document has been adopted to identify the potential hazards for the Proposal.

The bush fire assessment was prepared by R.W. Corkery & Co. Pty Limited based, in part, on information on local vegetation provided in OzArk (2024a). Vegetation communities identified within the Quarry Site are described further in Section 5.5.

5.9.2.2 Bush Fire Management Objectives

The objectives of RFS (2019) are to:

- afford occupants of any building adequate 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 residents is available;
- provide for ongoing management and maintenance of bush fire protection measures; and
- ensure that utility services are adequate to meet the needs of fire fighters.

The above objectives have been considered in relation to the areas which would be most likely to be populated during operations. That is, within the ancillary components area.

5.9.2.3 Assessment of Bush Fire Hazard

5.9.2.3.1 Introduction

The following sections use the RFS (2019) procedure to determine the Category of Bush Fire Attack (or bush fire hazard) for the ancillary components area. This area would incorporate the Quarry office, amenities, light vehicle parking, weighbridge and workshop and has been identified as the primary Quarry component at risk of Bush Fire Attack. It is noted that the ancillary components area would be relocated prior to Stage 3 to the north of the extraction area.

5.9.2.3.2 Fire Weather

The Carrathool LGA occurs within the Northern Riverina Fire Area and is designated a Fire Danger Index of 80.

5.9.2.3.3 Vegetation Formation

Vegetation mapping undertaken for the Proposal identifies vegetation within 140m of the ancillary components area as “woodland”.

5.9.2.3.4 Effective Slope

The maximum effective slopes within 100m of the ancillary components range between 0° and 3°.

5.9.2.3.5 Hazard Assessment

It is possible to calculate the bush fire hazard (referred to as the Bush Fire Attack Level in RFS, 2019) from a combination of the Fire Danger Index, vegetation formation, effective slope and the proximity of activities to the bush fire hazard. **Table 5.24** summarises the Bush Fire Attack characteristics calculated for the ancillary components area as well as the recommended minimum Asset Protection Zone (APZ) to be maintained between built structures and vegetation.

Table 5.24
Bush Fire Attack Levels

Fire Danger Index	Vegetation Formation	Maximum Effective Slope	Separation Distance (m)	Bush Fire Attack Level	Minimum APZ (m)
80	Woodland	3	25m	BAL-29	25m
Based on RFS (2019)					

The following descriptions of the predicted bush fire attack and levels of exposure are provided for the Category of Bush Fire Attack (or bush fire hazard) in AS2959.2009.

- BAL-Low: There is insufficient risk to warrant specific construction requirements.
- BAL-12.5: Ember attack.
- BAL-19: Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux (not greater than 19kW/m²).
- BAL-29: Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux (not greater than 29kW/m²).
- BAL-40: Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of exposure to flames.
- BAL-FZ: Direct exposure to flames from fire front in addition to heat flux and ember attack.

Based on the information provided in **Table 5.24**, and in accordance with Table A1.12.3 of Appendix 2 of RFS (2019), a minimum APZ of approximately 25m should be maintained between any structures within the ancillary components area and surrounding vegetation.

5.9.2.4 Management and Mitigation Measures

It is recognised that some areas of the Quarry Site will remain vegetated and, therefore, it would be possible for bush fire to spread both within the Quarry Site and adjacent to the Quarry Site if management measures are not adopted to mitigate this hazard.

In terms of potential impacts, the assets considered at risk include employees and the local community. In order to protect these assets, a proposed bush fire management plan would be documented in an *Environmental Management Strategy* that would be prepared in consultation with the local RFS. The bush fire management section of the *Environmental Management Strategy* would include the following.

- A review of bush fire hazards and identification.
- A summary of controls and management measures including fire response equipment and locations.
- Emergency contact details.
- Training requirements.

Various activities that may increase the risk of fire on the Quarry Site and transport route, and the controls proposed to limit the risk posed by these are presented in **Table 5.25**.

Table 5.25
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 Quarry Site. • Engines in all vehicles to be turned off during refuelling. • No smoking policy to be enforced in designated areas of the Quarry Site. • Fire extinguishers maintained within all site vehicles and mobile equipment.
General Activities	Cigarettes, Rubbish, e.g. glass, metal.	• No smoking policy to be enforced in designated areas of the Quarry Site. • No throwing cigarette butts from product trucks along the product delivery route. • Focus on housekeeping to be maintained by the Applicant. • 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.

- All employees would be trained in the proper use of the firefighting equipment on site.
- A water cart would be made available for firefighting purposes in the event of a bush fire.
- A protocol would be developed for restricting work in vegetated areas during high fire danger periods of the bush fire season (in accordance with the hazard category notifications).
- Procedures for hot works would be developed to prevent ignition sources for a bush fire.
- The local RFS would be consulted prior to each bush fire season to discuss the planned controls during the following season, status of access tracks, and equipment availability.
- Firebreaks would be developed and maintained as required and in consultation with the local RFS.
- The local Rural Fire Service would be consulted regarding any controlled burns planned for asset protection and / or ecological management.
- Emergency and Evacuation Management Procedures would be developed that would include procedures in the event of a local bush fire.

5.9.2.5 Assessment of Impacts

With the implementation of the proposed safeguards and controls, it is considered that the bush fire hazard associated with the Proposal would be acceptable and the Proposal would not significantly contribute to raising the risk of bush fires impacting the community, property or environmental assets.

5.9.3 Handling Storage and Disposal of Hydrocarbons Bush Fire Hazards

The specific hazard-related impacts that may result as a consequence of the Proposal relate primarily to the handling, storage and disposal of hydrocarbons. In order to minimise the potential for hydrocarbon contamination, the following controls and safeguards would be implemented.

- Hydrocarbons and hazardous materials would only be purchased from licensed suppliers for the transport of dangerous goods in accordance with *Dangerous Goods (Road and Rail Transport) Act 2008 No 95.*
- Diesel would be stored in a bunded above-ground tank in accordance with *AS 1940 – 2017 The Storage and Handling of Flammable and Combustible Liquids*, or an updated or replacement standard.
- Hydrocarbon waste would be removed from site and disposed of by a licenced waste contractor at a licenced waste facility.
- Hydrocarbon spill kits would be appropriately located within the workshop and Quarry office to ensure spill response and clean up can be carried out immediately following the detection of any spills.
- In the event of a hydrocarbon leak or spill, the Applicant would implement the following spill management procedure.
  - 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 facility licensed to accept and treat hydrocarbon contaminated material.
- Spills or leaks of other pollutants would be handled in accordance with the relevant Safety Data Sheet.

It is anticipated that with the proposed hydrocarbon management practices and the controls and safeguards, potential hazards as a result of hydrocarbon and hazardous materials to be used on the Quarry Site would be minimised.

5.10 Social and Economic

5.10.1 Introduction

The SEARs for the Proposal require the EIS to include an assessment of social and economic impacts, including 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.

This subsection describes the existing social and economic setting of the Quarry with focus on population, employment, and employment by industry statistics. Local amenity, regional history and tourism in the Carrathool Local Government Area (LGA) is also discussed. The potential social and economic costs and benefits associated with the Proposal and the mitigation and management measures that would be implemented by the Applicant along with any residual social and economic impacts are described.

5.10.2 The Existing Social and Economic Setting

The Quarry Site is located within the Carrathool LGA approximately 17km northwest of Rankins Springs on land owned by Kalrag Pty Ltd and is leased to the Applicant under a lease agreement which expires on 30 June 2060 (including 2 x 15-year options). The area surrounding the Quarry Site is separately populated and best described as rural with land uses principally comprising forestry, grazing and dryland cropping. **Figure 4.4** displays the locations of residences surrounding the Quarry Site. It is noted that there are only three residences are located with a 5km radius of the Quarry Site.

Communities surrounding the Quarry Site include the following.

- Adjoining Landowners – includes the owners of properties that adjoin the land owned by the Applicant.
- The Local Community – includes nearby landowners and residents who are considered to have an interest in the Proposal due to their proximity to the Quarry Site.
- The Carrathool LGA Community – both residents and businesses within the Carrathool LGA who are considered to have an interest in the ongoing economic development and amenity of the LGA.

The following subsections provide a brief overview of the social and economic setting in the Rankins Springs State Suburb (SSC) and Carrathool LGA based on information provided in Australian Bureau of Statistics (ABS) 2016 Census data. These data are compared against ABS data for NSW. General information on the Carrathool LGA has been sourced from the Carrathool Shire Council website.

5.10.2.1 Population

Table 5.26 presents the population statistics for the Rankins Springs SSC, Carrathool LGA and NSW collected from the 2016 Census data available from the ABS (2016). The Rankins Springs Carrathool LGA population exhibits a trend common in many regional towns, which is a lower proportion of the total population of young adult age and a higher proportion within the adult and retirement age groups. This is a common trend seen in many regional towns and is commonly considered to be the result of young adults leaving regional areas in search of further education or employment opportunities. A significant proportion of the Rankins Springs SSC population is aged under 14 years old with another notable peak within the 45-54-year-old age bracket. This likely indicates that a high number of young families reside within the area.

Table 5.26
Population Statistics (Rankins Springs SSC, Carrathool LGA and NSW)

	Rankins Springs SSC		Carrathool LGA		New South Wales	
Ages	**No.**	**%**	**No.**	**%**	**No.**	**%**
0-4 years	11	7.1	186	6.8	465 135	6.2
5-14 years	28	17.9	351	12.9	921 193	12.3
15-19 years	4	2.6	156	5.7	448 425	6.0
20-24 years	12	7.7	155	5.7	489 673	6.5
25-34 years	11	7.1	362	13.3	1 067 791	14.3
35-44 years	19	12.2	328	12.1	1 002 893	13.4
45-54 years	37	23.7	397	14.6	977 986	13.1
55-64 years	19	12.2	382	14.0	889 770	11.9
65-74 years	21	13.5	204	7.5	677 026	9.1
75-84 years	12	7.7	135	5.0	373 114	5.0
85 years +	3	1.9	60	2.2	167 506	2.2
Total	**156**	**100**	2 719	6.8	**7 480 512**	**100**
Median Age	45		40		40	

Source: Australian Bureau of Statistics – 2016 Census
Please note that the ABS makes small random adjustments to all cell values to protect the confidentiality of data. These adjustments may cause the sum of rows or columns to differ by small amounts from table totals.

5.10.2.2 Employment

Table 5.27 displays employment statistics for Rankins Springs SSC, Carrathool LGA and NSW collected from the ABS 2016 Census. The data indicate that as at 2016, both Rankins Springs SSC and Carrathool LGA had labour force participation rates significantly higher than the State average for NSW. The relatively higher proportion of the population engaged in the labour force within Rankins Springs SSC and Carrathool LGA may reflect the significant portion of the population employed on family farms (see **Table 5.28**) and discrepancies due to sample size.

Table 5.27
Employment Statistics (Rankins Springs SSC, Carrathool LGA and NSW)

	Rankins Springs SSC		Carrathool LGA		NSW	
	No.	**%[1]**	**No.**	**%[1]**	**No.**	**%[1]**
Employed						
Full-time[2]	61	63.5	882	61.7	2 134 521	59.2
Part-time	29	30.2	386	27.0	1 071 151	29.7
Employed, away from work[3]	3	3.1	59	4.1	174 654	3.0
Employed, hours not stated	3	3.1	57	4.0	67 003	1.8
Total	**91**		**1 384**		**3 380 332**	
Unemployed, looking for work						
Full-time work	3	3.1	29	2.0	123 987	3.4
Part-time work	0	0	16	1.1	101 567	2.8
Total	**3**		**46**		**225 546**	
Labour Force Participation						
Total labour force	96		1 430		3 605 881	
Not in labour force	36		570		2 088 240	
Labour force status not stated	8		190		399 773	
Total Persons	137		2 185		6 093 895	
Labour force participation	**70.1%**		**65.4%**		**59.2%**	

Note 1: Indicates percentage of total labour force

Note 2: Employed, worked full-time is defined as having worked 35 hours or more in all jobs during the week prior to Census Night.

Note 3: Comprises employed persons who did not work any hours in the week prior to Census Night.

Source: Australian Bureau of Statistics – 2016 Census
Please note that the ABS makes small random adjustments to all cell values to protect the confidentiality of data. These adjustments may cause the sum of rows or columns to differ by small amounts from table totals.

5.10.2.3 Industry of Employment

Table 5.28 displays the contribution of various industries to employment within the Rankins Springs SSC, Carrathool LGA and NSW. Within both Rankins Springs SSC and Carrathool LGA, the Agriculture, Forestry and Fishing industry contributes most to employment accounting for approximately 56.0% and 46.5% of total employment, respectively. The mining industry (including extractive industries) is a relatively minor contributor to employment within the Rankins Springs SSC and Carrathool LGA accounting for approximately 3.3% and 0.6% of total employment, respectively.

Table 5.28
Industry Employment Statistics (Rankins Springs SSC, Carrathool LGA and NSW)

	Rankins Springs SSC		Carrathool LGA		NSW	
Industry	**No.**	**%**	**No.**	**%**	**No.**	**%**
Agriculture, Forestry and Fishing	51	56.0	644	46.5	72 625	2.1
Mining	3	3.3	8	0.6	31 736	0.9
Manufacturing	4	4.4	46	3.3	197 331	5.8
Electricity, Gas, Water and Waste	4	4.4	6	0.4	31 881	0.9
Construction	0	0.0	50	3.6	282 491	8.4
Wholesale Trade	0	0.0	23	1.7	103 722	3.1
Retail Trade	4	4.4	61	4.4	326 396	9.7
Accommodation and Food	7	7.7	77	5.6	239 222	7.1
Transport, Postal and Warehousing	3	3.3	50	3.6	158 760	4.7
Information Media and Telecommunications	0	0.0	6	0.4	73 398	2.2
Financial and Insurance	0	0.0	15	1.1	167 259	4.9
Rental, Hiring and Real Estate	0	0.0	3	0.2	59 652	1.8
Professional, Scientific and Technical	3	3.3	17	1.2	274 078	8.1
Administrative and Support	0	0.0	44	3.2	117 482	3.5
Public Administration and Safety	3	3.3	74	5.3	204 173	6.0
Education and Training	3	3.3	78	5.6	282 568	8.4
Health Care and Social Assistance	3	3.3	87	6.3	422 195	12.5
Arts and Recreation	0	0.0	8	0.6	51 775	1.5
Other Services	0	0.0	24	1.7	124 477	3.7
Inadequately described/Not stated	3	3.3	63	4.6	159 108	4.7
Total	**91**		**1 384**		**3 380 332**	

Source: Australian Bureau of Statistics – 2016 Census
Please note that the ABS makes small random adjustments to all cell values to protect the confidentiality of data. These adjustments may cause the sum of rows or columns to differ by small amounts from table totals.

5.10.2.4 Regional History, Amenity and Tourism

Carrathool LGA is located in the Riverina Region of NSW. The LGA encompasses the town of Hillston and the surrounding villages of Goolgowi, Merriwagga, Rankins Springs and Carrathool. The Carrathool LGA is known for its rich agricultural history, including grazing and cropping, with recent innovations in irrigation allowing the industry to expand into citrus, cotton, viticulture, walnuts, olives and rice etc (CSC, n.d.). The LGA also provides opportunities for tourism with natural features including the Murrumbidgee and Lachlan Rivers as well as the Willandra National Park and the Conapaira Ranges at Rankins Springs (CSC, 2020).

The Quarry Site is located approximately 17km northwest of Rankins Springs within the Conapaira Range. Rankins Springs was established in 1870 approximately 10km from its current location in the middle of a valley. The village was moved to its current location in 1923 following the construction of the railway (CSC, 2020). Rankins Springs provides a number of facilities and services including a motel, caravan park, picnic and toilet facilities, parks as well as a general store, service station and hotel (CSC, 2020).

5.10.3 Costs and Benefits of the Proposal

5.10.3.1 Social and Economic Costs

Impacts to the Lifestyle of Surrounding Landowners

The Quarry Site is situated within the southeastern quadrant of the Carrathool LGA. The Quarry Site is bordered by the Lachlan Range State Forest to the south and east, with only three residences located within a 5km radius. The nearest of these residences are "Meringie" (approximately 2.2km to the northwest) and "The Brae" (approximately 2.5km to the southeast). It is considered that dust and noise generated from on-site activities may periodically be noticed at these residences however, given the considerable separation distances between the Quarry Site and the residences, no adverse impacts would occur.

Impacts of Road Transport and Network

As discussed in Section 2.8, and displayed in **Figure 2.8**, laden trucks departing the Quarry Site would utilise the surrounding local and State road networks. As the Applicant would pay a contribution to the Carrathool Shire Council to assist with road maintenance, as specified in the *Carrathool Shire Council Section 7.12 Fixed Levy Plan 2019*, impacts to the road network would be minimal. It is noted that all transportation operations would be undertaken in accordance with a Drivers Code of Conduct.

Impacts to Tourism

The Quarry Site is not in close proximity to any vantage points and/or any areas of touristic significance. The Proposal would not significantly alter topography and, with the implementation of the proposed visual management and mitigation measures, would have limited or no visibility from surrounding residences and roads. Hence, adverse impacts to the local tourism industry are highly unlikely.

5.10.3.2 Social and Economic Benefits

Significance of the Resource

As discussed in Section 2.3.1**,** the Applicant has identified a further 4.9 million tonnes of resource adjacent to and beneath the approved extraction area which they propose to extract. The ongoing extraction of material would allow the Applicant to continue to provide a source of high-quality hard rock aggregates and road pavement products for use in construction and infrastructure projects within the Carrathool LGA and the broader Riverina Region. This would positively impact the supply of hard rock aggregates and road pavement products in the Carrathool LGA and ensure competition in the construction materials sector is maintained.

Employment and Economic Stimulus

The Applicant currently employs four full time staff at the Western Riverina Quarry including a Quarry Manager, Supervisor and two Operators. It is anticipated that these employment levels would be maintained throughout the life of the Proposal.

The Proposal would also provide ongoing employment for between four and 12 truck drivers depending on demand. It is anticipated that an average of eight truck drivers would be employed throughout the ongoing life of the Proposal.

It is anticipated that the Applicant would spend $2 million on employee wages, machinery, materials and consumables and all other purchases per year to operate the Quarry in the manner outlined in this document. The majority of these purchases would be sourced from the Carrathool LGA and the broader Riverina Region. The flow-on effects from employees living locally would also ensure ongoing contributions to other sectors, such as retail and healthcare, within the Carrathool LGA.

Tax Revenue

The Applicant would continue to pay payroll tax to the State of NSW and income tax to the Federal government. A proportion of income taxes would be effectively received by the State of NSW and the local community through the Federal funding of infrastructure, health and education services.

5.10.4 Management and Mitigation Measures

The following mitigation and management measures would be implemented by the Applicant to ensure social and economic benefits arising from the Proposal are maximised and adverse impacts are minimised.

- Job opportunities at the Quarry would be advertised in local newspapers (e.g. the *Hillston-Ivanhoe Spectator* and the *Area News*) to ensure suitably qualified candidates from within the Carrathool LGA are considered for any available position.
- Locally based employees and contractors would be encouraged to participate in training and education programs.
- Preference would be given to contractors and suppliers of equipment, services, and consumables located within the Carrathool LGA, wherever practicable.
- Engage with the community to provide updates regarding Quarry activities, as required.
- Respond to community complaints in an expeditious and courteous manner.
- Implement the Driver's Code of Conduct to ensure that all truck drivers remain aware of their responsibilities while driving.

5.10.5 Impact Assessment

The Quarry has been operating within the Carrathool LGA since 1987, positively impacting the LGA's economy through the employment of people and the supply of high-quality hard rock aggregates and road products for use in construction and infrastructure projects. The Proposal would continue to generate positive flow-on effects from employee wages to other services in the region which would lead to positive impacts on the economy within the LGA. Sales from the Quarry would also ensure that competition in the supply of construction materials is maintained.

The Applicant intends to maximise social and economic benefit and minimise any adverse effects from the Quarry by implementing the mitigation and management measures described in Section 5.10.4. Given the current social and economic benefits of the Quarry, and considering the proposed mitigation and management measures, it is assessed that the Proposal would provide benefits that outweigh any residual impacts.

Section 6

Summary of Environmental Management and Monitoring Measures

PREAMBLE

This section has been compiled to record the full range of environmental management and monitoring measures that would be adopted when developing and operating the Quarry in accordance with Schedule 2(7) of the Environmental Planning and Assessment Regulation 2000. These measures are designed to effectively manage, mitigate, guide and monitor the operation of the Quarry throughout its entire operational life.

*The measures are presented in tabular form (**Table 6.1**) and record the respective objectives, actions and timing.*

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Table 6.1
Summary of Environmental Measures and Monitoring Measures

Desired Outcome	Action		Timing
1. Traffic and Transport			
Transport operations are undertaken with minimal impact on other road users and residents	1.1	Installation of a "GIVE WAY" sign facing drivers exiting the Quarry Access Road at its intersection with Munros Road.	Within 12 months of receipt of development consent
	1.2	Development of a comprehensive Environmental Management Plan including a subsection on Traffic Management.	Within 12 months of receipt of development consent
	1.3	Seal and widen the left-in bend from the Mid-Western Highway to Munros Road to ensure the intersection is compliant with the general minimum preferred treatment for rural road intersections	Within 12 months of receipt of development consent
Ensure drivers are aware of their responsibilities within the Quarry Site and during transportation of Quarry Products	1.4	Ensure that the Driver's Code of Conduct is: • signed by all drivers employed or contracted by the Applicant; • is included in induction, re-induction and training processes; and • retained with drivers at all times during Quarry-related activities.	Ongoing
2. Air Quality			
Site activities are undertaken without exceeding the nominated air quality criteria	2.1	Ensure the dust collection system on the drill rig is regularly serviced.	Ongoing
	2.2	Use misting sprays on processing equipment.	Ongoing
	2.3	Ensure unsealed internal roads are appropriately constructed and surfaced to limit dust lift-off from transportation activities.	As required
	2.4	Water unsealed roads and unformed tracks and/or surfaces utilised by vehicles.	As required
	2.5	Take appropriate care to avoid spillage during loading.	Ongoing
	2.6	Restrict load size to ensure materials do not extend above truck sidewalls and ensure all loaded trucks leaving the Quarry Site are fully covered.	Ongoing
	2.7	Ensure truck cover is fully extended on laden product transport trucks before each truck leaves the Quarry Site.	Ongoing
	2.8	Limit traffic speeds on internal unsealed roads and unformed tracks within the Quarry Site to no greater than 40km/h to reduce dust lift-off.	Ongoing
	2.9	Maintain the complaints management system to appropriately respond to any complaints.	Ongoing

Table 6.1 (Cont'd)
Summary of Environmental Measures and Monitoring Measures

Desired Outcome	Action		Timing
3. Noise and Vibration			
All activities are undertaken in a manner such that noise emissions do not exceed intrusiveness criteria nor significantly impact on neighbouring landowners and/or residents	3.1	All hours of operation would be strictly adhered to.	Ongoing
	3.2	The maximum number of truck movements per day would be limited to 120 movements per day (60 laden trucks).	Ongoing
	3.3	Regularly service all equipment on the Quarry Site to ensure the sound power level of each item remains at or below that nominated for noise modelling purposes.	Ongoing
All blasting activities are undertaken in a manner such that impacts do not exceed the nominated criteria nor significantly impact on neighbouring landowners and/or residents	3.4	Restrict blasting to between the hours of 10:00am and 3:00pm, Monday to Friday.	Ongoing
	3.5	Limit blasting to no more than once per day as specified in the ANZECC guidelines.	Ongoing
	3.6	Monitor the blast impacts during each blast.	Ongoing
	3.7	Implement a blast notification protocol and pre-emptively discuss planned blasting with surrounding residents.	Ongoing
4. Water Resources			
Separate clean water and sediment-laden water catchments	4.1	Ensure that Sediment Basin 1 is upgraded to provide a minimum total capacity of 1 408m^3.	Within 12 months of receipt of development consent
	4.2	Ensure that Sediment Basin 2 is constructed to provide a minimum total capacity of 784m^3.	Within 12 months of receipt of development consent
	4.3	Ensure that dirty water collection drains are constructed to convey sediment-laden runoff from areas of operational disturbance to sediment basins.	Prior to clearing within nominated areas.
	4.4	Construct a clean water diversion to direct runoff from undisturbed areas upslope of the areas of operational disturbance.	Within 12 months of receipt of development consent
Capture of sediment-laden water flows from Proposal-related disturbance and prevention of uncontrolled discharge of sediment-laden water from the Site	4.5	Maintain the structural integrity and capacity of the sediment basins to allow adequate volume for settlement.	Ongoing

Table 6.1 (Cont'd)
Summary of Environmental Measures and Monitoring Measures

Desired Outcome	Action		Timing
5. Biodiversity			
Minimise impacts on native flora and fauna	5.1	Survey and clearly mark the proposed limit of disturbance in order to ensure that all remnant vegetation beyond this area is retained.	Within six months of receipt of development consent and prior to any vegetation clearing
Minimise or mitigate unavoidable impacts on native flora and fauna	5.2	Vegetation to be removed in a manner that avoids damage to surrounding vegetation.	Ongoing
	5.3	Adopt a procedure to ensure all trees to be cleared are inspected prior to clearing and encourage any fauna to vacate the area.	Ongoing
	5.4	Salvage tree trunks, major limbs and, if practicable, minor branches for use in rehabilitation of the Quarry Site.	Ongoing
	5.5	Directly transfer stripped soil materials onto rehabilitation areas or stockpile for use in progressive rehabilitation activities.	Ongoing
	5.6	Ensure that all personnel and contractors are inducted and made aware of the legislative consequences of unauthorised clearing.	Ongoing
	5.7	Ensure fauna displaced as a result of vegetation clearing is allowed to relocate to surrounding vegetation.	Ongoing
	5.8	Confine, where practicable, vehicular access to formed and marked roads and tracks and limit vehicle speeds within the Quarry Site and on the Quarry Access Road to limit the potential for vehicle trauma to wildlife.	Ongoing
	5.9	Undertake regular weed control programs.	Ongoing
Undertake rehabilitation of the Quarry Site to provide for long-term conservation of native flora and fauna	5.10	Ensure species used during rehabilitation operations are consistent with vegetation community types located within and surrounding the Quarry Site or other suitable pasture species.	During rehabilitation activities
6. Cultural Heritage			
Minimise the potential for adverse Proposal-related impacts on Aboriginal and non-Aboriginal heritage values	6.1	Maintain fencing to preserve buffers to Sites A, B and C using star pickets and appropriate signs at regular intervals nominating areas as "no-go zones".	Ongoing
	6.2	Ensure that Aboriginal Sites Koomaringa IF-01, OS-13 and Koomaringa Anvil 1 are recorded, salvaged and relocated in accordance with the protocols and locations agreed upon with the RAPs.	Within six months of receipt of development consent and prior to any vegetation clearing

Table 6.1 (Cont'd)
Summary of Environmental Measures and Monitoring Measures

Desired Outcome	Action		Timing
6. Cultural Heritage (Cont'd)			
Minimise the potential for adverse Proposal related impacts on Aboriginal and non-Aboriginal heritage values (Cont'd)	6.3	Install signage nominating "environmental areas" or "no-go zones" facing towards Quarry operational areas adjacent to identified Aboriginal sites.	Within six months of receipt of development consent and prior to any vegetation clearing
	6.4	Include cultural heritage awareness in the site induction and staff training.	Ongoing
	6.5	Cease all works in the immediate area and establish a 10m buffer in the event that items of cultural heritage significance are discovered within the Quarry Site. Council, Heritage NSW and other relevant parties would be contacted as soon as practical. If human remains are suspected the police will be contacted.	Ongoing
7. Soil and Land Resources			
Prevent excessive topsoil deterioration during stripping and transportation	7.1	Avoid stripping or replacing soils during extremely wet conditions.	Ongoing
Maximise the viability of topsoil resources for site rehabilitation	7.2	Construct topsoil stockpiles no more than 2m high with side slopes of 1:3 (V:H) or less.	Ongoing
	7.3	Ensure topsoil stockpile surfaces are as "rough" as possible on a micro scale to assist surface water runoff, seed retention and germination.	Ongoing
	7.4	Spread seed of a suitable cover crop on all topsoil stockpiles to facilitate revegetation.	Ongoing
	7.5	Signpost topsoil stockpiles to limit the operation of machinery on stockpiles to minimise compaction.	Ongoing
8. Visibility			
Reduce the impact of the Proposal on the visual amenity from public vantage points	8.1	Retain remnant vegetation within the northern area of the Quarry Site to ensure views of operational areas from residences to the north are shielded.	Ongoing
	8.2	Progressively revegetate areas of operational disturbance as they become available.	Ongoing
	8.3	Progressively rehabilitate the perimeter safety bund around the extraction area and terminal benches.	Ongoing

Table 6.1 (Cont'd)
Summary of Environmental Measures and Monitoring Measures

Desired Outcome	Action		Timing
9. Public Safety Hazards			
Minimise the risk of fire ignition on the Quarry Site and transport route	9.1	Ensure engines in all vehicles are turned off during refuelling.	Ongoing
	9.2	Enforce a no smoking policy in designated areas of the Quarry Site.	Ongoing
	9.3	Maintain fire extinguishers within all site vehicles and mobile equipment.	Ongoing
	9.4	Enforce that no cigarette butts are thrown from product trucks along the product transport routes.	Ongoing
	9.5	Ensure the water cart is maintained full when not in use for dust suppression during the bush fire season.	Ongoing
Minimise the risk of bush fire attack	9.6	Maintain minimum Asset Protection Zones (APZs) of approximately 25m between any structures within the ancillary components area and surrounding vegetation.	
Minimise the potential for hydrocarbon contamination	9.7	Purchase hydrocarbons and hazardous materials from licensed suppliers for the transport of dangerous goods.	Ongoing
	9.8	Ensure that diesel is stored in a bunded above-ground tank.	Ongoing
	9.9	Ensure hydrocarbon waste is disposed of by a licenced waste contractor to a licenced waste facility.	Ongoing
	9.10	Ensure hydrocarbon spill kits are located in the demountable office to ensure spill response and clean up can be carried out immediately following the detection of any spills.	Ongoing
	9.11	Develop and implement a spill management procedure.	Ongoing
10. Social and Economic			
Consider local sources of service and supply contactors	10.1	Continue to source local suppliers and service contractors from within the Carrathool LGA where it is practicable to do so.	Ongoing
Consider employment and training opportunities for locals	10.2	Advertise job opportunities at the Quarry within local newspapers to ensure suitably qualified candidates from within the Carrathool LGA are considered for available positions.	Ongoing
Minimise impacts on members of the local community	10.3	Implement a Driver's Code of Conduct to ensure the safety of all road users and communities through which product transport trucks would pass.	Ongoing
	10.4	Implement a complaint management procedure or protocol to ensure that any complaint received is dealt with decisively and appropriately.	Ongoing

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Section 7

Evaluation and Justification of the Proposal

PREAMBLE

This section concludes the assessment of the proposed continued operation (and extension) of the Western Riverina Quarry. The residual impacts associated with the Proposal are evaluated through consideration of the principles of ecologically sustainable development (ESD).

A justification for the Proposal is then provided based on the residual impacts to the biophysical environment, the likely economic and social benefits that would continue to be generated, the consequences of the Proposal not proceeding and assessment against the objects of the EP&A Act.

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7.1 Evaluation of the Project

7.1.1 Residual Environmental Risk and Impacts

The Proposal has been designed to avoid or minimise environmental risks and impacts as much as is considered reasonable and feasible. Many aspects of the Proposal have also been planned so that the level of impacts would remain consistent with currently approved activities or would result in only minor changes.

The key residual impact of the Proposal would be the removal of approximately 4.23ha of native vegetation. The area that would require clearing has been minimised as much as feasible by electing to develop multiple benches to increase the volume of resource extracted from within the proposed disturbance footprint. It is currently envisaged that biodiversity credits associated with the Proposal would be offset through payment into the Biodiversity Conservation Fund (BCF) or by purchasing credits on the open market.

The Proposal would result in the removal and salvage of three known Aboriginal Sites (Koomaringa IF-03, OS-13 and Koomaringa Anvil 1 – see **Figure 5.7**). These sites are not considered to be archaeologically, aesthetically or historically significant, however, it is recognised that they hold significant social and cultural value for the Aboriginal community. The salvaged artefacts would be relocated as close as possible to their original locations, likely inside the site extent of "Site A" for Koomaringa IF-01 and Koomaringa Anvil 1 and "Site B" for Koomaringa OS-13, however, this would be decided with input from the Registered Aboriginal Parties (RAP) in the event that development consent is granted.

Other residual impacts associated with extractive industries include the generation of noise, dust and traffic on local roads. Residual impacts associated with noise and dust would be minimal given the considerable distances between the Quarry Site and the closest residential receivers[1]. It is acknowledged that traffic levels under the Proposal would result in an increase in heavy vehicle movements on the surrounding road network. However, TTPP (2022) has assessed that the level of service on the surrounding road network would remain good under the Proposal.

The Proposal may also result in other negligible adverse impacts principally relating to visual amenity and socio-economic impacts. However, these adverse impacts would be countered by the positive impacts, including economic benefits from the continued operation of the Quarry in the manner proposed.

In summary, a range of minor residual impacts are predicted from the Proposal, which have been assessed in this document. The outcomes of this assessment indicate that impacts would remain well within the relevant guideline criteria and reasonable community expectations. Residual impacts to biodiversity values through the removal of native vegetation and potential fauna habitat would be offset in accordance with the NSW Biodiversity Offset Scheme and would provide for the in-perpetuity conservation of an area commensurate with the predicted impact.

[1] The closest residential receiver is located approximately 2.8km to the southeast of the Quarry Site and there are only three residences within 5km of the Quarry Site.

7.1.2 Ecologically Sustainable Development

Sustainable practices by industry, all levels of government and the community are recognised to be globally important for future prosperity and well-being. The principles of Ecologically Sustainable Development (ESD) are based upon meeting the needs of the current generation while conserving our ecosystems for the benefit of future generations. In order to achieve sustainable development, recognition needs to be placed upon the integration of both short-term and long-term environmental, economic, social and equitable objectives.

Throughout the planning and design of ongoing operations and the proposed extension of Western Riverina Quarry, the Applicant has endeavoured to address each of the sustainable development principles. The following subsections draw together the features of the Proposal that reflect the four principles of sustainable development, namely:

- the precautionary principle;
- the principle of intergenerational equity;
- the principle of the conservation of biodiversity and ecological integrity; and
- the principle for the improved valuation, pricing and incentive mechanisms.

7.1.2.1 The Precautionary Principle

Preparation of the EIS has involved comprehensive technical assessment to examine the existing environment, predict possible impacts and recommend controls and mitigation measures to ensure that the level of impact is understood and so that the Proposal may be designed to ensure that it satisfies statutory requirements and reasonable community expectations. This approach has ensured that an appropriate level of research, baseline investigations and environmental evaluation was undertaken during the assessment. The controls, safeguards and mitigation measures presented in the EIS have been planned with a comprehensive knowledge of the existing environment and the potential risk of environmental degradation posed by the ongoing activities at the Quarry. In doing this, an anticipatory approach was taken to potential impact. Where data was not available a predictive assessment was completed using a conservative approach to likely scenarios and impacts.

Examples of where a precautionary approach has been taken include in the assessments of traffic, dust and noise impacts which have considered the potential worst case for operations in presented predicted impacts to ensure that management and mitigation measures account for this scenario. Overall, the impacts of the operation would be lower than those predicted in the assessments and reflect expected peaks in demand from clients.

7.1.2.2 Intergenerational Equity

Intergenerational equity embraces value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fair distribution of costs and benefits to the community. This provides for both inter-generational (between generations) and intra-generational (within generations) equity considerations. Equity within generations requires that the economic and social benefits of the development be distributed appropriately among all members of the community. Equity between generations requires that the non-material well-being or “quality of life” of existing and future residents of the local community would be maintained throughout and beyond the life of the Proposal.

Both elements of social equity are addressed through the design of the Proposal such that the Applicant would continue the significant contribution to the economy within the Carrathool LGA and the broader Riverina Region. Consideration of potential impacts to cultural heritage through assessment of potential impacts to Aboriginal heritage and historic heritage has confirmed that the Proposal would not significantly impact the cultural record of the local area.

Finally, rehabilitation of the Quarry Site at closure would provide for use of the land by future generations, whether it is used for biodiversity conservation and/or agriculture.

7.1.2.3 Conservation of Biological Diversity and Ecological Integrity

The protection of biodiversity and maintenance of ecological processes and systems are central goals of sustainability. It is important that developments do not threaten the integrity of the ecological system as a whole or the conservation of threatened species in the short- or long-term.

The Biodiversity Development Assessment Report has addressed the potential impacts to the natural environment including for both flora and fauna. Establishment of an offset for residual impacts to native vegetation and fauna habitat would conserve the biological diversity and ecological integrity of this region. In designing the Proposal, the Applicant has minimised disturbance of native vegetation and re-establishment of areas of native vegetation to ensure these values are maintained, where possible. The implementation of weed eradication programs would further assist in addressing the principle of sustainable development.

7.1.2.4 Improved Valuation and Pricing of Environmental Resources

The issues that form the basis of this principle relate to the acceptance that the "polluter pays", all resources are appropriately valued, cost-effective environmental stewardship is adopted and the adoption of user-pays principles based upon the full life cycle of the costs.

Consideration of this principle is demonstrated through the thorough assessment undertaken for the Proposal and commitment to ongoing management of the Quarry Site to limit residual environmental risks and impacts. The commitment to offset impacts to native vegetation and fauna habitat demonstrates that the Applicant is taking responsibility for the environmental impact of the Proposal.

7.2 Justification of the Proposal

7.2.1 Introduction

In assessing whether the development and operation of the Proposal is justified, consideration has been given both to biophysical and socio-economic factors including the predicted residual impacts on the local and wider environment and the potential benefits of the Proposal. This section also considers the consequences of the Proposal not proceeding.

7.2.2 Biophysical Considerations

Traffic and Transport

Assessment of potential traffic-related impacts has determined that under the Proposal the Quarry would continue to operate with acceptable impacts on the surrounding road network. Traffic operations for the Proposal have been planned to include a maximum of 12 laden truck movements per hour and 60 laden truck movements per day. TTPP (2022) has concluded that the level of service would remain good on the surrounding road network during peak hours with the combined effects of traffic growth and additional Proposal-generated traffic.

Air Quality

The results of the air quality assessment undertaken by Northstar (2022) based on consideration of two operational scenarios (Stage 1 and Stage 3) has concluded that the Proposal is predicted to comply with all impact assessment criteria for annual average concentrations of TSP, $PM_{2.5}$, PM_{10} and deposited dust. The assessment of 24-hour average $PM_{2.5}$ and 24-hour average PM_{10} applying a Level 2 Contemporaneous Assessment has indicated that there would be no additional exceedances of the assessment criteria as a result of the Proposal.

The Greenhouse Gas (GHG) assessment undertaken for the Proposal concluded that average Scope 1 emissions from the Proposal would represent approximately 0.0003 % of Australian and 0.0014 % of NSW GHG emissions which represents a very minor proportion of global GHG emissions.

Noise and Vibration

Operational noise attributable to activities within the Quarry Site and road traffic noise generated by product transportation would be within nominated limits and would have minimal impacts upon the occupants of surrounding residences. Blast overpressure and ground vibration levels would also be well below criteria levels at surrounding residences.

Water Resources

The Proposal includes the use of sediment basins and collection drains to manage potentially sediment-laden runoff. Sediment basins would be designed to accommodate predicted runoff resulting from a 90^{th} percentile 5-day rainfall event. The Applicant would continue to manage surface water runoff to limit the potential for sediment-laden runoff to leave the Quarry Site. It is noted that the extraction area has been designed to be internally draining to further minimise the risk of sediment-laden discharge off site.

Water use at the Quarry Site would generally be limited to that required for dust suppression with water to be sourced from the historical extraction area and sump. In the event that additional water is required for dust suppression, water would be carted in.

Given the elevation of the Quarry Site, and the lack of groundwater intersected during current extraction and exploration drilling activities, it is considered that the Proposal would not impact groundwater resources.

Biodiversity

The Proposal would include the removal of 4.23ha of native vegetation comprising 4.13ha of vegetation in poor condition and 0.10ha of vegetation in moderate condition. This vegetation has the potential to provide habitat through foraging areas or breeding habitat. Residual impacts to native vegetation would be offset in accordance with the Biodiversity Offset Scheme (see Section 2.15).

It has been concluded that potential direct (residual) impacts would be suitably offset and potential indirect impacts would be managed through the implementation of measures to avoid or mitigate potential risks. There would be no significant impacts to serious and irreversible impacts (SAII) or matters of national environmental significance (MNES) as a result of the Proposal.

Cultural

While the Proposal would result in removal and salvage of three known Aboriginal Sites, these sites are not considered to be archaeologically, aesthetically or historically significant and are relatively common in the vicinity of the Quarry Site. The Applicant acknowledges the significance of these sites to the Aboriginal community and would implement the management recommendations outlined in OzArk (2024b) to protect identified sites in the landscape and to appropriately manage unknown sites that may be identified.

The heritage values associated with the Quarry Site are derived from practices which are unlikely to have physical remains, such as grazing. No historic remnants of activities associated with grazing or agricultural practices were recorded during the survey, except for some trees which had been ring barked.

Soil and Land Resources

Assuming the implementation of appropriate soil management measures, the residual impacts associated with soil removal, handling, storage and re-use would be negligible. In addition, the Proposal would not alter the productive use of surrounding land.

7.2.3 Economic and Social Considerations

The Proposal provides for the ongoing extraction, processing and despatch of Quarry products to end markets within the Carrathool LGA and the broader Riverina Region. The ongoing extraction of the targeted resource would ensure that downward pressure is exerted on costs associated with construction material supply and influence market costs associated with construction and infrastructure projects. The Proposal would also provide for the ongoing employment of local persons which would contribute to economic growth within the Carrathool LGA and support local businesses and services. The Applicant's estimated annual expenditure of approximately $2 million would also have considerable direct and indirect economic benefits.

Consultation with the local community has identified that the existing operation has been operating with minimal social impacts or loss of amenity. Given the large distances between the Quarry Site and surrounding residences, it is anticipated that there would not be a significant change in the current level of social impact. Notwithstanding this, the Proposal incorporates a range of management and mitigation measures to ensure that the Proposal would operate with only minor residual impacts. The Applicant would continue to maintain an open-door policy regarding complaints, questions and feedback from the local community.

7.2.4 Consequences of not Proceeding with the Proposal

The consequences of not continuing operations at Western Riverina Quarry relate principally to the lost opportunity to access the hard rock resource that would be extracted by the Applicant to produce a range of Quarry products for use in construction and infrastructure projects. Given that the demand for these products would remain, it is expected that alternative greenfield sources would need to be developed, which would almost certainly result in much greater impacts to the biophysical environment than the incremental impacts addressed for the Proposal. Alternatively, products would be drawn from other quarries operated by the Applicant which would result in longer transport distances to end-users and consequently higher costs for all consumers.

In addition, the Proposal would provide for the employment of four full-time employees on site with an average of eight truck drivers also employed throughout the life of the Quarry. Overall, it is anticipated that the Applicant would spend approximately $2 million each year on wages, machinery servicing, consumables and all other purchases for the operation of Western Riverina Quarry, the bulk of which would be spent within the Carrathool LGA or the broader Riverina Region.

Should the Proposal not proceed, the minor impacts on the local biophysical environment would not eventuate.

It is considered that the benefits of continuing (and extending) the operations at Western Riverina Quarry therefore outweigh the minor impacts on the environment that would result. The nominated consequences of not proceeding with the Proposal also weigh heavily in favour of continuing the operation of the Quarry.

7.2.5 Objects of the *Environmental Planning and Assessment Act 1979*

Table 7.1 provides a short description of how the Proposal 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
The objects of this Act are as follows:	
a) 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,	It is considered that the Proposal would provide for the orderly and professional ongoing operation of the Quarry.
b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,	Final decisions on whether the Proposal is acceptable will be made by the Western Regional Planning Panel. However, as described in Section 7.1, the Applicant has undertaken detailed technical assessments to understand residual risks and impacts of the Proposal and to plan to avoid, minimise or mitigate these impacts as much as is reasonable and feasible. The principles of ecological sustainable development have been considered in the development of the Proposal (see Section 7.1.2).

Table 7.1 (Cont'd)
Objects of the EP&A Act

Object	EIS Coverage
c) to promote the orderly and economic use and development of land,	The ongoing development of the Quarry would maintain the existing orderly development of an existing site and, through doing so, avoid the need for the Applicant to seek alternate sources of a similar resource. Development for the purpose of an extractive industry is considered a beneficial use of the land on which the Quarry is located.
d) to promote the delivery and maintenance of affordable housing,	While not directly relatable to the Proposal, it is considered that the ongoing provision of Quarry products from Western Riverina Quarry would exert a downward force on construction material prices which may have a beneficial impact on housing development in Carrathool LGA.
e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,	Consideration of residual impacts to biodiversity values has been undertaken in accordance with the *Biodiversity Conservation Act 2016*. Direct disturbance of native vegetation and potential native fauna habitat has been minimised as much as possible to reduce the need for impact to biodiversity values.
f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),	The Proposal would not reduce the availability of any matters or sites of cultural heritage value for the general public.
g) to promote good design and amenity of the built environment,	The Proposal has been designed to incorporate a range of components, either excavated or constructed, that would achieve a good design and minimise impacts to amenity.
h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,	The new Quarry office and amenities area would be constructed in a proper manner in order to facilitate the health and safety of its occupants.
i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,	The assessment requirements addressed in this EIS include feedback from relevant State government agencies. The Proposal would be determined by the Western Regional Planning Panel.
j) to provide increased opportunity for community participation in environmental planning and assessment.	The Applicant has and would continue to maintain an open-door policy for community involvement in the operation. In addition, if any member(s) of the local community that have concerns or complaints, they should feel comfortable in approaching Quarry personnel and know that that they would be provided with constructive feedback on the issues raised.

7.3 Conclusion

The Proposal has been designed to permit the ongoing efficient extraction of an important hard rock resource within the Quarry Site. The Proposal incorporates a range of design and operational management and mitigation measures to ensure all relevant statutory goals and criteria, environmental objectives and reasonable community expectations are satisfied.

This document and the range of specialist consultant studies undertaken have identified that the Proposal should proceed because it would:

- contribute towards satisfying the demand for Quarry products required for construction and infrastructure projects within the Carrathool LGA and the broader Riverina Region;
- have a minimal and manageable impact on the biophysical environment;
- satisfy sustainable development principles; and
- result in a net benefit for the local community, the Carrathool Shire Council and the State of NSW.

Section 8

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Section 9

Glossary of Technical Terms, Acronyms, Symbols and Units

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Technical Terms

ABS - Australian Bureau of Statistics.

acid – substance with a pH less than 7.0; the lower the pH, the higher the corrosive ability of the substance.

acidic – having a pH less than 7.0.

acoustics – the science of sound and vibration.

ADGC – Australian Code for the Transport of Dangerous Goods by Road and Rail.

adverse weather conditions (in respect of noise and dust) – conditions, such as high wind, that assist the movement of dust or propagation of noise away from the mine towards receptors.

AEP – Annual Exceedance Probability. The probability of exceedance of a given discharge within a period of one year.

aesthetic significance – an item/area having visual or sensory appeal, landmark qualities and/or creative or technical excellence.

aggregates – fragments of crushed rock with a defined size.

agricultural resources – the land on which agriculture is dependent and the associated water resources (quality and quantity) that are linked to that land.

AHD - Australian height datum (in metres).

airblast overpressure – a shock wave from the blast transmitted through the air, normally measured in dB(Linear).

air pollutant - a substance in ambient atmosphere, resulting from the activity of man or from natural processes, causing adverse effects to man and the environment (also called "air contaminant").

air pollution - presence of air pollutants.

air pollution emissions inventory – all information, collection and processing system containing data on emissions of, and sources of, air pollution from both man-made and natural causes.

air quality criteria – quantitative relationship between a pollutant's dose, concentration, deposition rate or any other air quality-related factors, and the related effects on receptors, e.g. humans, animals, plants, or materials. Air quality criteria serve as the scientific basis for formulating ambient air quality standards or objectives.

algorithm – a mathematical equation devised to solve a particular type of problem.

alkaline – having a pH greater than 7.0.

alkalinity – in water analysis a measure of the carbonates, bicarbonates, hydroxides and occasionally the borates, silicates and phosphates in the water.

alluvial – pertaining to material, such as sand or silt, deposited by running water (e.g. a creek or river).

alluvium – a general term for stream-deposited sediment (sand, silt, gravel, etc.) within stream beds or on flood plains or alluvial fans.

amenity – the desirability of an area.

ANFO – mixture of ammonium nitrate and fuel oil (diesel) used as an explosive.

ANZECC – Australian and New Zealand Environment and Conservation Council.

Applicant – person, organisation or company proposing to carry out an activity / seeking development consent (i.e. Argent (Kempfield) Pty Ltd.

approx. – approximately.

aquatic – pertaining to water.

aquatic – living in or on water, or concerning water.

aquifer – rock or sediment capable of holding and transmitting groundwater.

archaeology – the scientific study of human history, particularly the relics and cultural remains of the distant past.

artefact – anything made by human workmanship, particularly by previous cultures (such as chipped and modified stones used as tools).

AS – Australian Standard.

atmospheric stability – a measure of turbulence which determines the rate at which the effluent is dispersed as it is transported by the wind.

attenuation – reduction in sound pressure levels between two locations.

Average Recurrence Interval (ARI) - statistical period in years for a design storm event.

background – the conditions (e.g. noise levels, bird populations) already present in an area before the commencement of a specific activity (e.g. a mining operation).

background level – the concentration (deposition) level of a pollutant which must be added to the concentration (deposition) level of the modelled sources in order to obtain a total.

background dust level – dust level in the absence of mining and processing activities.

background noise level – noise level in the absence of mining and processing activity.

background noise levels – the level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (e.g. sound from a particular noise source; or sound generated for test purposes).

biodiversity – the full range of living things and the ecosystem in which they live.

biological diversity/biodiversity – a concept encompassing the diversity of indigenous species and communities occurring in a given region; biological diversity includes genetic diversity, which is the diversity of genes and genotypes within each species; species diversity, which is the variety of living species; and ecosystem diversity which is the diversity of the different types of communities formed by living organisms and the relations between them.

blasting – the operation of breaking rock by means of explosives.

bore – a well, usually of less than 20cm diameter, sunk into the ground and from which water is pumped.

buffer – a physical barrier / structure or width of land that encloses, partially encloses, or defines a particular environment. A buffer serves to minimise the impacts of non-desirable external influences on the adjoining environment.

bulldozer – an item of tracked mobile earth moving equipment fitted with a front blade and with rear rippers used for pushing and ripping soil and rock.

catch drains – drains used to intercept and redirect runoff.

catchment – the entire land area from which water (e.g. rainfall) drains to a specific water course or waterbody.

catchment area – the area determined by topographic features within which rainfall will contribute to runoff at a particular point.

community – a combination of plants that are dependent on their environment and influence one another and modify their own environment. They form together, with their common habitat and other associated organisms, an ecosystem, which is also related to neighbouring ecosystems and to the macroclimate of the region.

concentration – the amount of a substance, expressed as mass or volume, in a unit volume of air.

concrete products – products manufactured primarily from Portland Cement concrete, these include bricks, blocks, pavers, pipes and box culverts and other precast concrete sections.

cone crusher – a type of crusher for reducing rock fragment size by means of appropriately positioned and spaced rotating or oscillating cones.

conservation – the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations, while maintaining its potential to meet the needs as aspirations of future generations.

contaminant – a chemical compound or element which has been introduced as a result of human activity. It is noted, however, that some chemical compounds and elements also occur naturally in water and sediments.

crusher – that part of an ore-processing plant where the ore is mechanically crushed into smaller pieces.

crushing – the mechanical process of reducing rock size usually by pressure or impact.

culvert – large pipe or channel carrying water underneath a structure (e.g. a road or railway track) or underneath the ground.

cumulative – increasing by successive additions.

day time period – the period from 7:00am to 6:00pm Monday to Saturday and 8:00am on Sundays and Public Holidays (where relating to noise).

dB – decibel, unit used to express sound intensity.

dB(A) - unit of measurement of human appreciation of noise level.

dB(A) – decibels, A-weighted scale; unit used for most measurements of environmental noise; the scale is based upon typical responses of the human ear to sounds of different frequencies.

decibel - unit expressing difference in power between acoustic signals.

density – 1. The mass of a substance (e.g. sediment) divided by its volume; water has a density of exactly 1 kilogram per litre; gold has a density of 19.3 kilograms per cubic metre. 2. The coverage of vegetation (e.g. trees) per unit of distance (along a linear transect) or unit of area (in an area transect).

development application – an application to the local council for approval of an activity deemed to require an approval prior to commencement.

Devonian - a period of geological time from 395 to 345 million years before present.

dispersibility – a characteristic of soils relating to their structural breakdown in water into individual particles.

dispersion/diffusion – a mixing process in which air motions mix a pollutant plume over an ever increasing volume, thereby diluting the concentration of the pollutant in the ambient air.

dispersion model – a set of mathematical equations relating to the release of air pollutant to the corresponding concentrations in the ambient atmosphere or deposition on the surface.

dispersion parameters – the parameters which describe the growth of the dimensions of a Gaussian plume as a function of travel distance of travel time. The dispersion parameters are classified according to diffusion turbulence conditions in the atmospheric boundary layer on the dispersion.

disseminated – spread widely, diffused.

drilling – the action of boring holes (usually less than 30cm in diameter and up to several kilometres deep) into the ground, typically to establish a water bore or to investigate the geology found at depth.

dust – particles of mostly mineral origin generated by erosion of surfaces and the mining and handling of materials.

dust concentration – the amount of a substance, expressed as mass or volume, in a unit volume of air.

dust deposition – dust particles that settle out from the air – measured in grams per square metre per unit month (g/m^2/month).

ecology – the relationship between living things and their environment.

ecologically sustainable development (ESD) – using, conserving and enhancing the community's resources so that ecological processes on which life depends are maintained and the total quality of life, now and in the future can be increased.

ecosystem – the totality of biological processes and interactions within a specified physical environment.

emission – a discharge of a substance (e.g. dust) into the environment.

emission factor – an expression for the rate at which a pollutant is generated as a result of some activity, divided by the level of that activity.

emissions inventory – an information, collection and processing system containing data on emissions of, and sources of, air pollution from both man-made and natural causes.

environment – a general term for all the conditions (physical, chemical, biological and social) in which an organism or group of organisms (including human beings) exists.

Environmental Impact Statement (EIS) – a formal description of a project and an assessment of its likely impact on the physical, social and economic environment. It includes an evaluation of alternatives and an overall justification of the project. The EIS is used as a vehicle to facilitate public comment and as the basis for analysing the project with respect to granting approval under relevant legislation.

EPA – Environment Protection Authority – the successor to the SPCC.

EP&A Act – Environmental Planning and Assessment Act 1979.

ephemeral – lasting only a short time.

ephemeral – not permanent, e.g. a stream that flows only seasonally or after rainfall or a lake that periodically dries out.

ephemeral stream – a water course that flows intermittently.

erosion – the wearing away of the land surface (whether natural or artificial) by the action of water, wind and ice.

evening period – the period from 6:00pm to 10:00pm (when relating to noise).

excavate – to dig into natural material or fill using an excavator or other machinery.

excavator – item of earth moving equipment fitted with a bucket on an articulated boom and used for digging material from a face in front of, or below the machine. An excavator would be used around the perimeter of the lakes.

exceedance probability – statistical probability that a given value will be exceeded by sample values.

existing air quality – the quality of the ambient air near ground level, expressed as concentrations or deposition rates or air pollutants – also expressed as ambient air quality.

exotic – introduced or foreign, not native.

extraction – a term synonymous with quarrying.

face – sub-vertical quarry feature generally forming limits of benches.

fauna – a general term for animals (birds, reptiles, marsupials, fish etc.) particularly in a defined area or over a defined time period.

fines – material such as clay or silt sized particles.

flora – a general term for plant, particularly those found in a defined area or characteristic of a defined time period.

fluvial – pertaining to or produced by a river.

formation – a large stratigraphic sequence of rock beds (sandstone, shale, limestone, etc.) generally deposited over a distinct geological period (e.g. during a glacial period).

fragmentation – the extent to which rock is broken into small pieces by primary blasting.

front-end loader – machine used to lift and place soil, earth, rocks, etc. on a construction site.

Geographic Information System (GIS) – computer technology that can store, manipulate and display information in a spatial context.

geological time – the time periods over which geological processes such as sedimentation or erosion occur (generally from tens of thousands to hundreds of millions of years).

gradient – rate of change of a given variable (such as temperature or elevation) with distance.

Greenhouse effect – the heating of the earth's surface because outgoing long-wavelength radiation from the earth is absorbed and re-emitted by the carbon dioxide and water vapour in the lower atmosphere and eventually returns to the surface.

ground vibration – oscillatory motion of the ground caused by the passage of seismic waves originating from a blast.

groundwater – all waters occurring below the land surface; the upper surface of the soils saturated by groundwater in any particular area is called the water table.

groundwater dependent ecosystems – ecosystems that use groundwater as part of survival, and can potentially include wetlands, vegetation, springs, base flows, cave ecosystems, river pools and hanging swamps.

habitat – the place where an organism normally lives; habitats can be described by their floristic and physical characteristics.

heavy vehicle – a motor vehicle or trailer that has a gross vehicle mass greater than 4.5 tonnes. Also includes motor vehicles with seats for more than 12 adults.

heritage – the things of value which are inherited.

heritage significance – of aesthetic, historic, scientific, cultural, social, archaeological, natural or aesthetic value for past, present or future generations.

heritage study – a conservation study of an area. The study usually includes historical context report, an inventory of heritage items within the area and recommendations for conserving their significance.

infrastructure – the necessary buildings, roads and equipment associated with a quarrying operation.

inter-generational equity – the principle that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

interbedded – two or more types of sediment rock deposited alternately to build up a sequence.

inversion – generally used in meteorology with respect to an increase of temperature with height in contrast with the usual decrease of temperature with height in the troposphere. An inversion layer is distinguished by its large stability, which limits the turbulence and therefore the dispersion of pollutants.

invertebrates – commonly, animals without a backbone (jellyfish, worms, molluscs, etc.).

jaw crusher – a crusher which uses the pressure applied to the rock between the fixed and moving plate to reduce rock size.

landform – a specific feature of a landscape (such as a hill) or the general shape of the land.

LEP – local environmental plan.

light vehicle – a vehicle that has a gross vehicle mass of 4.5 tonnes or less.

lithology – refers to the general characteristics of sediments.

Local Environmental Plan (LEP) – a plan developed by a council to control development in part or all of their shire or municipality.

long-term – a period of time associated with annual air quality standards. Long-term models usually address pollutant concentrations over several seasons to one year.

mammal – animal of the class mammalia, distinguished by the presence of hair and mammary glands.

maximum instantaneous charge (MIC) – the maximum amount of explosives detonated during each delay during a blast.

metamorphic rock – rock type such as shale changed to rock type such as slate and phylitte by earth forces (heat, pressure, fluids, etc.).

migratory – passing, usually predictably (based on aquatic species), from one region or climate to another, for purposes of feeding, breeding, or other biological purposes.

mitigation measures – measures employed to reduce (mitigate) an impact (such as the construction of a perimeter bund to reduce sound emissions).

mobile equipment – wheeled or tracked self-propelled equipment such as trucks and front-end loaders.

monitoring – the regular measurement of components of the environment to establish environmental standards are being met.

native title – Aboriginal land title which has survived European settlement.

natural – existing in, or formed by, nature (generally excludes anything obviously modified by human beings).

night-time period – the period from 10:00pm to 7:00am Monday to Saturday and 10:00pm to 8:00am on Sundays and Public Holidays (when relating to noise).

overburden – subsoil and decomposed rock overlying the main rock body that is not suitable for use in the final product.

particulate matter – small solid or liquid particles suspended in or falling through the atmosphere - sometimes expressed by the term particulates.

passive – performing a function without electrical or mechanical action or movement (e.g. a jar-and-funnel rain gauge).

perennial – refers to stream which has flow throughout the year.

perimeter safety bund – embankment constructed from soil and/or weathered rock to surround the Project Site or extraction area.

permeability – a material property relating to the ability of the material to transmit water.

pH – a measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithmically) on a scale of 1 to 14, on which 1 is most acid, 7 is neutral acid, and 14 is most basic (alkaline).

plant communities – groupings of plants that inhibit the same area.

pollution – the alteration of air, soil, or water as a result of human activities such that it is less suitable for any purpose for which it could be used in its natural state.

population – a group of organisms all of the same species occupying a particular area.

potable – water suitable for human consumption.

precautionary principle – a principle of ESD which states that decisions about any proposed development should be guided by careful management to avoid serious and irreversible damage to the environment.

precipitation – natural water phenomena producing quantities of water measurable by standard methods (e.g. rainfall, snow).

primary crusher – the first crusher through which the rock passes in the processing plant.

privately-owned residence – an occupied dwelling not owned or under an option to purchase by the Applicant or another resource company, or the subject of a purchase or lease agreement with the Applicant or by any other resource company – referred to as receptors when considered with the predicted noise and/or air quality impacts.

proactive – anticipating a situation and reacting to it before it occurs.

processing plant – a group of equipment used to clean and grade sand.

processing screen – the screen used for separate various sizes of material for further crushing or product screening.

product truck – a registered truck used for the delivery of products from the quarry to the customer.

progressive rehabilitation – rehabilitation of mine or disturbed areas as soon as practicable after they are released during the life of the mine.

Quarry Site – the area of land which corresponds with the area of application for development consent and containing the Mining Lease Application area.

quantify – to determine the quantity or amount of a component in a substance.

quarry – an open pit from which construction materials are excavated.

Receptor – A privately-owned residence, community facility or enterprise at which noise and/or air quality is predicted as a result of modelling of the Proposal.

rehabilitation – the preparation of a final landform after quarrying and its stabilisation with grasses, trees and shrubs.

residual environmental impacts – impacts from an activity (e.g. mining) that remain after mitigation measures.

revegetated – an area that has been planted with trees, bushes and grasses after being disturbed.

revegetation – replacement of vegetation, principally grasses and legumes on areas disturbed by quarrying activities.

riparian – pertaining to or situated on the bank of a river or creek.

road base – road pavement usually made up of densely graded crushed rock in varying

runoff – that portion of the rainfall falling on a catchment area that flows from the catchment past a specified point.

runoff pond – containment structure for water which runs off the leach heaps.

run-of-mine (ROM) – ore or overburden in condition as loaded from open cut.

rutile – a mineral of composition TiO_2.

saline – water with elevated salt concentrations.

saline seep – a place where saline groundwater has reached the surface.

salinity – the dissolved content of water expressed in terms of milligrams per litre.

salinity – the total content of dissolved solids in groundwater, commonly expressed as parts of dissolved solids per million parts of solution, or milligrams of dissolved solids per litre of solution (mg/L); the significance of salinity depends on the nature as well as the amount of the dissolved solids.

sandstone – general term for sedimentary rock with grain size from 0.063mm to 2mm - grains may be minerals or rock fragments.

satellite imagery – computer-generated information obtained from orbiting satellites produced as photo-like mosaics (e.g. infra-red response, magnetic intensity).

scarify – to stir the soil without altering its form, or disturbing its sequence of layers.

screening – a process which separates crushed rock into various size fractions – this usually involves a mechanical vibration of the rock over a series of decks fitted with steel mesh, steel plate or polyurethane or rubber mats with fixed sized apertures.

secondary crusher – the second crusher from which rock passes to be further reduced in size.

sediment basin – a small excavation designed to trap the coarse material washed from disturbed areas.

sedimentary rocks – rocks formed from material derived from pre-existing rocks or by chemical precipitation.

sedimentation – process or rate of depositing of sediment.

settling velocity – speed at which particles settle out of a solution.

sight distance – the distance along the road visible to the driver. It is measured along the normal travelled path of a roadway from the driver's location (such as at an intersection) to a specified height above the roadway when the view is unobstructed by traffic.

silica – silicon dioxide (SiO_2).

social capital – the expected collective or economic benefits derived from the preferential treatment and cooperation between individuals and groups.

social cohesion – the bonds and relationships people have with their family, friends and the wider community.

social infrastructure – community facilities, services and networks which help individuals, families, groups and communities meet their social needs, maximise their potential for development and enhance community wellbeing.

source – the place where pollutants are emitted into the atmosphere. Sources may be point, area or line sources. Often the term "source" is used for a whole plant or an installation. In air pollution modelling, the terms "continuous source" and "instantaneous source" are used:

continuous source: source which emits pollution continuously over a time period much larger than the travel time to a point where the concentration is considered. Usually it is assumed that during this time period the emission is constant.

instantaneous source: source which emits pollution over a time period much short than the travel time of the emission to a point where its concentration is considered.

spatial – related to areal extent.

species – a taxonomic grouping of organisms that are able to interbreed with each other but not with members of other species.

specific gravity – the weight of any body or substance considered with regard to the weight of an equal bulk of pure water.

stable – used with respect to the atmospheric boundary layer, when the vertical temperature gradient is greater than the adiabatic lapse rate. Vertical air motions are suppressed. The turbulence intensity is low resulting in poor dispersion conditions.

stakeholder – person, group or organisation or company with an interest in an activity or outcome.

storage capacity – the maximum volume of liquid able to be retained in a container (e.g. a reservoir or lake).

stratigraphy – the succession and age of strata of rock and unconsolidated material.

stream order – defined by the Strahler steam order used to define stream size based upon a hierarchy of tributaries.

- **first order streams** – the smallest streams in a drainage network that have no tributary streams.
- **second order streams** – two first order streams unite to form a second order stream.
- **third order streams** – have second and first order streams as tributaries.
- **fourth, fifth, sixth, etc. orders** – reflect a similar approach to second or third order streams.

As the order of the stream increases, the discharge increases, the gradient decreases and the channel dimensions increase to accommodate discharge.

stripping – removal of vegetation and topsoil.

structure (soil) – the physical texture of the soil arising from the interrelationship between the grain size, composition, and organic nature of a soil.

Study Area – a defined area for the purposes of a specific area of environmental study.

stygofauna – aquatic invertebrates living within the groundwater systems. This includes 'obligate stygofauna' that represent endemic species that relate to particular regions or ecosystems only.

subsoil – the layer of soil lying below the topsoil; usually contains less organic matter and is less fertile.

temperature inversion – an increase in air temperature with height.

terrestrial – of or relating to the land, as distinct from air or water.

tertiary crusher – the third crusher through which rock passes to be reduced in size.

throughput – quantity of material (ore, chemicals, etc.) moving through a system (e.g. an ore processing plant).

topography – landform.

topography – the physical relief and contour of a region.

topsoil – the upper layer of soil, usually containing more organic material and nutrients than the subsoil beneath it.

total suspended particulates (TSP) – the mass of all particulate matter suspended in air.

transect – a line across a study area along which observations are made and changes can be observed (e.g. changes in vegetation).

unconsolidated – loose or soft, not compacted (particularly soil or sediment).

undulation – the gentle rise and fall or wave-like structure of a landscape.

uniform – similar or unvarying.

variability – degree or amount of change.

variable – not constant, subject to change (e.g. temperature, rainfall or population).

variance – statistical measure of the variation within a set of data, equal to the square of the standard deviation.

vegetated – covered with plants.

vehicle movement – a one-way trip.

vibration – oscillating movement.

visual amenity – attractiveness to the eye.

watercourse – stream or river, running water.

weed – any plant (in particular an herbaceous one) that survives in an area where it is harmful or troublesome to the desired land use.

wetland – swamp of damp area of land.

wind direction – the direction from which the wind, averaged over a certain period of time, is blowing.

wind erosion – wearing away of exposed soil, earth, or rock surfaces by the abrasive action of wind-blown particles (e.g. grains of sand).

wind rose – diagrammatic representation of wind direction, strength, and frequency of occurrence over a specified period.

Acronyms, Symbols and Units

~ – approximately.

°C – degrees Celsius.

µg/g – micrograms per gram.

µg/L – micrograms per litre.

µg/m³ – micrograms per cubic metre.

µm – micron, one millionth of a metre (one thousandth of a millimetre).

µS/cm – microsiemens per centimetre; a measure of conductivity.

% – percentage.

24-hour air quality standard – value of an air quality variable not to be exceeded when averaged over 24 hours.

72-hour rainstorm – total rainfall recorded over a 72-hour period.

100 year flood limit – predicted extent of a 1 in 100 year flood occurrence.

'000 t – multiples of one thousand tonnes.

< – less than.

≤ – less than or equal to.

> – greater than.

≥ – greater than or equal to.

95% exceedance – a value that is exceeded by 95% of sample values.

ABS – Australian Bureau of Statistics.

AEP – Annual Exceedance Probability.

AHD – Australian Height Data; in metres above mean sea level.

AHIMS – Aboriginal Heritage Information Management System.

ANFO – mixture of ammonium nitrate and fuel oil (diesel) used as an explosive.

ANZECC – Australian and New Zealand Environment and Conservation Council.

ARI – average recurrence interval.

AS – Australian Standard.

BOM – Bureau of Meteorology.

cm – centimetre (unit of measure).

CO_2 – carbon dioxide

dB – decibel, unit used to express sound intensity.

dB(A) – the unit of measurement of sound pressure level heard by the human ear, expressed in "A" scale.

dB(A) – decibels, A-weighted scale; unit used for most measurements of environmental noise; the scale is based upon typical responses of the human ear to sounds of different frequencies.

dB(Linear) – the measurement of sound pressure level in which the amplitudes of the sound signal, though all frequencies of the signal, are treated equally, i.e. not weighted.

DPIE – Department of Planning, Industry and Environment (NSW).

DP – Deposited Plan.

DPI – Department of Primary Industries (NSW)

EIS – Environmental Impact Statement.

EP&A Act – Environmental Planning and Assessment Act 1979 (NSW).

EP&A Regulation – Environmental Assessment and Planning Regulation 2000.

EPA – Environment Protection Authority (NSW).

EPL – Environment Protection Licence.

g – gram (= 0.001 kilogram).

g/m²/month – grams per square metre per month unit for deposited dust.

GHG – greenhouse gas.

ha – hectare (100 m x 100 m).

kg – kilogram (weight measure).

kL – kilolitre (thousand litre).

km – kilometre (= 1 000 metres).

km² – square kilometres.

km/h – kilometres per hour.

L – litre.

LEP – Local Environmental Plan.

L_{A10} – sound level exceeded 10 per cent of the sampling time.

L_{A90} – sound level exceeded 90 per cent of the sampling time.

L_{Aeq} – the L_{Aeq} is the "equal energy" average noise levels and is used in some instances for the assessment of traffic noise effects or the risk of hearing impairment due to noise exposures.

$L_{Aeq\ 1\ hour}$ – the "equal energy" average noise level over 60 minutes – used for assessing impacts of motor vehicles.

$L_{Aeq\ T}$ – Sound level of continuous noise which emits the same energy as the fluctuation sound over a given time period (T).

L_{Amax} – the absolute maximum noise level measured in a given time interval.

L_{AN} – the A-weighted sound pressure level exceeded by N% of a given measured period.

LEP – Local Environmental Plan.

LGA – Local Government Area

m – metre.

m AHD – metres Australian Height Datum.

m BGL – metres below ground level.

m² – square metre.

m³ – cubic metre.

mg – milligram (weight unit).

mg/L – milligrams per litre (parts per million).

mg TSS/L – milligrams of total suspended solids per litre.

mg Zn/kg – milligrams of zinc per kilogram.

MIC – Maximum Instantaneous Charge.

ML – megalitre.

mm – millimetre (= 0.001 metres).

pH – measurement indicating whether water or soil is acid or alkaline.

PM_{10} – particulate matter <10μm in diameter.

$PM_{2.5}$ - particulate matter <2.5μm in diameter.

ppm – parts per million.

SEPP – State Environmental Planning Policy.

t – tonnes.

t/m³ – tonnes per cubic metre.

tpa – tonnes per annum.

tpd – tonnes per day

tph – tonnes per hour.

μg/m³ – micrograms per cubic metre.

μm – micron (1 micron=0.001 millimetre).

μS/cm – micro seimens per centimetre.

V:H – vertical to horizontal ratio.

WSP – Water Sharing Plan.

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Appendices

(Total No. of pages including blank pages = 757)

Appendix 1 Secretary's Environmental Assessment Requirements and Matters Identified for Consideration (54 pages)

Appendix 2 Coverage of Secretary's Environmental Assessment Requirements and Requirements of Consulted Government Agencies (22 pages)

Appendix 3 Traffic Impact Assessment (52 pages)

Appendix 4 Air Quality Impact Assessment (92 pages)

Appendix 5 Noise and Vibration Impact Assessment (56 pages)

Appendix 6 Sediment Basin Storage Requirement Calculations (16 pages)

Appendix 7 Biodiversity Development Assessment Report (212 pages)

Appendix 8 Aboriginal Cultural Heritage Assessment (251 pages)

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Appendix 1

Secretary's Environmental Assessment Requirements and Matters Identified for Consideration

(Total No. of pages including blank pages = 54)

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Planning and Assessments
Energy and Resource Assessments
Contact: Joel Herbert
Phone: 02 8289 6614
Email: joel.herbert@planning.nsw.gov.au

Geoff Pigram
Milbrae Quarries Pty Ltd
PO Box 225
Leeton NSW 2705

gpigram@milbrae.com.au

Dear Mr Pigram

Planning Secretary's Environmental Assessment Requirements
Western Riverina Quarry (EAR 1353)

I refer to your request for the Planning Secretary's Environmental Assessment Requirements (SEARs) 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 SEARs 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 SEARs, 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.

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 the Environment and Energy 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 Joel Herbert on the details listed above.

Yours sincerely

Howard Reed 17.7.19

Howard Reed
Director, Resource Assessments
Energy and Resource Assessments
As delegate of 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 1353
Proposal	Extracting and processing of up to 200,000 tonnes of basalt per annum over a 30 year period
Location	439 Wiltshire Road, Rankin Springs (Lot 1, DP821515)
Applicant	Milbrae Quarries Pty Ltd
Date of Issue	17 July 2019
Date of Expiry	17 July 2021
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 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 or Crown land stakeholders 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** – including; - a description of the proposed blasting hours, frequency and methods; 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; - 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; - 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 for the site, 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 *Carrathool Local Environmental Plan (LEP) 2012* 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
	Carrathool Local Environmental Plan 2012
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)
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 2006 (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

Joel Herbert

From: kirstyn.goulding@crownland.nsw.gov.au on behalf of Lands Ministerials <lands.ministerials@industry.nsw.gov.au>
Sent: Monday, 24 June 2019 12:58 PM
To: Joel Herbert
Subject: Request for Requirements - EAR 1353 - Western Riverina Quarry, Griffith

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Joel

Apologies for the delay in responding. DoI Crown Lands has no comments for this proposal.

Thanks
Kirstyn

Lands Ministerial Unit
NSW Department of Industry - Crown Lands
Level 4, 437 Hunter Street, NEWCASTLE NSW 2300
E: lands.ministerials@industry.nsw.gov.au W: www.industry.nsw.gov.au

Please contact Kirstyn Goulding on (02) 4920 5058 for any inquiries

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender. Views expressed in this message are those of the individual sender, and are not necessarily the views of their organisation.

NSW GOVERNMENT | Department of Primary Industries

OUT19/7683

11 June 2019

Joel Herbert
Environmental Assessment Officer
GPO Box 39
Sydney NSW 2001
Joel.herbert@planning.nsw.gov.au

Dear Joel

Request for Requirements:

EAR 1345 - Tarraweena Quarry, Gundagai
EAR 1350 - Hillview Quarry, Leeton
EAR 1351 - Strontian Quarry, Narrandera
EAR 1352 - Walleroobie Quarry, Walleroobie
EAR 1353 - Western Riverina Quarry, Griffith

Thank you for the opportunity to provide Environmental Assessment Requirements (EAR) for the above proposals as per your correspondence dated 5 and 7June 2019.

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.

The EISs for these extractive industry proposals must consider any surrounding agricultural industries and resources as potential receptors of identified impacts. The guidelines below will provide information on potential agricultural impacts for consideration by these types of development. Detailed requirements can be found in Attachment 1.

Title	Location
Land Use Conflict Risk Assessment Guide	www.dpi.nsw.gov.au/content/agriculture/resources/lup/development-assessment/lucra
Agricultural Issues for Extractive industry Development	http://www.dpi.nsw.gov.au/content/agriculture/resources/lup/development-assessment/extractive-industries
Infrastructure proposals on rural land	https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment2/infrastructure-proposals

Should you require clarification on any of the information contained in this response, please contact Agricultural land Use Planning Officer Lilian Parker on (02) 69381906.

Yours sincerely

L L Parker.

Lilian Parker
Agricultural Land Use Planning
Department of Primary Industries

Attachment 1: SEARs Recommendations

Issue and desired outcome	Detail / Requirement
Site Suitable for development	• Detail that the quarry is consistent with strategic plans and zone requirements • 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. • Detail the expected life span of the proposed development
Bushfire risk identified and managed	• Risk assessment level and mitigation plan developed to address bush fire risk.
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. • The proposal should detail how design and operation will be undertaken for by-product management in accordance with best practice to prevent excess build-up of nutrients and salts in the soil profile and increase the risk of leaching. A monitoring program should be developed.
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 (eg noise, dust, volume of traffic). This should include consideration of Travelling Stock Reserves1 (TSR) and the movement of livestock or farm vehicles along / across the affected roads
Visual amenity achieved	• Amenity impacts are assessed and any necessary response to mitigate visual impacts is described and illustrated.

Issue and desired outcome	Detail / Requirement
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 bushfire threats and possible mass mortality events which might result from extreme climatic conditions, routine or emergency animal disease outbreaks.

Joel Herbert

From: alistair.drew@industry.nsw.gov.au on behalf of Landuse Enquiries <landuse.enquiries@dpi.nsw.gov.au>
Sent: Friday, 14 June 2019 1:00 PM
To: Joel Herbert
Subject: Fwd: FW: Request for Requirements - EAR 1353 - Western Riverina Quarry, Griffith

---------- Forwarded message ---------
From: **Nathan Reynoldson** <nathan.reynoldson@dpi.nsw.gov.au>
Date: Fri, 14 Jun 2019 at 09:06
Subject: Re: FW: Request for Requirements - EAR 1353 - Western Riverina Quarry, Griffith
To: Landuse Enquiries <landuse.enquiries@dpi.nsw.gov.au>

To whom it may concern

DPI fisheries has nil comment

Regards

On Wed, 12 Jun 2019 at 21:03, Luke Pearce <luke.pearce@dpi.nsw.gov.au> wrote:

> Hey Reno can you please respond to this one.
>
> Cheers
>
> Luke
>
> ---------- Forwarded message ---------
> From: <ahp.central@dpi.nsw.gov.au>
> Date: Tue, 11 Jun 2019 at 08:48
> Subject: FW: Request for Requirements - EAR 1353 - Western Riverina Quarry, Griffith
> To: Luke Pearce <luke.pearce@dpi.nsw.gov.au>
>
> **From:** alistair.drew@industry.nsw.gov.au [mailto:alistair.drew@industry.nsw.gov.au] **On Behalf Of** Landuse Enquiries
> **Sent:** Friday, 7 June 2019 11:14 AM
> **To:** Water Referrals; Landuse Ag; Lands Ministerials; AHP Central
> **Subject:** Fwd: Request for Requirements - EAR 1353 - Western Riverina Quarry, Griffith
>
> Hi all
> Please find below correspondence requesting SEAR's for the above Local Designated Development application for your direct response to the Department of Planning and Environment.
> Regards,
>
> Alistair

---------- Forwarded message ---------
From: **Joel Herbert** <Joel.Herbert@planning.nsw.gov.au>
Date: Fri, 7 Jun 2019 at 09:43
Subject: Request for Requirements - EAR 1353 - Western Riverina Quarry, Griffith
To: Adam Oehlman <landuse.enquiries@dpi.nsw.gov.au>, records@rfs.nsw.gov.au <records@rfs.nsw.gov.au>, EPA Planning Matters Mailbox <planning.matters@epa.nsw.gov.au>, DRG RO Assessment Coordination Mailbox <assessment.coordination@planning.nsw.gov.au>, environmental.assessments@waternsw.com.au <environmental.assessments@waternsw.com.au>, Planning Matters Mailbox <planning.matters@environment.nsw.gov.au>, RRD EO Resources Regulator Mailbox <resources.regulator@planning.nsw.gov.au>, OLG - Cootamundra-Gundagai Regional Council <mail@cgrc.nsw.gov.au>, development.south.west@rms.nsw.gov.au <development.south.west@rms.nsw.gov.au>

Good afternoon,

Proposal – Western Riverina Quarry, Rankins Springs

EAR ID No. 1353

RW Corkery and CO Pty Ltd on behalf of Milbrae Quarries Pty Ltd (the Applicant) has requested the requirements of the Secretary of the Department of Planning and Environment for the preparation of an Environmental Impact Statement (EIS) for the above local designated development located in Carrathool Shire local government area.

I have attached a copy of the Applicant's request for your reference.

Under Schedule 2 of the *Environmental Planning and Assessment Regulation 2000,* the Secretary is requesting your requirements for the EIS.

It would be greatly appreciated if we could receive your advice by **Friday 21 June 2019.**

If you have any queries, please contact me on the details below.

Regards,

Joel Herbert

Environmental Assessment Officer

Resource Assessments

320 Pitt Street | GPO Box 39 | Sydney NSW 2001

T 02 8289 6614 | E Joel.Herbert@planning.nsw.gov.au

Planning & Environment

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Alistair Drew I Policy Officer Assessments

NSW Department of Industry **I** Lands & Water **I** Strategic Relations

Level 3 | 26 Honeysuckle Drive | Newcastle | NSW 2300

M: 0417 626 567

E: landuse.enquiries@dpi.nsw.gov.au

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--

Luke Pearce | Fisheries Manager | Aquatic Ecosystems
NSW Department of Primary Industries | Unit 5,620 Macauley St | Albury NSW 2640

T: 02 6051 7768 M: 0428227464 | E: luke.pearce@dpi.nsw.gov.au
W: www.dpi.nsw.gov.au

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--

Nathan Reynoldson | A/Fisheries Manager | Aquatic Ecosystems
NSW Department of Primary Industries | 5/620 Macauley Street | Albury NSW 2640
T: 02 6051 7766 | M: 0419 185 546 | E: nathan.reynoldson@dpi.nsw.gov.au
W: www.industry.nsw.gov.au | www.dpi.nsw.gov.au

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--

Alistair Drew I Policy Officer Assessments

NSW Department of Industry **I** Lands & Water **I** Strategic Relations

Level 3 | 26 Honeysuckle Drive | Newcastle | NSW 2300

M: 0417 626 567

E: landuse.enquiries@dpi.nsw.gov.au

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DOC19/494660-1

The Environmental Assessment Officer
Resource Assessments
Department of Planning and Environment

By email: joel.herbert@planning.nsw.gov.au

Dear Mr Herbert

Re EAR ID No 1353

I refer to your electronic mail on 7 June 2019 to the Environment Protection Authority (EPA) seeking our requirements for the preparation of an Environmental Impact Statement for the proposal to expand the Western Riverina Quarry.

The specific issues that we consider to be critical to an assessment of the proposed development include the potential dust impacts, impacts of noise and blasting, and sediment and erosion control. Details of our specific requirements and guidance documents are provided at Attachments A and B respectively.

To assist the EPA in assessing the EIS we request that the EIS follow the format of the former Department of Urban Affairs and Planning EIS Guideline for Extractive Industries Quarries.

We recommend that during the preparation of the EIS that the proponent consults with the EPA to ensure that the specific issues identified in the attachments are adequately addressed.

If you have any further enquiries about this matter please contact Jason Price by telephoning 02 6969 0700 or by electronic mail at riverina.farwest@epa.nsw.gov.au.

Yours sincerely

12 June 2019

DARREN WALLETT
Head Regional Operations Unit – Riverina Far West Region
Environment Protection Authority

ATTACHMENT A

Potential environmental impacts of the project

1. The following potential environmental impacts of the project need to be assessed, quantified and reported on.

   - Air
   - Noise
   - Water
   - Land
   - Waste and chemicals.

   The Environmental Impact Statement (EIS) should address how the required environmental goals will be met for each potential impact.

2. Describe the management strategies for the treatment and processing/utilisation of all wastes proposed to be received at the facility.

3. Describe mitigation and management options that will be used to prevent, control, abate or mitigate identified potential environmental impacts associated with the project and to reduce risks to human health and prevent the degradation of the environment.

   This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

Potential impacts on air quality

The goals of the project in relation to air quality should be to ensure sensitive receptors are protected from adverse impacts from dust.

Details would need to be provided on the proposed measures to manage dust from all sources. Measures to prevent or control the emission of dust from the quarrying activities must be detailed based on the outcome of an assessment of dust emissions undertaken in accordance with the *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales* (DECC, 2005). All potentially impacted residential or sensitive premises likely to be impacted by the development must be identified and included in the assessment.

The EIS should identify any other existing impacts on air quality within the area and if necessary provide an assessment and commentary on the predicted cumulative impacts that may arise.

Emissions from any plant must meet the design criteria detailed in the Protection of the Environment Operations (Clean Air) Regulation 2010. Details need to be provided on the proposed air pollution control techniques from any air emission points, including proposed measures to manage and monitor efficiency and performance.

Potential impacts of noise, vibration and blasting

The goals of the project should include design, construction, operation and maintenance of the facility in accordance with relevant EPA policy, guidelines and criteria, and in order to minimise potential impacts from noise.

The EPA expects that potential noise sources are assessed in accordance with the *Noise Policy for Industry* (EPA 2017), and where required mitigation measures are proposed (eg appropriate equipment chosen to minimise noise levels). All residential or noise sensitive premises likely to be impacted by the development must be identified and included in the assessment.

The proposed development may result in an increase in traffic movements associated with the transport of livestock and feed. The number of traffic movements associated with the proposal should be

quantified and the potential noise impacts associated with these traffic movements need to be assessed in accordance with the *NSW Road Noise Policy* (DECCW, 2011).

An assessment of vibration from all activities (including construction and operation) to be undertaken on the premises and this should be assessed using the guidelines contained in the document *Assessing Vibration: a technical guideline (DEC, 2006).*

An assessment of potential blast impacts should be undertaken and this should be assessed against the guidelines contained in the document *Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC, 1990)*.

Potential impacts on water quantity and quality

The goals of the project should include the following.

- No pollution of waters (including surface and groundwater), except to the extent authorised by EPA (i.e in accordance with an Environment Protection Licence);
- Polluted water (including effluent, process waters, wash down waters, polluted stormwater or sewage) is captured on the site and collected, treated and beneficially reused, where this is safe and practicable to do so;
- It is acceptable in terms of the achievement or protection of the River Flow Objectives and Water Quality Objectives.

The EIS should document the measures that will achieve the above goals.

Details of the site drainage and any natural or artificial waters within or adjacent to the development must be identified and where applicable measures proposed to mitigate potential impacts of the development on these waters.

The EIS should provide details of any water management systems for the site to ensure surface and ground waters are protected from contaminants.

Potential impacts on land

The goals of the project should include the following.

- No pollution of land, except to the extent authorised by EPA (ie in accordance with an Environment Protection Licence); and
- The potential impact of land erosion from the development is mitigated.

The EIS should document the measures that will achieve the above goals.

Waste

The goals of the project should include the following.

- It is in accordance with the principles of the waste hierarchy and cleaner production;
- Where potential impacts associated with the handling, processing and storage of all waste materials generated at the premises are identified, these be satisfactorily mitigated;
- The beneficial reuse of all wastes generated at the premises are maximised where it is safe and practical to do so; and
- No waste disposal occurs on site except in accordance with an Environment Protection Licence.

The goal of the project should be to ensure that environmental risks from manure composting are minimised. The EIS needs to identify the proposed type, quantity and location of wastes to be stored and/or processed at the site.

Spill management measures, including items such as bunding, and emergency procedures should be clearly outlined.

Monitoring

The EIS must outline the proposed monitoring regime to be implemented in relation to the following potential impacts, where relevant.

- air quality and particulate matter,
- operational noise,
- blasting,
- vibration, and
- waste and wastewater.

ATTACHMENT B

Title	Web address
Relevant Legislation	
Environmental Planning and Assessment Act 1979	https://www.legislation.nsw.gov.au/#/view/act/1979/203
Protection of the Environment Operations Act 1997	https://www.legislation.nsw.gov.au/#/view/act/1997/156/full
Licensing	
Guide to Licensing	http://www.epa.nsw.gov.au/licensing/licenceguide.htm
Air Issues	
POEO (Clean Air) Regulation 2010	https://www.legislation.nsw.gov.au/#/view/regulation/2010/428/historical2016-11-01/full
Approved methods for modelling and assessment of air pollutants in NSW (2016)	http://www.environment.nsw.gov.au/resources/air/ammodelling05361.pdf
Assessment and management of odour from stationary sources in NSW (DEC, 2006)	Technical framework: https://www.environment.nsw.gov.au/resources/air/20060440framework.pdf Technical notes: https://www.environment.nsw.gov.au/resources/air/20060441notes.pdf
Noise and Vibration	
Interim Construction Noise Guidelines (EPA, 2017)	https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/interim-construction-noise-guideline
Noise Policy for Industry (EPA, 2017)	https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/noise-policy-for-industry-(2017)
NSW Road Noise Policy (EPA, 2011)	https://www.epa.nsw.gov.au/publications/noise/2011236-nsw-road-noise-policy
Assessing Vibration: a technical guideline (DEC 2006)	https://www.epa.nsw.gov.au/noise/vibrationguide.htm
Australian and New Zealand Environment Council: Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC 1990)	https://www.epa.nsw.gov.au/resources/noise/ANZECBlasting.pdf

Soils	
Managing Urban Stormwater: Soils and Construction (Landcom, 2004)	https://www.environment.nsw.gov.au/stormwater/publications.htm
Waste	
Waste Classification Guidelines (EPA, 2014)	https://www.epa.nsw.gov.au/your-environment/waste/classifying-waste/waste-classification-guidelines
Protection of the Environment Operations (Waste) Regulation 2014	https://www.legislation.nsw.gov.au/regulations/2014-666.pdf
Environmental Guidelines: Solid Waste Landfills, Second edition (EPA, 2016)	https://www.epa.nsw.gov.au/~/media/EPA/Corporate%20Site/resources/waste/solid-waste-landfill-guidelines-160259.ashx
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
National Water Quality Management Strategy: Australia and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000)	http://www.waterquality.gov.au/anz-guidelines/Documents/ANZECC-ARMCANZ-2000-guidelines-vol2.pdf
National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ, 2000)	http://www.waterquality.gov.au/anz-guidelines/Documents/ANZECC-ARMCANZ-monitoring-reporting.pdf
Using the ANZECC Guidelines and Water Quality Objectives in NSW (EPA, 2006)	https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/water/anzeccandwqos06290.pdf
Environmental Guidelines: Storage and Handling of Liquids (EPA, 2007)	https://www.epa.nsw.gov.au/licensing-and-regulation/licensing/environment-protection-licences/compliance-audit-program/chemical-storage-handling-and-spill-management/storing-and-handling-liquids-trainers-manual
The NSW State Groundwater Policy Framework Document (DLWC, 1997)	http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/547550/avail_ground_nsw_state_groundwater_policy_framework_document.pdf
The NSW State Groundwater Quality Protection Policy (DLWC, 1998)	http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/548286/nsw_state_groundwater_quality_policy.pdf
National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC, 1995)	https://www.water.wa.gov.au/__data/assets/pdf_file/0020/4925/8728.pdf

Contact details for OEH Planning Teams and Branch Offices

October 2018

Greater Sydney

Office of Environment and Heritage
Greater Sydney Planning Team
PO Box 644
Parramatta NSW 2124

Phone: 02 9995 5000
gs.ach@environment.nsw.gov.au

AHIPs NOT to be submitted by email for Greater Sydney

Hunter Central Coast

Office of Environment and Heritage
Hunter Central Coast Planning Team
Locked Bag 1002
Dangar NSW 2309

Phone: 02 4927 3119
rog.hcc@environment.nsw.gov.au

North East

Office of Environment and Heritage
North East Planning Team
Locked Bag 914
Coffs Harbour NSW 2450

Phone: 02 66598200
rod.ne@environment.nsw.gov.au

North West

Office of Environment and Heritage
North West Planning Team
PO Box 2111
Dubbo NSW 2830

Phone: 02 6883 5300
rog.nw@environment.nsw.gov.au

South East

Office of Environment and Heritage
South East Planning Team
PO Box 733
Queanbeyan NSW 2620

Phone: (02) 6229 7000
rog.southeast@environment.nsw.gov.au

Illawarra Planning Team
PO Box 513
Wollongong NSW 2520

Phone: (02) 4224 4150
rog.illawarra@environment.nsw.gov.au

South West

Office of Environment and Heritage
South West Planning Team
PO Box 1040
Albury NSW 2640

Phone: (02) 6022 0624
rog.southwest@environment.nsw.gov.au

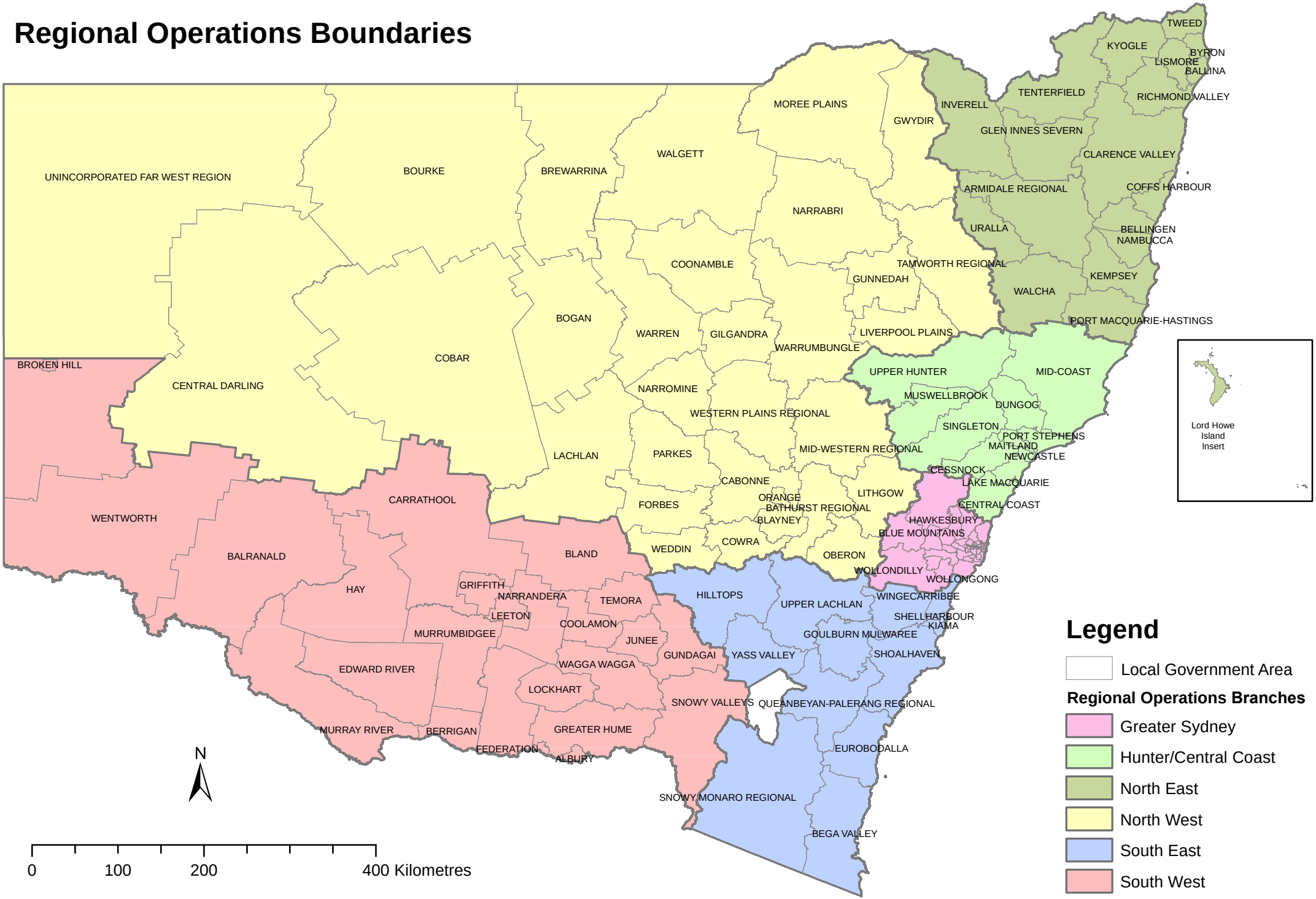
A map of OEH boundaries for ACH regulation is provided on the next page.

*OEH Planning Teams are in the **Conservation and Regional Delivery Division** (CaRD) Greater Sydney is in the **Communities and Greater Sydney Division** (CaGS).*

If you don't know who to contact:

- Email the **OEH Planning Matters Mailbox** planning.matters@environment.nsw.gov.au
- Call **Environment Line** on 131 555

Regional Operations Boundaries



Office of Environment & Heritage

Your reference:	EAR 1353
Our reference:	DOC19/493467
Contact:	Marcus Wright Ph 02 6983 4917
Date:	20 June 2019

Joel Herbert
Resource Assessments
Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Via email: joel.herbert@planning.nsw.gov.au

Dear Mr Herbert

RE: Request for requirements - proposed expansion of the Western Riverina Quarry, Rankins Springs (EAR 1353)

I refer to your email dated 28 May 2019 seeking input from the Office and Environment and Heritage (OEH) into the Department of Planning and Environment (DPE) Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement (EIS) for the proposed development.

OEH has reviewed the documents you sent and provides SEARs for the proposed development in **Attachment A.** Guidance material is listed in **Attachment B**.

OEH recommends that the Environmental Impact Statement (EIS) appropriately address the following:

1. Biodiversity
2. Aboriginal cultural heritage (ACH)

The EIS should fully describe the proposal, the existing environment and impacts of the development including the location and extent of all proposed works that may impact on ACH (including the Koomaringa Aboriginal Place) and biodiversity. The scale and intensity of the proposed development should dictate the level of investigation. It is important that all conclusions are supported by adequate data.

The assessment must include all ancillary infrastructure associated with the project such as roads, water and power supplies, and Rural Fire Service requirements for asset protection, and include threatened species impacts not associated with vegetation communities such as scattered paddock trees and the increase in laden truck traffic.

The activity involves the clearing of remnant vegetation as described in your submission. The preferred approach under the *Biodiversity Conservation Act 2016* (BC Act) is to avoid impacting on biodiversity. Unless the vegetation can be avoided, the exact nature of the impact should be confirmed by applying the Biodiversity Offset Scheme Entry Thresholds tool (BOSET) and a Test of Significance. Any determined impacts must be managed in a Biodiversity Development Assessment Report (BDAR).

OEH notes the proposed quarry expansion is intended to occur within a declared Aboriginal Place (Koomaringa) and considers there is both potential for harm to Aboriginal sites and objects (should they occur) and values associated with the Koomaringa Aboriginal Place (Aboriginal Place ID: 11) particularly where ground disturbance activities and impacts to native vegetation are proposed. We recommend that the proposed activity area be subject to a detailed Aboriginal cultural heritage assessment in accordance with the *Guide to Investigation, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* and *Code of Practice for the Archaeological Investigation of Aboriginal*

PO Box 1040 Albury NSW 2640
512 Dean Street Albury NSW 2640
Ph: (02) 6022 0624
E-mail: rog.southwest@environment.nsw.gov.au
ABN 30 841 387 271
www.environment.nsw.gov.au

Objects in NSW (DEECW 2010). This is a standard requirement for designated development proposals and should be prepared by a qualified archaeologist with specialist skills in identifying and reporting on ACH. It is important that the EIS confirms all statements and conclusions in relation to ACH with appropriate supporting material. Further details on assessment requirements for ACH are provided in **Attachment A**.

If you have any questions regarding this matter, please contact Marcus Wright on 6983 4917 or via rog.southwest@environment.nsw.gov.au.

Yours sincerely

ANDREW FISHER
Senior Team Leader Planning
South West Branch
Conservation and Regional Delivery
Office of Environment & Heritage

ATTACHMENT A – Recommended Environmental Assessment Requirements for Western Riverina Quarry, Rankins Springs (EAR 1353)

ATTACHMENT B – Guidance material

Attachment A – Recommended Environmental Assessment Requirements for Western Riverina Quarry, Rankins Springs (EAR 1353)

The Proposal

The objectives of the proposal should be clearly stated and identify:

- the size, scale and type of the proposed activity / development;
- all anticipated environmental impacts including: direct and indirect; construction and operational; and extent of vegetation / habitat clearing or disturbance;
- threatened species, populations, ecological communities or habitats impacted upon;
- the staging and timing of the proposal; and
- the proposal's relationship to any other proposals and developments.

1. Environmental Impacts of the Proposal

The proponent must consider, assess, quantify and report on the likely environmental impacts of the proposal if applicable, particularly:

- Aboriginal cultural heritage
- Biodiversity

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 B**. Appropriate justification should be provided in instances where the below matters are not addressed.

2. Aboriginal Cultural Heritage

- The Environmental Impact Statement (EIS) must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the proposal. This may include the need for surface survey and test excavation. The identification of cultural heritage values must be conducted in accordance with the *Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW* (OEH 2010), and should be guided by the *Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2011) and consultation with OEH regional branch officers. The Due Diligence process is not appropriate to use as an assessment here.
- Where Aboriginal cultural heritage values are identified, consultation with Aboriginal people must be undertaken and documented in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW). The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the EIS.
- Impacts on Aboriginal cultural heritage values are to be assessed and documented in the EIS. The EIS must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.
- The assessment of cultural heritage values must include a surface survey undertaken by a qualified archaeologist in areas with potential for subsurface Aboriginal deposits. The result of the surface survey is to inform the need for targeted test excavation to better assess the integrity, extent, distribution, nature and overall significance of the archaeological record. The results of surface surveys and test excavations are to be documented in the EIS.
- Where harm to an Aboriginal object or declared Aboriginal place cannot be avoided, an Aboriginal Heritage Impact Permit (AHIP) will be required from OEH under the *National Parks and Wildlife Act 1974*. You must apply to OEH for an AHIP prior to commencing works that will directly or indirectly harm an Aboriginal object or a declared Aboriginal place.

- The EIS must outline procedures to be followed in the event Aboriginal burials or skeletal material is uncovered during construction to formulate appropriate measures to manage the impacts to this material.
- The EIS must outline procedures to be followed if Aboriginal objects are found at any stage of the life of the development to formulate appropriate measures to manage unforeseen impacts.

3. Biodiversity

Negative impacts on native vegetation should be avoided where possible using prevention and mitigation measures. Where impacts cannot be avoided, the EIS should detail how they will be remedied through biodiversity offsetting, including quantification of impacts and assessment of the value of offset areas, protection mechanisms and associated management regimes for those areas.

We recommend that the applicant provide evidence that any clearing associated with or ancillary to the activity is not likely to significantly affect threatened species, threatened ecological communities or their habitats. At a minimum that evidence should take the form of a Test of Significance according to the Minister's Guidelines: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/threatened-species-test-significance-guidelines-170634.pdf

The OEH threatened species website www.environment.nsw.gov.au/threatenedspecies/) and Atlas of NSW Wildlife (www.bionet.nsw.gov.au/) can be used to generate a list of threatened species, populations and ecological communities predicted or known to occur in the area. Vegetation map datasets can be accessed through the OEH website at mapdata.environment.nsw.gov.au/.

Habitat preferences can then be used to determine the likelihood of these species occurring in the study area. Appropriate measures to avoid, minimise and mitigate any impacts on vegetation and threatened species habitat should be set out in the EIS. If impacts on biodiversity are likely to be significant, then the applicant must mitigate these impacts through the Biodiversity Offset Scheme according to the *Biodiversity Conservation Act 2016*, namely a Biodiversity Development Assessment Report (BDAR). www.environment.nsw.gov.au/biodivoffsets/oehoffsetprincip.htm..

The applicant should also apply the Biodiversity Offset Scheme Entry Threshold tool (BOSET) and submit the report with the application. The tool will determine whether the activity exceeds the entry thresholds and triggers the Biodiversity Offset Scheme. The tool and a user guide can be found at www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap.

Where the proposal is likely to significantly affect threatened species within the meaning of Section 7.2 of the *Biodiversity Conservation Act 2016*, the application for development consent is to be accompanied by a Biodiversity Development Assessment Report, and 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 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*.

Please note that because the Western Riverina Quarry is a matter which requires consent under the *Environmental Planning and Assessment Act 1979*, the clearing provisions of the *Local Land Services Act 2013* and the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*, do not permit clearing associated with or ancillary to the activity regardless of zone.

Matters of National Environmental Significance

Regarding the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the REF should identify any relevant Matters of National Environmental Significance, whether the proposal has been referred to the Australian Government or whether it is already determined to be a controlled action.

Attachment B – Guidance material

Title	Web address
Relevant Legislation	
Biodiversity Conservation Act 2016	www.legislation.nsw.gov.au/#/view/act/2016/63/full
Commonwealth Environment Protection and Biodiversity Conservation Act 1999	www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
National Parks and Wildlife Act 1974	www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Environmental Planning and Assessment Act 1979	www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Biodiversity	
Biodiversity Assessment Method (OEH, 2017)	www.environment.nsw.gov.au/resources/bcact/biodiversity-assessment-method-170206.pdf
Biodiversity Offsets Scheme Entry Threshold Tool	www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap
Biodiversity Values Map	www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap
Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH, 2017)	www.environment.nsw.gov.au/resources/bcact/guidance-decision-makers-determine-serious-irreversible-impact-170204.pdf
Ancillary rules: biodiversity conservation actions	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	www.environment.nsw.gov.au/resources/bcact/ancillary-rules-reasonable-steps-170498.pdf
OEH Threatened Species Profiles	www.environment.nsw.gov.au/threatenedspeciesapp/
BioNet Atlas	www.environment.nsw.gov.au/wildlifeatlas/about.htm
BioNet Vegetation Classification – see **NSW Plant Community Type (PCT) classification** link for PCT database login page	http://www.environment.nsw.gov.au/research/Visclassification.htm
NSW guide to surveying threatened plants (OEH 2016)	www.environment.nsw.gov.au/resources/threatenedspecies/160129-threatened-plants-survey-guide.pdf
OEH threatened species survey and assessment guideline information	www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm
NSW Guide to Surveying Threatened Plants (OEH, 2016)	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 Minsters Guidelines - The Test of Significance (OEH 2018)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/threatened-species-test-significance-guidelines-170634.pdf
OEH Data Portal (access to online spatial data)	http://data.environment.nsw.gov.au/

Title	Web address
Fisheries NSW policies and guidelines	www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals/fish-habitat-conservation
Aboriginal Cultural Heritage	
Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011)	www.environment.nsw.gov.au/resources/cultureheritage/20110263ACHguide.pdf
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)	www.environment.nsw.gov.au/resources/cultureheritage/10783FinalArchCoP.pdf
Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)	www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf
Aboriginal Site Recording Form	www.environment.nsw.gov.au/resources/parks/SiteCardMainV1_1.pdf
Aboriginal Site Impact Recording Form	https://www.environment.nsw.gov.au/resources/cultureheritage/aboriginal-site-impact-recording-form-120558.pdf
Aboriginal Heritage Information Management System (AHIMS) Registrar	www.environment.nsw.gov.au/contact/AHIMSRegistrar.htm
Care Agreement Application form	www.environment.nsw.gov.au/resources/cultureheritage/20110914TransferObject.pdf
Heritage	
The Burra Charter (The Australia ICOMOS charter for places of cultural significance)	http://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf
Statements of Heritage Impact 2002 (HO & DUAP)	www.environment.nsw.gov.au/resources/heritagebranch/heritage/hmstatementsofhi.pdf
NSW Heritage Manual (DUAP) (scroll through alphabetical list to 'N')	www.environment.nsw.gov.au/Heritage/publications/

Planning & Environment
Resources Regulator

Our Ref: DOC19/545516

Mr Joel Herbert
Environmental Assessment Officer
Resource Assessments
Planning Services
Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

By email: Joel.Herbert@planning.nsw.gov.au

Western Riverina Quarry (EAR ID No. 1353): Request for Resources Regulator Secretary's Environmental Assessment Requirements

Dear Mr Herbert,

I refer to the Department of Planning and Environment – Resources Assessments (DPE – Resources & Assessment) email dated 7 June 2019 inviting the Resources Regulator to provide Secretary's Environmental Assessment Requirements (SEARs) for Western Riverina Quarry (EAR ID No. 1353).

Compliance Operations within the Resources Regulator has responsibility for providing strategic advice for environmental issues pertaining to the proposed development in so far as they relate to or affect rehabilitation.

Mine Safety Operations within the Resources Regulator is responsible for ensuring mine operators manage the risk to worker health and safety though compliance with the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and the subordinate mining legislation. In particular the effective management of risk associated with the principal hazards as specified in the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Development Details and Assessment

The proposed Western Riverina Quarry is a hard rock quarry located approximately 55 kilometres from Griffith, NSW. The development application proposes to:

- recover basalt material to produce a range of products including hard rock aggregates, road base, rail ballast and rock spalls.

Response

The proposed development is not a mining operation and does not involve the extraction of material classified as a mineral under Schedule 1 of the Mining Regulation 2016.

In addition, the land comprising the proposed development is not the subject of a mining lease granted pursuant to the *Mining Act 1992*.

The Resources Regulator has not identified any matter that would require further comment.

For enquiries regarding this matter please contact me on 4063 6444 or minres.environment@planning.nsw.gov.au

Yours sincerely

Christine Fawcett
Manager Environmental Operations – Central/West

On behalf of
Matthew Newton
Director Compliance Operations
Resources Regulator
NSW Department of Planning and Environment

26 June 2018

NSW RURAL FIRE SERVICE

The Secretary
Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

Your reference: EAR 1353
Our reference: D19/1926
DA19060719056 BB

Attention: Joel Herbert

24 June 2019

Dear Sir/Madam,

Request for Secretary's Requirements - Expansion of Western Riverina Quarry

Reference is made to correspondence dated 7 June 2019 seeking key issues and assessment requirements regarding bush fire protection for the above proposal in accordance with the *Environmental Planning and Assessment Act 1979*.

The New South Wales Rural Fire Service (NSW RFS) has considered the information submitted and notes that the proposed development has the potential to increase the level of bush fire risk within the landscape and, the development may be impacted upon during a bush fire event. As such, the environmental assessment for the proposed expansion of the Western Riverina Quarry should address the following bush fire criteria:

- the aims and objectives of *Planning for Bush Fire Protection 2006;*
- identification of potential ignition sources during construction and operation of the development;
- storage of fuels and other hazardous materials;
- proposed bush fire protection measures for the development, including vegetation management and fire suppression capabilities;
- operational access for fire fighting appliance to the site; and
- emergency and evacuation planning.

If you have any queries regarding this advice, please contact Bradley Bourke on 1300 NSW RFS.

Yours sincerely,

Martha Dotter
Acting Team Leader, Development Assessment and Planning
Planning and Environment Services

Postal address
NSW Rural Fire Service
Planning and Environment Services
Locked Bag 17
GRANVILLE NSW 2141

T 1300 NSW RFS
F (02) 8741 5433
E records@rfs.nsw.gov.au
www.rfs.nsw.gov.au

SWT19/00074
SF2019/118637
MM

19 June 2019

The Manager
Department of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Joel Herbert

SSD-1353 –REQUEST FOR SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENT - PROPOSED EXTRACTIVE INDUSTRY "WESTERN RIVERINA QUARRY", LOT 1 DP821515, 439 WILTSHIRE ROAD RANKIN SPRINGS.

I refer to correspondence forwarded to Roads and Maritime Services requesting the provision of key issues and assessment requirements to be included in the Secretary's Environmental Assessment Requirements.

Roads and Maritime Services has reviewed the Background Paper for the Western Riverina Quarry. From the information provided it is understood that the proposed development is for the expansion of the existing quarry with an intended maximum extraction rate of up to 200,000 tonnes per annum. The subject site has frontage to Wiltshire Road, which is classed as a local road, within a 100 km/h speed zone.

Roads and Maritime is interested in the characteristics of the traffic generated by the development and in the impact of the development on the safety and efficiency of the road network. A Traffic Impact Assessment (TIA) should be prepared to outline measures to address and manage traffic related issues generated by the development. 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.

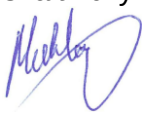
The information supplied provides limited detail regarding the anticipated extraction from the proposed quarry or the access arrangements proposed for the development. The degree of traffic assessment required to support the proposal will depend on the level of impact resulting from traffic generated by the proposed quarries, the rate of extraction of material and the standard of construction of, and current usage characteristics of, the public roads servicing the proposed quarry sites.

Any Traffic Impact Assessment needs to address the impacts of traffic generated by this development upon the nearby road network, particularly intersections. 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.

Roads and Maritime emphasises the need to appropriately consider and minimise the impacts on of the development on the existing road network and maintain the level of safety, efficiency and maintenance along the existing road network.

Any enquiries regarding this correspondence may be referred to the Manager, Land Use for Roads and Maritime Services (South West Region), Maurice Morgan, phone (02) 6923 6611.

Yours faithfully



Per:
Lindsay Tanner
Director, South West NSW

PO Box 453, Deniliquin NSW 2710
8-20 Edwardes Street
Deniliquin, NSW 2710
www.waternsw.com.au
ABN 21 147 934 787

18 June 2019

Contact: Simone Tonkin
Phone: 03 5880 1736
Email :simone.tonkin@waternsw.com.au
Our ref: F2018/2489

Executive Director
Planning Services
Department of Planning and Environment
PO Box 39
Sydney NSW 2000

Attn: Joel Herbert,

Dear Mr Herbert,

Re: SEARs ID No.1353– Proposed Western Riverian Quarry,– 439 Wiltshire Road, Rankins Springs.

WaterNSW has reviewed the supporting documentation accompanying the request for Secretary's Environmental Assessment Requirements (SEARs) and provides the following comments below, and further detail in **Attachment A**.

It is recommended that the EIS be required to include:

Access to surface and groundwater resources

- Annual volumes of surface water and groundwater proposed to be taken by the activity (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan.
- Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project).
- Assessment of the impact and approvals (Works and Use Approvals under the WMA 2000) required for the taking or storage of water.
- The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.
- A detailed and consolidated site water balance.

Impact on surface and groundwater resources

- Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.
- Full technical details and data of all surface and groundwater modelling.
- Proposed surface and groundwater monitoring activities and methodologies.
- Proposed management and disposal of produced or incidental water.

Flooding

WaterNSW is responsible for the management and licensing of flood work approvals.

If the proposal is for an earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake then the assessment is required to address potential impacts detailed further in attachment A.

Impact on waterfront land and water resource dependents

- Clear identification of "waterfront land" (as defined in the WMA 2000) and an assessment of impacts of works and activities on waterfront land. (Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the *Water Management Act 2000.)*

- Details of the final landform of the site, including final void management (where relevant) and rehabilitation measures.

- Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts.

- Consideration of relevant policies and guidelines.

- A statement of where each element of the SEARs is addressed in the EIS (i.e. in the form of a table).

Please direct any questions or correspondence to **Simone Tonkin at simone.tonkin@waternsw.com.au**.

Yours sincerely

Simone Tonkin
Water Regulation Officer
Assessments and Approvals
Customer and Community
WaterNSW

ATTACHMENT A

WaterNSW General Assessment Requirements

The following detailed assessment requirements are provided to assist in adequately addressing the assessment requirements for this proposal.

For further information visit the website, www.water.nsw.gov.au

Key Relevant Legislative Instruments

This section provides a basic summary to aid proponents in the development of an Environmental Impact Statement (EIS), and should not be considered a complete list or comprehensive summary of relevant legislative instruments that may apply to the regulation of water resources for a project.

The EIS should take into account the objects and regulatory requirements of the *Water Management Act 2000* (WMA 2000), and associated regulations and instruments, as applicable.

Water Management Act 2000 (WMA 2000)
Key points:

- Volumetric licensing in areas covered by water sharing plans
- Works within 40m of waterfront land
- SSD & SSI projects are exempt from requiring water supply work approvals and controlled activity approvals as a result of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*.
- No exemptions for volumetric licensing apply as a result of the *EP&A Act*.
- Basic landholder rights, including harvestable rights dams
- Aquifer interference activity approval and flood management work approval provisions have not yet commenced and are regulated by the *Water Act 1912*
- Maximum penalties of $2.2 million plus $264,000 for each day an offence continues apply under the *WMA 2000*

Water Management (General) Regulation 2011
Key points:

- Provides various exemptions for volumetric licensing and activity approvals
- Provides further detail on requirements for dealings and applications.

Water Sharing Plans – these are considered regulations under the *WMA 2000*

Access Licence Dealing Principles Order 2004

Harvestable Rights Orders

Water Sharing Plans

It is important that the proponent understands and describes the ground and surface water sharing plans, water sources, and management zones that apply to the project. The relevant water sharing plans can be determined spatially at www.ourwater.nsw.gov.au. Multiple water sharing plans may apply and these must all be described.

The EIS is required to:

- Demonstrate how the proposal is consistent with the relevant rules of the Water Sharing Plan including rules for access licences, distance restrictions for water supply works and rules for the management of local impacts in respect of surface water and groundwater sources, ecosystem protection (including groundwater dependent ecosystems), water quality and surface-groundwater connectivity.

- Provide a description of any site water use (amount of water to be taken from each water source) and management including all sediment dams, clear water diversion structures with detail on the location, design specifications and storage capacities for all the existing and proposed water management structures.
- Provide an analysis of the proposed water supply arrangements against the rules for access licences and other applicable requirements of any relevant WSP, including:
    - Sufficient market depth to acquire the necessary entitlements for each water source.
    - Ability to carry out a "dealing" to transfer the water to relevant location under the rules of the WSP.
    - Daily and long-term access rules.
    - Account management and carryover provisions.
- Provide a detailed and consolidated site water balance.
- Further detail on licensing requirements is provided below.

Relevant Policies and Guidelines

The EIS should take into account the following policies (as applicable):

- NSW Guidelines for Controlled Activities on Waterfront Land (NOW, 2012)
- NSW Aquifer Interference Policy (NOW, 2012)
- Risk Assessment Guidelines for Groundwater Dependent Ecosystems (NOW, 2012)
- Australian Groundwater Modelling Guidelines (NWC, 2012)
- NSW State Rivers and Estuary Policy (1993)
- NSW Wetlands Policy (2010)
- NSW State Groundwater Policy Framework Document (1997)
- NSW State Groundwater Quality Protection Policy (1998)
- NSW State Groundwater Dependent Ecosystems Policy (2002)
- NSW Water Extraction Monitoring Policy (2007)

Policies can be accessed at the following links:
http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/default.aspx
http://www.water.nsw.gov.au/Water-licensing/Approvals/Controlled-activities/default.aspx

An assessment framework for the NSW Aquifer Interference Policy can be found online at: http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/Aquifer-interference.

Licensing Considerations

The EIS is required to provide:

- Identification of water requirements for the life of the project in terms of both volume and timing (including predictions of potential ongoing groundwater take following the cessation of operations at the site – such as evaporative loss from open voids or inflows).
- Details of the water supply source(s) for the proposal including any proposed surface water and groundwater extraction from each water source as defined in the relevant Water Sharing Plan/s and all water supply works to take water.
- Explanation of how the required water entitlements will be obtained (i.e. through a new or existing licence/s, trading on the water market, controlled allocations etc.).

- Information on the purpose, location, construction and expected annual extraction volumes including details on all existing and proposed water supply works which take surface water, (pumps, dams, diversions, etc).
- Details on all bores and excavations for the purpose of investigation, extraction, dewatering, testing and monitoring. All predicted groundwater take must be accounted for through adequate licensing.
- Details on existing dams/storages (including the date of construction, location, purpose, size and capacity) and any proposal to change the purpose of existing dams/storages
- Details on the location, purpose, size and capacity of any new proposed dams/storages.
- Applicability of any exemptions under the *Water Management (General) Regulation 2011* to the project.

Water allocation account management rules, total daily extraction limits and rules governing environmental protection and access licence dealings also need to be considered.

The Harvestable Right gives landholders the right to capture and use for any purpose 10 % of the average annual runoff from their property. The Harvestable Right has been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC). The MHRDC is determined by the area of the property (in hectares) and a site-specific run-off factor. The MHRDC includes the capacity of all existing dams on the property that do not have a current water licence. Storages capturing up to the harvestable right capacity are not required to be licensed but any capacity of the total of all storages/dams on the property greater than the MHRDC may require a licence.

For more information on Harvestable Right dams, including a calculator, visit: http://www.water.nsw.gov.au/Water-licensing/Basic-water-rights/Harvesting-runoff/Harvesting-runoff

Dam Safety

Where new or modified dams are proposed, or where new development will occur below an existing dam, the NSW Dams Safety Committee should be consulted in relation to any safety issues that may arise. Conditions of approval may be recommended to ensure safety in relation to any new or existing dams.

See www.damsafety.nsw.gov.au for further information.

Surface Water Assessment

The predictive assessment of the impact of the proposed project on surface water sources should include the following:

- Identification of all surface water features including watercourses, wetlands and floodplains transected by or adjacent to the proposed project.
- Identification of all surface water sources as described by the relevant water sharing plan.
- Detailed description of dependent ecosystems and existing surface water users within the area, including basic landholder rights to water and adjacent/downstream licensed water users.
- Description of all works and surface infrastructure that will intercept, store, convey, or otherwise interact with surface water resources.
- Assessment of predicted impacts on the following:
    - flow of surface water, sediment movement, channel stability, and hydraulic regime,

- water quality,
- flood regime,
- dependent ecosystems,
- existing surface water users, and
- planned environmental water and water sharing arrangements prescribed in the relevant water sharing plans.

Flooding

If the proposal is for an earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake then the assessment is required to address potential impacts detailed below;

- the contents of any relevant floodplain management plan or any other relevant Government policy,
- the need to maintain the natural flood regimes in wetlands and related ecosystems and the preservation of any habitat, animals (including fish) or plants that benefit from periodic flooding,
- the effect or likely effect on water flows in downstream river sections,
- any geographical features, or other matters, of Aboriginal interest that may be affected by a controlled work,
- the effect or likely effect of a controlled work on the passage, flow and distribution of any flood waters,
- the effect or likely effect of a controlled work on existing dominant flood ways or exits from flood ways, rates of flow, flood water levels and the duration of inundation,
  the protection of the environment

Groundwater Assessment

To ensure the sustainable and integrated management of groundwater sources, the EIS needs to include adequate details to assess the impact of the project on all groundwater sources including:

- Works likely to intercept, connect with or infiltrate the groundwater sources.
- Any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes.
- Bore construction information is to be supplied to DPI Water by submitting a “Form A” template. DPI Water will supply “GW” registration numbers (and licence/approval numbers if required) which must be used as consistent and unique bore identifiers for all future reporting.
- A description of the water table and groundwater pressure configuration, flow directions and rates and physical and chemical characteristics of the groundwater source (including connectivity with other groundwater and surface water sources).
- Sufficient baseline monitoring for groundwater quantity and quality for all aquifers and GDEs to establish a baseline incorporating typical temporal and spatial variations.
- The predicted impacts of any final landform on the groundwater regime.
- The existing groundwater users within the area (including the environment), any potential impacts on these users and safeguard measures to mitigate impacts.
- An assessment of groundwater quality, its beneficial use classification and prediction of any impacts on groundwater quality.

- An assessment of the potential for groundwater contamination (considering both the impacts of the proposal on groundwater contamination and the impacts of contamination on the proposal).
- Measures proposed to protect groundwater quality, both in the short and long term.
- Measures for preventing groundwater pollution so that remediation is not required.
- Protective measures for any groundwater dependent ecosystems (GDEs).
- Proposed methods of the disposal of waste water and approval from the relevant authority.
- The results of any models or predictive tools used.

Where potential impact/s are identified the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on:

- Any proposed monitoring programs, including water levels and quality data.
- Reporting procedures for any monitoring program including mechanism for transfer of information.
- An assessment of any groundwater source/aquifer that may be sterilised from future use as a water supply as a consequence of the proposal.
- Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category).
- Description of the remedial measures or contingency plans proposed.
- Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period.

Groundwater Dependent Ecosystems

The EIS must consider the potential impacts on any Groundwater Dependent Ecosystems (GDEs) at the site and in the vicinity of the site and:

- Identify any potential impacts on GDEs as a result of the proposal including:
  - the effect of the proposal on the recharge to groundwater systems;
  - the potential to adversely affect the water quality of the underlying groundwater system and adjoining groundwater systems in hydraulic connections; and
  - the effect on the function of GDEs (habitat, groundwater levels, connectivity).
- Provide safeguard measures for any GDEs.

Watercourses, Wetlands and Riparian Land

The EIS should address the potential impacts of the project on all watercourses likely to be affected by the project, existing riparian vegetation and the rehabilitation of riparian land. It is recommended the EIS provides details on all watercourses potentially affected by the proposal, including:

- Scaled plans showing the location of:
  - wetlands/swamps, watercourses and top of bank;
  - riparian corridor widths to be established along the creeks;
  - existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed);

- the site boundary, the footprint of the proposal in relation to the watercourses and riparian areas; and
- proposed location of any asset protection zones.

- Photographs of the watercourses/wetlands and a map showing the point from which the photos were taken.
- A detailed description of all potential impacts on the watercourses/riparian land.
- A detailed description of all potential impacts on the wetlands, including potential impacts to the wetlands hydrologic regime; groundwater recharge; habitat and any species that depend on the wetlands.
- A description of the design features and measures to be incorporated to mitigate potential impacts.
- Geomorphic and hydrological assessment of water courses including details of stream order (Strahler System), river style and energy regimes both in channel and on adjacent floodplains.
- Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the *Water Management Act 2000. This is managed by DPI Water.* Further information can be obtained from the DPI Water's website:
  www.water.nsw.gov.au Water licensing › Approvals › Controlled activities

Drill Pad, Well and Access Road Construction

- Any construction activity within 40m of a watercourse, should be designed by a suitably qualified person, consistent with the NSW *Guidelines for Controlled Activities on Waterfront Land* (July 2012).
- Construction of all wells must be undertaken in accordance with the *Minimum Construction Requirements for Water Bores in Australia* (3rd edition 2012) by a driller holding a bore drillers' licence valid in New South Wales.
- The length of time that a core hole is maintained as an open hole should be minimised.

Landform rehabilitation (including final void management)

Where significant modification to landform is proposed, the EIS must include:

- Justification of the proposed final landform with regard to its impact on local and regional surface and groundwater systems;
- A detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape;
- Outline of proposed construction and restoration of topography and surface drainage features if affected by the project;
- Detailed modelling of potential groundwater volume, flow and quality impacts of the presence of an inundated final void (where relevant) on identified receptors specifically considering those environmental systems that are likely to be groundwater dependent;
- An outline of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation; and
- The measures that would be established for the long-term protection of local and regional aquifer systems and for the ongoing management of the site following the cessation of the project.

Consultation and general enquiries
General licensing enquiries can be made to Advisory Services:
water.enquiries@waternsw.com.au, 1800 353 104.

Assessment or state significant development enquiries, or requests for review or consultation should be directed to the Strategic Stakeholder Liaison Unit, water.referrals@dpi.nsw.gov.au.

A consultation guideline and further information is available online at:
www.water.nsw.gov.au/water-management/law-and-policy/planning-and-assessment

End Attachment A

From: Matthew Carlin <MCarlin@carrathool.nsw.gov.au>
Sent: Monday, 16 December 2019 10:18 AM
To: Geoff Pigram <gpigram@milbrae.com.au>
Subject: Sear Response RS Quarry

Good Morning Jeff.

Per our phone conversation and the request for a response to the SEARs I can advise you that Carrathool Shire Council has no comments

Regards

Matthew Carlin
Building & Regulatory Services Manager
Carrathool Shire Council
PO Box 12
GOOLGOWI NSW 2652
P: (02) 6965 1900
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M: 0438 062 589
E: mcarlin@carrathool.nsw.gov.au
W: www.carrathool.nsw.gov.au

****
This message is intended for the addressee named and may contain

Planning & Environment
Resources Regulator

Our Ref: DOC19/545516

Mr Joel Herbert
Environmental Assessment Officer
Resource Assessments
Planning Services
Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

By email: Joel.Herbert@planning.nsw.gov.au

Western Riverina Quarry (EAR ID No. 1353): Request for Resources Regulator Secretary's Environmental Assessment Requirements

Dear Mr Herbert,

I refer to the Department of Planning and Environment – Resources Assessments (DPE – Resources & Assessment) email dated 7 June 2019 inviting the Resources Regulator to provide Secretary's Environmental Assessment Requirements (SEARs) for Western Riverina Quarry (EAR ID No. 1353).

Compliance Operations within the Resources Regulator has responsibility for providing strategic advice for environmental issues pertaining to the proposed development in so far as they relate to or affect rehabilitation.

Mine Safety Operations within the Resources Regulator is responsible for ensuring mine operators manage the risk to worker health and safety though compliance with the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and the subordinate mining legislation. In particular the effective management of risk associated with the principal hazards as specified in the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Development Details and Assessment

The proposed Western Riverina Quarry is a hard rock quarry located approximately 55 kilometres from Griffith, NSW. The development application proposes to:

- recover basalt material to produce a range of products including hard rock aggregates, road base, rail ballast and rock spalls.

Response

The proposed development is not a mining operation and does not involve the extraction of material classified as a mineral under Schedule 1 of the Mining Regulation 2016.

In addition, the land comprising the proposed development is not the subject of a mining lease granted pursuant to the *Mining Act 1992*.

The Resources Regulator has not identified any matter that would require further comment.

For enquiries regarding this matter please contact me on 4063 6444 or minres.environment@planning.nsw.gov.au

Yours sincerely

Christine Fawcett
Manager Environmental Operations – Central/West

On behalf of
Matthew Newton
Director Compliance Operations
Resources Regulator
NSW Department of Planning and Environment

26 June 2018

2 July 2019

Joel Herbert
Environmental Assessment Officer – Resource Assessments
Department of Planning & Environment
GPO Box 39
Sydney NSW 2001

Emailed: joel.herbert@planning.nsw.gov.au

Your Reference: SEARs 1353
Our Reference: DOC19/527280

Dear Mr Herbert,

Re: Request for Secretary's Environmental Assessment Requirements
Western Riverina Quarry – SEARs 1353.

Thank you for the opportunity to provide advice on the Secretary's Environmental Assessment Requirements (SEARs 1353) for the Western Riverina Quarry. This is a response from NSW Department of Planning & Environment – Division of Resources & Geoscience (the Division).

Basalt is not a prescribed mineral under the *Mining Act 1992*. Therefore, the Division has no statutory role in authorising or regulating the extraction of this commodity, apart from its role under the *Work Health and Safety Act 2011* and associated regulations and the *Work Health and Safety (Mine and Petroleum Sites) Act 2013* and associated regulations, for ensuring the safe operation of mines and quarries. However, the Division 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.

The above information should be summarised in the EIS, with full documentation appended. If deemed commercial-in-confidence, the resource assessment summary included in the EIS should commit to providing the Division with full resource assessment documentation separately. Applications to modify, expand, extend or intensify an existing consent that has

already been adequately reported using the above protocol in publicly available documents, may restrict detailed documentation to the additional resources to be used, if accompanied by a summary of past resource assessments and of past production.

The Division 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 the NSW Division of Resources and Geoscience as a condition of any new or amended development consent.

During the preparation of the EIS, The Division recommends that the proponent consult NSW Department of Planning & Environment's *'EIS Guideline - Extractive Industries – Quarries'*. This guideline is available from:

http://www.planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/~/media/4A89C0947A8C4D70A983F8EE1D7B9790.ashx

The Division 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 Division of Resources & Geoscience - Land Use team at landuse.minerals@geoscience.nsw.gov.au.

Yours sincerely

Steven Palmer
Acting Manager - Land Use

Joel Herbert

From: Bryson Lashbrook <bryson.lashbrook@nrar.nsw.gov.au>
Sent: Tuesday, 23 July 2019 3:50 PM
To: Joel Herbert
Subject: Request for Requirements - EAR 1353 - Western Riverina Quarry, Griffith

Follow Up Flag: Follow up
Flag Status: Flagged

G'day Joel,

In relation to the request for requirements for EAR 1353 - Western Riverina Quarry, Griffith, which 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, or a Controlled Activity Approval under the Water Management Act and/or the proponent is not a public authority such as Council. 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 and associated licensing/approval requirements and submission of any relevant General Terms of Approval if the matter has been referred as integrated development.

If you have any questions or comments I would be happy to discuss.

Cheers,
Bryson.

Bryson Lashbrook | Water Regulation Officer | Licencing and Approvals
Natural Resources Access Regulator | West
26-28 Johnston Street | Wagga Wagga NSW 2650
T: 02 6937 2708 M
: 0448 917 414
E: bryson.lashbrook@nrar.nsw.gov.au
W:
https://www.industry.nsw.gov.au/natural-resources-access-regulator

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender. Views expressed in this message are those of the individual sender, and are not necessarily the views of their organisation.

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Appendix 2

Coverage of Secretary's Environmental Assessment Requirements and Requirements of Consulted Government Agencies

(Total No. of pages including blank pages = 22)

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Table A2.1
Coverage of Secretary's Environmental Assessment Requirements in the EIS

Paraphrased Relevant Requirement	Relevant EIS Section(s)
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*.	Noted
The EIS must include: • an executive summary;	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;	1.6, 2
– identification of the resource, including the amount, type, composition;	2.3.1
– the layout of the proposed works and components (including any existing infrastructure that would be used for the development);	2.2
– 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;	5
– a detailed rehabilitation plan for the site;	2.14
– 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;	3.5.1
– a list of any other approvals that must be obtained before the development may commence;	2.1.3
– the permissibility of the development, including identification of the land use zoning of the site;	3.5.1
– 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;	4.3
• a conclusion justifying why the development should be approved, taking into consideration:	7
– 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.	Page v
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.	3
During the preparation of the EIS you must also consult the Department's EIS Guideline – Extractive Industries – Quarries.	Noted
In addition, the EIS must assess the development against the Carrathool Local Environmental Plan (LEP) 2011 and any relevant development control plans/strategies.	3.5

Table A2.1 (Cont'd)
Coverage of Secretary's Environmental Assessment Requirements in the EIS

Paraphrased Relevant Requirement	Relevant EIS Section(s)
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 or Crown land stakeholders that may be impacted by the development.	1.9
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.	
NOISE AND VIBRATION	
Noise – 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;	5.3.6
• reasonable and feasible mitigation measures to minimise noise emissions; and	5.3.4
• monitoring and management measures;	
Blasting and Vibration – including:	2.5
• a description of the proposed blasting hours, frequency and methods; 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	5.3.6.3
AIR QUALITY	
• 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;	5.2
WATER	
• 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;	5.4.4
• identification of any licensing requirements or other approvals required under the *Water Act 1912* and/or *Water Management Act 2000*;	5.4.4
• 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)	5.4.3
• 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;	5.4.4
• an assessment of activities that could cause erosion or sedimentation issues, and the proposed measures to prevent or control these impacts;	5.4.3.3
• an assessment of any likely flooding impacts of the development;	5.4.3.1
• an assessment of potential impacts on the quality and quantity of existing surface and ground water resources;	5.4.2.3, 5.4.3.3

Table A2.1 (Cont'd)
Coverage of Secretary's Environmental Assessment Requirements in the EIS

Paraphrased Relevant Requirement	Relevant EIS Section(s)
WATER (Cont'd)	
• a detailed description of the proposed water management system, water monitoring program and other measures to mitigate surface and groundwater impacts;	5.4.2.2, 5.4.2.4, 5.4.3.2, 5.4.3.4
BIODIVERSITY	
• accurate predictions of any vegetation clearing on site;	5.5.3
• 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	5.5.5
• 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.	5.5.4
HERITAGE	
• 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	5.6.6
• 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;	5.6.3.3
TRAFFIC AND TRANSPORT	
• 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;	5.1.3.2
• 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;	5.1.5
• 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;	5.1.4
• evidence of any consultation with relevant roads authorities, regarding the establishment of agreed contributions towards road upgrades or maintenance; and	Appendix 1
• a description of access roads, specifically in relation to nearby Crown roads and fire trails;	5.1.2.2
LAND RESOURCES	
• potential impacts on soils and land capability (including potential erosion and land contamination) and the proposed mitigation, management and remedial measures (as appropriate);	5.7.4
• 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	

Table A2.1 (Cont'd)
Coverage of Secretary's Environmental Assessment Requirements in the EIS

Paraphrased Relevant Requirement	Relevant EIS Section(s)
LAND RESOURCES (Cont'd)	
• 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*;	3.5.1.1
HAZARDS AND WASTE	
• 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;	2.9
• 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;	5.9
VISUAL AMENITY	
• 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;	5.8
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	5.10
REHABILITATION	
• a detailed description of the proposed rehabilitation measures that would be undertaken throughout the development and during quarry closure;	2.14
• a detailed rehabilitation strategy for the site, including justification for the proposed final landform and consideration of the objectives of any relevant strategic land use plans or policies; and	2.14
• 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.	2.14

Table A2.2
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
DoI Crown Lands 24 June 2019	No comments.	N/A
DPI Fisheries 14 June 2019	No comments.	N/A
Resources Regulator 26 June 2019	The proposed development is not a mining operation and does not involve the extraction of material classified as a mineral under Schedule 1 of the Mining Regulation 2016. In addition, the land comprising the proposed development is not the subject of a mining lease granted pursuant to the Mining Act 1992. The Resources Regulator has not identified any matter that would require further comments.	Noted
NSW Natural Resources Access Regulator 23 July 2019	In relation to the request for requirements for EAR 1353 - Western Riverina Quarry, Griffith, which 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.	Noted
GENERAL ISSUES		
NSW DPI – Agriculture 11 June 2019	The EISs for these extractive industry proposals must consider any surrounding agricultural Industries and resources as potential receptors of identified impacts.	3.5.1.1
	Detail that the quarry is consistent with strategic plans and zone requirements.	3.5
	Complete a Land Use Conflict Risk Assessment (LUCRA) to identify potential land use 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.	5.7.4
	Include a map to scale showing the above operational and infrastructure details including separation distances from sensitive receptors.	4.3.1
	Detail the expected life span of the proposed development.	2.12
Environment Protection Authority (EPA) 12 June 2019	To assist the EPA in assessing the EIS we request that the EIS follow the format of the former Department of Urban Affairs and Planning EIS Guideline for Extractive Industries Quarries.	Noted
	The EIS must outline the proposed monitoring regime to be implemented in relation to the following impacts, where relevant. • air quality and particulate matter,	5.2.6
	• operational noise,	5.3.7.1
	• blasting,	5.3.7.2
	• vibration, and	
	• waste and wastewater.	2.9, 5.4.3.5

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
GENERAL ISSUES (Cont'd)		
NSW Office of Environment & Heritage 20 June 2019	The assessment must include all ancillary infrastructure associated with the project such as office and amenities, roads water and power supplies, and Rural Fire Service requirements for asset protection.	Noted
	The objectives of the proposal should be clearly stated and identify:	2.1
	• the size, scale and type of the proposed activity / development;	
	• all anticipated environmental impacts including: direct and indirect; construction and operational; and extent of vegetation / habitat clearing or disturbance;	5
	• threatened species, populations, ecological communities or habitats impacted upon;	5.5
	• the staging and timing of the proposal; and	2.5.3
	• the proposal's relationship to any other proposals and developments.	4.3.2
	Please note that because the Western Riverina Quarry Is a matter which requires consent under the *Environmental Planning and Assessment Act 1979*, the clearing provisions of the *Local Land Services Act 2013* and the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*, do not permit clearing associated with or ancillary to the activity regardless of zone.	Noted
WaterNSW – 18 June 2019	Consideration of relevant policies and guidelines.	3
	A statement of where each element of the SEARs is addressed in the EIS (i.e. in the form of a table).	Appendix 2
NSW DPE - Division of Resources & Geoscience 2 July 2019	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	2.3.1
	• Documents the methods used to assess the resource and its suitability for the intended applications.	2.3.2
	The above information should be summarised in the EIS, with full documentation appended. If deemed commercial-in-confidence, the resource assessment summary included in the EIS should commit to providing the Division with full resource assessment documentation separately.	2.3
	During the preparation of the EIS, the Division recommends that the proponent consult NSW Department of Planning & Environment's *EIS Guideline – Extractive Industries – Quarries*.	Noted
	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 the NSW Division of Resources and Geoscience as a condition of any new or amended development consent.	Noted

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
LAND RESOURCES		
NSW DPI – Agriculture 11 June 2019	Describe the current and potential *Important Agricultural Land* on the proposed development site and surrounding locality including the land capability and agricultural productivity.	4.3.2, 5.7
	Demonstrate all the significant impacts on current and potential agricultural developments and resources can be reasonably avoided or adequately mitigated.	5.7
	Consider possible cumulative effects to agricultural enterprises and landholders.	5.7
Environment Protection Authority (EPA) 12 June 2019	The goals of the project should include the potential impact of land erosion from the development is mitigated.	5.4.3, 5.7
HAZARDS AND WASTE		
NSW DPI – Agriculture 11 June 2019	Risk assessment level and mitigation plan developed to address bush fire risk.	5.9.2.3
	Contingency plans should be developed to enable the operation to deal with emergency situations. Commitment to the preparation of an Emergency Management Plan that outline procedures and responsibilities for responding to bushfire threats, and possible mass mortality events which might results from extreme climatic conditions, routine or emergency animal disease outbreaks.	5.9
Environment Protection Authority (EPA) 12 June 2019	Describe the management strategies for the treatment and processing/utilisation of all wastes proposed to be received at the facility.	2.9
	The goals of the project should include the following. • No pollution of land, except to the extent authorised by EPA (i.e. in accordance with an Environment Protection Licence); and	
	• It is in accordance with the principles of the waste hierarchy and cleaner production;	
	• Where potential impacts associated with the handling, processing and storage of all waste materials generated at the premises are identified, these be satisfactorily mitigated;	
	• The beneficial reuse of all wastes generated at the premises are maximised where it is safe and practical to do so; and	
	• No waste disposal occurs on site except in accordance with an Environment Protection Licence	
	The goal of the project should be to ensure that environmental risks from manure composting are minimised. The EIS needs to identify the proposed type, quantity and location of wastes to be stored and/or processed at the site.	2.9
	Spill management measures, including items such as bunding, and emergency procedures should be clearly outlined.	5.9.3

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
HAZARDS AND WASTE (Cont'd)		
NSW Rural Fire Service 21 June 2019	The environmental assessment for the proposed expansion of the Western Riverina Quarry should address the following bush fire criteria: • the aims and objectives of *Planning for Bush Fire Protection 2006*; • identification of potential ignition sources during construction and operation of the development; • storage of fuels and other hazardous materials; • proposed bush fire protection measures for the development, including vegetation management and fire suppression capabilities; • operational access for fire fighting appliance to the site; and • emergency and evacuation planning.	5.9.2
WATER		
NSW DPI – Agriculture 11 June 2019	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.	5.4.4
	Outline any impacts to water use from agriculture and mitigation measures required.	5.4.3.3
	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.	5.4.3.2
	The proposal should detail how design and operation will be undertaken for by-product management in accordance with best practice to prevent excess build-up of nutrients and salts in the soil profile and increase the risk of leaching. A monitoring program should be developed.	5.4.3.4
Environment Protection Authority (EPA) 12 June 2019	The goals of the project should include the following. • No pollution of waters (including surface and groundwater), except to the extent authorised by EP/\ (i.e. in accordance with an Environment Protection Licence);	5.4.3.2
	• Polluted water (including effluent, process waters, wash down waters, polluted stormwater or sewage) is captured on the site and collected, treated and beneficially reused, where this is safe and practicable to do so;	5.4.3.2.1
	• It is acceptable in terms of the achievement or protection of the River Flow Objectives and Water Quality Objectives	5.4.3.3
	The EIS should document the measures that will achieve the above goals.	5.4.3
	Details of the site drainage and any natural or artificial waters within or adjacent to the development must be identified and where applicable measures proposed to mitigate potential impacts of the development on these waters.	5.4.3
	The EIS should provide details of any water management systems for the site to ensure surface and ground waters are protected from contaminants.	5.4.2.2 5.4.3.2

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
	WATER (Cont'd)	
WaterNSW 18 June 2019	**Access to surface and groundwater resources** • Annual volumes of surface water and groundwater proposed to be taken by the activity (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan.	5.4.4
	• Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project).	5.4.4
	• Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts.	5.4.2.3, 5.4.3.3
	• Assessment of the impact and approvals (Works and Use Approvals under the WMA 2000) required for the taking or storage of water.	5.4.4
	• The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.	5.4.4
	• A detailed and consolidated site water balance.	5.4.4
	Impact on surface and groundwater resources • Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.	5.4.2.3, 5.4.3.3
	• Full technical details and data of all surface and groundwater modelling.	5.4.2.1, 5.4.3.1
	• Proposed surface and groundwater monitoring activities and methodologies.	5.4.2.4, 5.4.3.4
	• Proposed management and disposal of produced or incidental water.	5.4.3.2
	Flooding WaterNSW is responsible for the management and licensing of flood work approvals.	Noted
	If the proposal is for an earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake then the assessment is required to address potential impacts detailed further in attachment A.	N/A
	Impact on waterfront land and water resource dependents • Clear identification of "waterfront land" (as defined in the WMA 2000) and an assessment of impacts of works and activities on waterfront land. (Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the Water Management Act 2000.)	5.4.3.2
	• Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts.	5.4.2.3, 5.4.3.3

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
	WATER (Cont'd)	
WaterNSW 18 June 2019 (Cont'd)	**Water Sharing Plans** It is important that the proponent understands and describes the ground and surface water sharing plans, water sources, and management zones that apply to the project. The relevant water sharing plans can be determined spatially at www.ourwater.nsw.gov.au. Multiple water sharing plans may apply and these must all be described.	5.4.2.1, 5.4.3.1
	The EIS is required to: • Demonstrate how the proposal is consistent with the relevant rules of the Water Sharing Plan including rules for access licences, distance restrictions for water supply works and rules for the management of local impacts in respect of surface water and groundwater sources, ecosystem protection (including groundwater dependent ecosystems), water quality and surface-groundwater connectivity	5.4.4
	• Provide a description of any site water use (amount of water to be taken from each water source) and management including all sediment dams, clear water diversion structures with detail on the location, design specifications and storage capacities for all the existing and proposed water management structures.	5.4.4
	• Provide an analysis of the proposed water supply arrangements against the rules for access licences and other applicable requirements of any relevant WSP, including:	5.4.4
	– Sufficient market depth to acquire the necessary entitlements for each water source. – Ability to carry out a "dealing" to transfer the water to relevant location under the rules of the WSP. – Daily and long-term access rules. – Account management and carryover provisions.	5.4.4
	• Provide a detailed and consolidated site water balance.	5.4.4
	• Further detail on licensing requirements is provided below.	5.4.4
	Licensing Considerations	
	The EIS is required to provide: • Identification of water requirements for the life of the project in terms of both volume and timing (including predictions of potential ongoing groundwater take following the cessation of operations at the site - such as evaporative loss from open voids or inflows).	5.4.4
	• Details of the water supply source(s) for the proposal including any proposed surface water and groundwater extraction from each water source as defined in the relevant Water Sharing Plan/s and all water supply works to take water.	5.4.4
	• Explanation of how the required water entitlements will be obtained (i.e. through a new or existing licence/s, trading on the water market, controlled allocations, etc.).	5.4.4

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
	WATER (Cont'd)	
WaterNSW 18 June 2019 (Cont'd)	• Information on the purpose, location, construction and expected annual extraction volumes including details on all existing and proposed water supply works which take surface water, (pumps, dams, diversions, etc).	5.4.4
	• Details on all bores and excavations for the purpose of investigation, extraction, dewatering, testing and monitoring. All predicted groundwater take must be accounted for through adequate licensing.	5.4.4
	• Details on existing dams/storages (including the date of construction, location, purpose, size and capacity) and any proposal to change the purpose of existing dams/storages	5.4.3.2.1
	• Details on the location, purpose, size and capacity of any new proposed dams/storages.	5.4.3.2.1
	• Applicability of any exemptions under the Water Management (General) Regulation 2011 to the project.	N/A
	Water allocation account management rules, total daily extraction limits and rules governing environmental protection and access licence dealings also need to be considered.	5.4.4
	Surface Water Assessment The predictive assessment of the impact of the proposed project on surface water sources should include the following: • Identification of all surface water features including watercourses, wetlands and floodplains transected by or adjacent to the proposed project.	5.4.3.1
	• Identification of all surface water sources as described by the relevant water sharing plan.	5.4.3.1
	• Detailed description of dependent ecosystems and existing surface water users within the area, including basic landholder rights to water and adjacent/downstream licensed water users.	5.4.4
	• Description of all works and surface infrastructure that will intercept, store, convey, or otherwise interact with surface water resources.	5.4.3.2.1
	• Assessment of predicted impacts on the following: – flow of surface water, sediment movement, channel stability, and hydraulic regime, – water quality, – flood regime, – dependent ecosystems, – existing surface water users, and – planned environmental water and water sharing arrangements prescribed in the relevant water sharing plans.	5.4.3.3
	Flooding If the proposal is for an earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or lake then the assessment is required to address potential impacts detailed below;	N/A

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
	WATER (Cont'd)	
WaterNSW 18 June 2019 (Cont'd)	• the contents of any relevant floodplain management plan or any other relevant Government policy	
	• the need to maintain the natural flood regimes in wetlands and related ecosystems and the preservation of any habitat, animals (including fish) or plants that benefit from periodic flooding	N/A
	• the effect or likely effect on water flows in downstream river sections	N/A
	• any geographical features, or other matters, of Aboriginal interest that may be affected by a controlled work	5.6.3
	• the effect or likely effect of a controlled work on the passage, flow and distribution of any flood waters,	N/A
	• the effect or likely effect of a controlled work on existing dominant flood ways or exits from flood ways, rates of flow, flood water levels and the duration of inundation, the protection of the environment	N/A
	Groundwater Assessment To ensure the sustainable and integrated management of groundwater sources, the EIS needs to include adequate details to assess the impact of the project on all groundwater sources including: • Works likely to intercept, connect with or infiltrate the groundwater sources.	5.4.2.3
	• Any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes	5.4.4
	• Bore construction information is to be supplied to DPI Water by submitting a "Form A" template. DPI Water will supply "GW" registration numbers (and licence/approval numbers if required) which must be used as consistent and unique bore identifiers for all future reporting.	Noted
	• A description of the water table and groundwater pressure configuration, flow directions and rates and physical and chemical characteristics of the groundwater source (including connectivity with other groundwater and surface water sources).	5.4.2.1
	• Sufficient baseline monitoring for groundwater quantity and quality for all aquifers and GDEs to establish a baseline incorporating typical temporal and spatial variations.	5.4.2.1
	• The predicted impacts of any final landform on the groundwater regime.	5.4.2.3
	• The existing groundwater users within the area (including the environment), any potential impacts on these users and safeguard measures to mitigate impacts.	5.4.2.1
	• An assessment of groundwater quality, its beneficial use classification and prediction of any impacts on groundwater quality.	5.4.2.3
	• An assessment of the potential for groundwater contamination (considering both the impacts of the proposal on groundwater contamination and the impacts of contamination on the proposal).	5.4.2.3

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
WATER (Cont'd)		
WaterNSW 18 June 2019 (Cont'd)	• Measures proposed to protect groundwater quality, both in the short and long term.	5.4.2.2
	• Measures for preventing groundwater pollution so that remediation is not required.	5.4.2.2
	• Protective measures for any groundwater dependent ecosystems (GDEs).	5.4.2.2
	• Proposed methods of the disposal of waste water and approval from the relevant authority.	5.4.3.2.1
	• The results of any models or predictive tools used.	5.4.2.1
	Where potential impacts are identified the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on: • Any proposed monitoring programs, including water levels and quality data.	5.4.3.4
	• Reporting procedures for any monitoring program including mechanism for transfer of information.	5.4.3.4
	• An assessment of any groundwater source/aquifer that may be sterilised from future use as a water supply as a consequence of the proposal	5.4.2.3
	• Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category).	5.4.2.3
	• Description of the remedial measures or contingency plans proposed.	5.4.2.2
	• Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period.	5.4.2.4
	Groundwater Dependent Ecosystems The EIS must consider the potential impacts on any Groundwater Dependent Ecosystems (GDEs) at the site and in the vicinity of the site and: • Identify any potential impacts on GDEs as a result of the proposal including: – the effect of the proposal on the recharge to groundwater systems;	5.4.2.1
	– the potential to adversely affect the water quality of the underlying groundwater system and adjoining groundwater systems in hydraulic connections; and	5.4.2.3
	– the effect on the function of GDEs (habitat, groundwater levels, connectivity).	5.4.2.3
	• Provide safeguard measures for any GDEs.	5.4.2.2

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
	WATER (Cont'd)	
WaterNSW 18 June 2019 (Cont'd)	**Watercourses, Wetlands and Riparian Land** The EIS should address the potential impacts of the project on all watercourses likely to be affected by the project, existing riparian vegetation and the rehabilitation of riparian land. It is recommended the EIS provides details on all watercourses potentially affected by the proposal, including: • Scaled plans showing the location of: – wetlands/swamps, watercourses and top of bank	4.2
	– riparian corridor widths to be established along the creeks;	N/A
	– existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed);	N/A
	– the site boundary, the footprint of the proposal in relation to the watercourses and riparian areas; and	4.2
	– proposed location of any asset protection zones.	N/A
	• Photographs of the watercourses/wetlands and a map showing the point from which the photos were taken.	N/A
	• A detailed description of all potential impacts on the watercourses/riparian land.	5.4.3.3
	• A detailed description of all potential impacts on the wetlands, including potential impacts to the wetlands hydrologic regime; groundwater recharge; habitat and any species that depend on the wetlands	N/A
	• A description of the design features and measures to be incorporated to mitigate potential impacts	5.4.3.2
	• Geomorphic and hydrological assessment of water courses including details of stream order (Strahler System), river style and energy regimes both in channel and on adjacent floodplains.	5.4.2.1, 5.4.3.1
	• Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the Water Management Act 2000. This is managed by DPI Water. Further information can be obtained from the DPI Water's website: www.water.nsw.gov.au Water licensing > Approvals > Controlled activities	Noted
	Drill Pad, Well and Access Road Construction • Any construction activity within 40m of a watercourse, should be designed by a suitably qualified person, consistent with the NSW Guidelines for Controlled Activities on Waterfront Land (July 2012).	Noted
	• Construction of all wells must be undertaken in accordance with the Minimum Construction Requirements for Water Bores in Australia (3rd edition 2012) by a driller holding a bore drillers' licence valid in New South Wales.	Noted
	• The length of time that a core hole is maintained as an open hole should be minimised.	Noted

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
	BIODIVERSITY	
NSW DPI – Agriculture 11 June 2019	Include a biosecurity (pests & weeds) risk assessment outlining the likely plant, animal and community risks.	5.5.5
	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.	5.5.4
NSW Office of Environment & Heritage 20 June 2019	include threatened species impact not associated with vegetation communities such as scattered paddock trees or increases in road traffic.	5.5.5
	Unless the vegetation can be avoided, the exact nature of the impact should be confirmed by applying the Biodiversity Offset Scheme Entry Threshold tool (BOSET) and a Test of Significance. Any determined impacts must be managed in a Biodiversity Development Assessment Report (BDAR).	2.15
	Where impacts cannot be avoided, the EIS should detail how they will be remedied through biodiversity offsetting, including quantification of impacts and assessments of the value of offset areas, protection mechanisms and associated management regimes of those areas.	2.15, 5.5.4
	We recommend the applicant provide evidence that any learning associated with or ancillary to the activity is not likely to significantly affect threatened species, threatened ecological communities or their habitats. At a minimum that evidence should take the form of a Test of Significance according to the Minister's Guidelines.	5.5.5
	Appropriate measures to avoid, minimise and mitigate any impacts on vegetation and threatened species habitat should be set out in the EIS. If impacts on biodiversity are likely to be significant then the applicant, must mitigate these impacts through the Biodiversity Offset Scheme according to the Biodiversity Conservation Act, namely a Biodiversity Development Assessment Report (BDAR).	2.15, 5.5.4, Appendix 7
	The applicant should also apply the Biodiversity Offset Scheme Entry Threshold tool (BOSET) and submit the report with the application.	Noted
	Where the proposal is likely to significantly affect threatened species within the meaning of Section 7.2 of the Biodiversity Conservation Act 2016, the application for development consent is to be accompanied by a Biodiversity Development Assessment Report, and 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.	5.5.5 Appendix 7
	• 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.	Appendix 7
	• The BDAR must include details of the measures proposed to address the offset obligation as follows:	Appendix 7

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
	BIODIVERSITY (Cont'd)	
NSW Office of Environment & Heritage 20 June 2019 (Cont'd)	– 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.	Appendix 7
	• 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 7
	Regarding the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, the REF should identify any relevant Matters of National Environmental Significance, whether the proposal has been referred to the Australian Government or whether it is already determined to be a controlled action.	N/A
	TRAFFIC AND TRANSPORTATION	
NSW DPI – Agriculture 11 June 2019	Consideration of the route for movements needs to be taken in to account so that impacts on sensitive receptors are minimised (e.g. noise, dust, volume of traffic). This should include consideration of Travelling Stock Reserves 1 (TSR) and the movement of livestock or farm vehicles along / across the affected roads.	2.8.2
Roads & Maritime Services 19 June 2019	A Traffic Impact Assessment (TIA) should be prepared to outline measures to address and manage traffic related Issues generated by the development. 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 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.	Appendix 3
	Any Traffic Impact Assessment needs to address the impacts of traffic generated by this development upon the nearby road network, particularly intersections.	Appendix 3
	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.	Appendix 3
	Roads and Maritime emphasises the need to appropriately consider and minimise the impacts on of the development on the existing road network and maintain the level of safety, efficiency and maintenance along the existing road network.	Appendix 3

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
VISUAL AMENITY		
NSW DPI – Agriculture 11 June 2019	Amenity impacts are assessed and any necessary response to mitigate visual impacts is described and illustrated.	5.8.4
REHABILITATION		
NSW DPI – Agriculture 11 June 2019	Develop Rehabilitation and Decommissioning/Closure Plans that describes the design criteria of the final land use and landform along with the expected timeline for the rehabilitation program.	2.14
	Outline monitoring and mitigation measures to be adopted for rehabilitation remedial actions.	2.14
WaterNSW 18 June 2019	Details of the final landform of the site, including final void management (where relevant) and rehabilitation measures.	2.14
	Landform rehabilitation (including final void management) Where significant modification to landform is proposed, the EIS must include: • Justification of the proposed final landform with regard to its impact on local and regional surface and groundwater systems;	2.14
	• A detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape;	2.14
	• Outline of proposed construction and restoration of topography and surface drainage features if affected by the project;	2.14
	• Detailed modelling of potential groundwater volume, flow and quality impacts of the presence of an inundated final void (where relevant) on identified receptors specifically considering those environmental systems that are likely to be groundwater dependent;	N/A
	• An outline of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation; and	2.14
	• The measures that would be established for the long-term protection of local and regional aquifer systems and for the ongoing management of the site following the cessation of the project.	N/A
CONSULTATION		
NSW DPI – Agriculture 11 June 2019	Consult with relevant agencies such as on the design, construction and operation of the proposed infrastructure.	Appendix 1
	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 and compensation.	1.9
	Establish a complaints register that includes reporting and investigating procedures and timelines, and liaison with Council in relation to complaint issues.	7.2.3
Environment Protection Authority (EPA) 12 June 2019	We recommend that during the preparation of the EIS that the proponent consults with the EPA to ensure that the specific issues identified in the attachments are adequately addressed.	Appendix 1

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
CONSULTATION (Cont'd)		
WaterNSW 12 June 2019	Where new or modified dams are proposed, or where new development will occur below an existing dam, the NSW Dams Safety Committee should be consulted in relation to any safety issues that may arise. Conditions of approval may be recommended to ensure safety in relation to any new or existing dams.	Appendix 1
NSW DPIE – Division of Resources and Geoscience 2 July 2019	The Division 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.	Appendix 1
AIR QUALITY		
Environment Protection Authority (EPA) 12 June 2019	The goals of the project in relation to air quality should be to ensure sensitive receptors are protected from adverse impacts from dust.	
	Details would need to be provided on the proposed measures to manage dust from all sources. Measures to prevent or control the emission of dust from the quarrying activities must be detailed based on the outcome of an assessment of dust emissions undertaken in accordance with the Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales (DECC, 2005). All potentially impacted residential or sensitive premises likely to be impacted by the development must be identified and included in the assessment.	5.2.6, 5.2.7, 5.2.2.1
	The EIS should identify any other existing impacts on air quality within the area and if necessary provide an assessment and commentary on the predicted cumulative impacts that may arise.	5.2.2.3
	Emissions from any plant must meet the design criteria detailed in the Protection of the Environment Operations (Clean Air) Regulation 2010. Details need to be provided on the proposed air pollution control techniques from any air emission points, including proposed measures to manage and monitor efficiency and performance.	5.2.6
NOISE		
Environment Protection Authority (EPA) 12 June 2019	The goals of the project should include design, construction, operation and maintenance of the facility in accordance with relevant EPA policy, guidelines and criteria, and in order to minimise potential impacts from noise.	Noted
	The EPA expects that potential noise sources are assessed in accordance with the *Noise Policy for Industry* (EPA 2017), and where required mitigation measures are proposed (e.g. appropriate equipment chosen to minimise noise levels). All residential or noise sensitive premises likely to be impacted by the development must be identified and included in the assessment.	5.3.3, 5.3.4, 5.3.2.1
	The proposed development may result in an increase in traffic movements associated with the transport of livestock and feed. The number of traffic movements associated with the proposal should be quantified and the potential noise impacts associated with these traffic movements need to be assessed in accordance with the NSW *Road Noise Policy* (DECCW, 2011).	5.1.3, 5.3.6.2

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
NOISE (Cont'd)		
Environment Protection Authority (EPA) 12 June 2019 (Cont'd)	An assessment of vibration from all activities (including construction and operation) to be undertaken on the premises and this should be assessed using the guidelines contained in the document *Assessing Vibration: a technical guideline* (DEC 2006).	5.3.5
	An assessment of potential blast impacts should be undertaken and this should be assessed against the guidelines contained in the document Australian and New Zealand Environment Council - *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZECC, 1990).	5.3.5.4, 5.3.6.3
HERITAGE		
NSW Office of Environment & Heritage 20 June 2019	The EIS should fully describe the proposal, the existing environment and impacts of the development including the location and extent of all proposed works that may impact on the ACH (including the Koomaringa Aboriginal Place) and biodiversity. The scale and intensity of the proposed development should dictate the level of investigation. It is important that all conclusions are supported by adequate data.	2, 4, 5.6
	We recommend that the proposed activity area be subject to a detailed Aboriginal cultural heritage assessment in accordance with the *Guide to Investigation, Assessing and Reporting on Aboriginal Cultural Heritage in NSW and Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010).	Appendix 8
	The EIS must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the proposal. This may include the need for surface survey and test excavation. The identification of cultural heritage values must be conducted in accordance with the *Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW* (OEH 2010), and should be guided by the *Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2011) and consultation with OEH regional branch officers. The Due Diligence process is not appropriate to use as an assessment here.	5.6, Appendix 8
	Where Aboriginal cultural heritage values are identified, consultation with Aboriginal people must be undertaken and documented in accordance with the *Aboriginal cultural heritage consultation requirements for proponents* 2010 (DECCW). The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the EIS.	1.9, 5.6.5, Appendix 8
	Impacts on Aboriginal cultural heritage values are to be assessed and documented in the EIS. The EIS must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.	5.6.4, 5.6.6, Appendix 8

Table A2.2 (Cont'd)
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS

Agency / Organisation	Paraphrased Relevant Requirement	Relevant EIS Section(s)
HERITAGE (Cont'd)		
NSW Office of Environment & Heritage 20 June 2019 (Cont'd)	The assessment of cultural heritage values must include a surface survey undertaken by a qualified archaeologist in areas with potential for subsurface Aboriginal deposits. The result of the surface survey is to inform the need for targeted test excavation to better assess the integrity, extent, distribution, nature and overall significance of the archaeological record. The results of surface surveys and test excavations are to be documented in the EIS.	5.6.3, Appendix 8
	Where harm to an Aboriginal object or declared Aboriginal place cannot be avoided, an Aboriginal Heritage Impact Permit (AHIP) will be required from OEH under the *National Parks and Wildlife Act 1974*. You must apply to OEH for an AHIP prior to commencing works that will directly or indirectly harm an Aboriginal object or a declared Aboriginal place	Noted
	The EIS must outline procedures to be followed in the event Aboriginal burials or skeletal material is uncovered during construction to formulate appropriate measures to manage the impacts to this material.	5.6.4
	The EIS must outline procedures to be followed if Aboriginal objects are found at any stage of the life of the development to formulate appropriate measures to manage unforeseen impacts.	5.6.4

Appendix 3

Traffic Impact Assessment

prepared by

The Transport Planning Partnership Pty Ltd

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Western Riverina Quarry
Road Transport Assessment

Prepared for:

R.W. Corkery & Co. Pty Limited on behalf of
Rockwoods Investment Group Pty Ltd

10 February 2022

The Transport Planning Partnership

Western Riverina Quarry
Road Transport Assessment

Client: R.W. Corkery & Co. Pty Limited on behalf of Rockwoods Investment Group Pty Ltd

Version: Final

Date: 10 February 2022

TTPP Reference: 19471

Quality Record

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Table of Contents

1 Introduction 1
2 Existing and Proposed Operations 3
2.1 Site Location 3
2.2 Existing Quarry Operations 3
2.3 The Proposal 4
3 Existing Road Transport Environment 5
3.1 Road Network and Intersections 5
3.2 Travelling Stock Reserves 5
3.3 Fire Trails 6
3.4 Heavy Vehicle Routes 7
3.5 Traffic Volumes 8
3.5.1 Historic Traffic Volumes 8
3.5.2 Proposal Traffic Surveys 9
3.5.3 Surveyed Traffic Volumes 9
3.6 Road Safety History 11
3.7 Background Traffic Growth 12
3.8 Future Traffic Volumes 12
3.9 Road Network Efficiency 13
3.9.1 Midblock Level of Service 13
3.9.2 Operation of Intersections 15
4 Impacts of the Proposal 16
4.1 Traffic Generation 16
4.2 Traffic Distribution 17
4.3 Future Traffic Volumes 17
4.4 Future Road Network Efficiency 18
4.4.1 Future Midblock Level of Service 18
4.4.2 Future Operation of Intersections 18
4.5 Intersection Treatments 20
4.6 Road Safety 20
4.7 Travelling Stock Reserves 21
4.8 Fire Trails 21
4.9 Mitigation Measures 21
5 Summary and Conclusion 23

Tables

Table 1.1: Coverage of SEARs and Agency Inputs Relevant to Traffic 1
Table 3.1: TfNSW Historic Traffic Volume Data 9
Table 3.2: Surveyed Daily Traffic Volumes 2020 (vehicles per day) 9
Table 3.3: Surveyed Average Weekday Traffic Volumes 2020 (vehicles per day) 10
Table 3.4: Surveyed Daily Traffic Volumes 2020 (vehicles per hour) 11
Table 3.5: Road Crash History Summary 12
Table 3.6: Surveyed and Baseline Future Traffic Volumes 13
Table 3.7: LOS Criteria for Two Lane Two Way Roads 14
Table 3.8: Average Weekday Midblock Level of Service 15
Table 4.1: Average Proposal Material Haulage Trip Generation 16
Table 4.2: Future Weekday Traffic Volumes with the Proposal at Maximum Haulage 17
Table 4.3: Midblock Level of Service with the Proposal Busy Day 18
Table 4.4: Intersection Level of Service Criteria 19
Table 4.5: Operating Conditions Mid Western Highway and Munros Road 20

Figures

Figure 2.1: Regional Location 3
Figure 3.1: Travelling Stock Reserves 6
Figure 3.2: NSW Approved Heavy Vehicle Routes 7
Figure 3.3: NSW Approved Road Train Routes 8
Figure 3.4: Average Weekday Hourly Traffic Distribution 2020 10

Appendices

A. TRAFFIC SURVEYS
B. PHOTOS
C. SIDRA OUTPUTS

References

Austroads (2020a), *Guide to Traffic Management Part 3: Traffic Studies and Analysis Methods.*

Austroads (2020b), *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings.*

NSW Government Local Land Services (2021), *https://www.lls.nsw.gov.au/help-and-advice/growing,-grazing-and-land/travelling-stock-reserves*

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1 Introduction

This report has been prepared on behalf of Rockwoods Investment Group Pty Ltd to present the findings of an assessment of the road transport implications of a proposal to increase the annual production rate at the Western Riverina Quarry also known as Koomaringa Quarries (the Quarry), located approximately 55 kilometres (km) north of Griffith, New South Wales (NSW).

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs), and the relevant input to the SEARs relating to the road transport environment from authorities. The SEARs and agency inputs are presented in Table 1.1.

Table 1.1: Coverage of SEARs and Agency Inputs Relevant to Traffic

Coverage of Secretary's Environmental Assessment Requirements in the EIS		Relevant Section(s)
Coverage of Secretary's Environmental Assessment Requirements in the EIS		
• 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 4.1
• 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 4
• 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 4.9
• a description of access roads, specifically in relation to nearby Crown roads and fire trails.		Section 3.1 Section 3.3 Section 4.8
Coverage of Issues Identified by Other Agencies for Consideration in the EIS		
NSW DPI – Agriculture 11 June 2019	Consideration of the route for movements needs to take in to account so that impacts on sensitive receptors are minimised (e.g. noise, dust, volume of traffic). This should include consideration of Travelling Stock Reserves 1 (TSR) and the movement of livestock or farm vehicles along / across the affected roads.	Section 3.2 Section 4.2 Section 4.7
Roads & Maritime Services (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. 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.	This report
	Any traffic impact assessment needs to address the impacts of traffic generated by this development upon the nearby road network, particularly intersections.	Section 4.4
	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.	Section 4

Coverage of Secretary's Environmental Assessment Requirements in the EIS		Relevant Section(s)
	Roads and Maritime emphasises the need to appropriately consider and minimise the impacts of the development on the existing road network and maintain the level of safety, efficiency and maintenance along the existing road network.	Section 4

The remainder of this report is set out as follows:

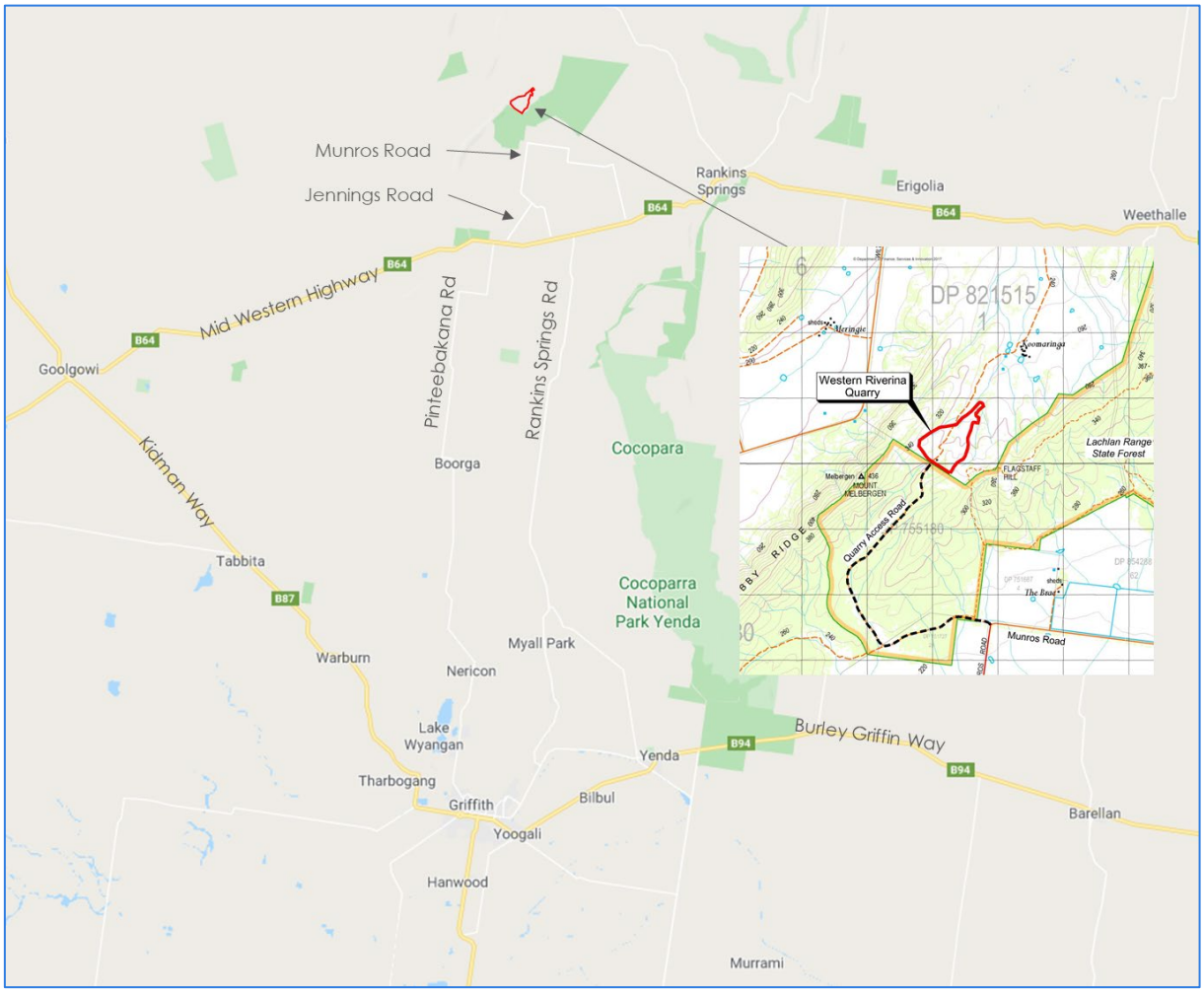
- Section 2 describes the existing and proposed operations at the Quarry and its vehicular access arrangements;
- Section 3 describes the existing road transport environment, including traffic volumes, operational performance and road crash history.
- Section 4 traffic impacts of the Proposal, including its peak traffic generation and the effects on operational performance and road safety on access routes. The need for measures to mitigate impacts of the Proposal is discussed.
- Section 5 presents the conclusions of the study.

2 Existing and Proposed Operations

2.1 Site Location

The Quarry is located approximately 55 km north of Griffith, NSW, within the Carrathool Shire Council (CSC) local government area (LGA). Vehicular access to the Quarry is via the Quarry Access Road and Munros Road, where all trucks turn right and travel to Mid Western Highway. The Quarry's location in the region is outlined in red in Figure 2.1.

Figure 2.1: Regional Location



2.2 Existing Quarry Operations

The Quarry was granted development consent in 1987 (DA1/86), and currently operates under DA2/91 which was granted in 1991. The Quarry currently has approval to extract and process up to 5,000 m^3 of basalt per year, or approximately 13,000 tonnes per annum (tpa). It is understood that the annual production rate has exceeded this limit in recent years.

The extracted material is processed on site and stockpiled prior to transportation to their points of use. Transportation of products from the Quarry uses truck and dog combinations with a maximum payload capacity of 38 t and an average payload of 32 t, thus the approved transport of 13,000 t of products requires 406 loads per year.

The approved route for the transport of products uses the Quarry Access Road and Munros Road to Mid Western Highway. Approximately 80 percent of quarry trucks travel to the west and 20 percent to the east along Mid Western Highway. The Quarry despatches product between 7:00 am and 5:00 pm Monday to Friday, and between 7:00 am and 3:00 pm on Saturdays. It employs four full time people on-site each day.

2.3 The Proposal

The Proposal proposes:

- extraction of basalt and quartzite material from within the proposed extraction area to produce up to 250,000 tpa of Quarry products;
- importation of up to 1,500 tpa of concrete washout and other construction materials for recycling and incorporation in products produced within the Quarry;
- crushing and screening of fragmented rock and imported materials on site using a fixed processing plant;
- pre-coating of up to 20,000 tpa of aggregates;
- transportation of an average of 165,000 tpa and a maximum of 250,000 tpa Quarry products to end points of use within the Carrathool LGA and the broader Riverina region;
- ongoing employment of local personnel; and
- progressive and final rehabilitation of the Quarry to develop a final landform suitable for grazing and passive biodiversity conservation.

Vehicular access would be retained via the Quarry Access Road and Munros Road to Mid Western Highway. The hours within which product would be despatched and the workforce would remain unchanged from those of the approved Quarry. Transport of Quarry products would use the existing fleet of truck and dog trailers, with a maximum payload capacity of 38 t, and an average load of 32 t. Smaller quantities of products would periodically be despatched using other heavy vehicle configurations.

It is anticipated that the Quarry would operate for approximately 30 years from the commencement of operations under the new consent.

As the Proposal would not involve a distinct construction phase, this assessment does not consider construction phase conditions as required by the SEARs (Table 1.1).

3 Existing Road Transport Environment

3.1 Road Network and Intersections

The road network serving the Quarry was observed by TTPP in January 2020, and is described below. Photographs of typical features are provided in Appendix B, and the existing conditions are described below.

The **Quarry Access Road** is a private road which extends from the Munros Road and through the Lachlan Range State Forest, and is used by all Quarry-generated vehicles. Access to the Quarry Access Road is controlled by a gate west of Munros Road. West of the gate, the Quarry Access Road is a gravel road with a privately signposted speed limit of 40 kilometres per hour (km/h). It has no advisory signs, and some roadside guide posts. Sight distance along the access road in both directions is generally sufficient such that drivers have adequate warning of a vehicle approaching from the opposite direction.

Munros Road is a sealed two lane, two-way road with sealed shoulders, and provides all vehicular access to and from the Quarry. Munros Road typically has unbroken edgelines and the centreline varies, including no linemarking, a single broken centreline, or double lines on curves. Advisory signs and guide posts are provided along its length. There is no signposted speed limit on Munros Road, hence the rural default of 100 km/h is assumed to apply. The travel lanes are approximately 3.5 m wide, with a 0.5 m wide sealed shoulder on each side. At its intersection with the Quarry Access Road, Munros Road curves through 90 degrees (south and east), and the Quarry Access Road forms the western approach. At its intersection with Mid Western Highway, Munros Road displays some breakdown of the pavement along the kerbside wheelpath of vehicles approaching Mid Western Highway.

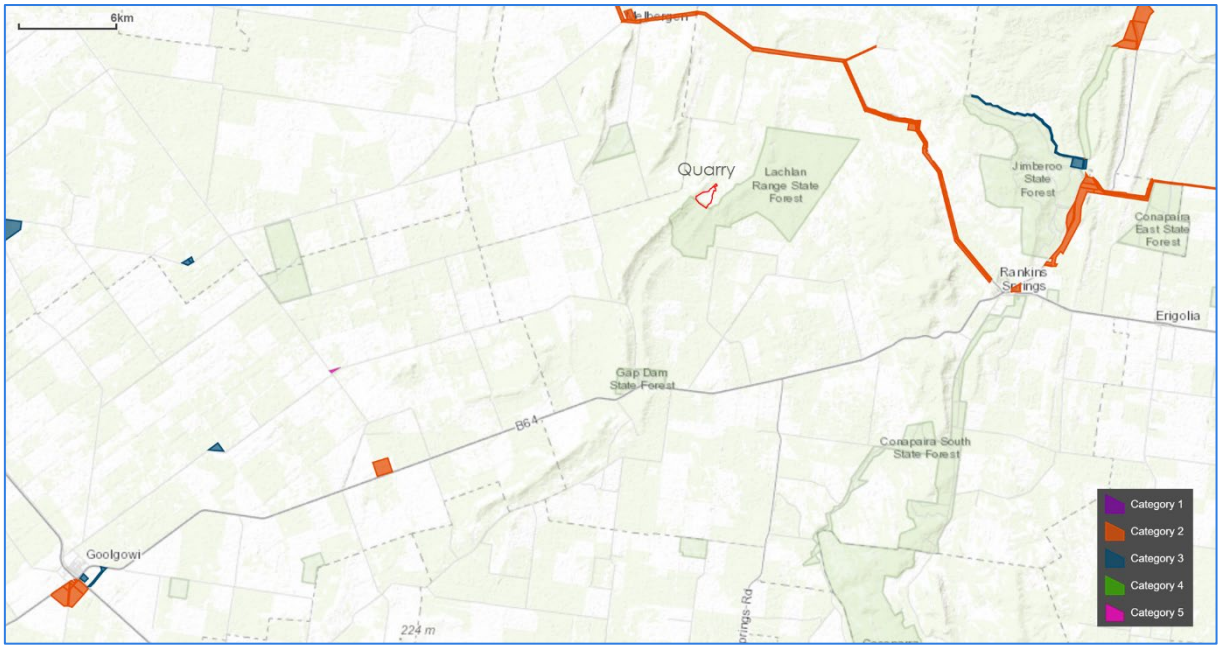
Mid Western Highway provides a major east-west link from Hay, via One Tree, Goolgowi, Rankins Springs, Erigolia, Weethalle, North Yalgaogrin, to West Wyalong. In the vicinity of the Quarry, Mid Western Highway has a single travel lane in each direction with sealed shoulders, solid edge lines and a single broken centre lines. At its intersection with Munros Road, Mid Western Highway follows a straight and level alignment, and sight distances are good.

3.2 Travelling Stock Reserves

Travelling Stock Reserves (TSRs) are parcels of Crown land reserved under legislation for use by travelling stock. TSRs provide pasture reserves for travelling or grazing stock, and are also used for public recreation, apiary sites and for conservation and are categorised depending on their level and type of use. Use of TSRs requires a permit, and stock are only to be walked over TSRs during daylight hours, and yarded at night. When stock are on or near a road, approved warning signs must be displayed for motorists.

Figure 3.1 presents the locations and classifications of TSRs in the vicinity of the Quarry.

Figure 3.1: Travelling Stock Reserves



With regard to the Proposal access routes, there are no TSRs on or near the local roads between the Quarry and Mid Western Highway. There is a Category 2 TSR known as Rankins Springs (R85151) located on the northern side of Mid Western Highway at Rankins Springs approximately 19 km east of the intersection of Jennings Road. There are a number of Category 2 TSRs on Mid Western Highway west of Munros Road, the closest being approximately 20 km to the west (unnamed) and 40 km to the west at Goolgowi (R56838). There is also two Category 3 TSRs near Goolgowi (R55146.

Category 2 TSRs are used for travelling stock, emergency management or biosecurity purposes, but also other reasons, e.g., biodiversity conservation, Aboriginal cultural heritage or recreational purposes. Category 3 TSRs are rarely if ever used for travelling stock or emergency management, but are valued for other reasons, e.g. biodiversity conservation, Aboriginal cultural heritage or recreational purposes.

3.3 Fire Trails

The MIA District Office of NSW Rural Fire Service indicated that there are fire trails within the Lachlan Range, which is managed by State Forests. The Fire Access & Fire Trail Plan 2019 indicates that the Quarry access road is the Lachlan Range State Forest 08 Trail, being a Category 7 Tactical Fire Trail.

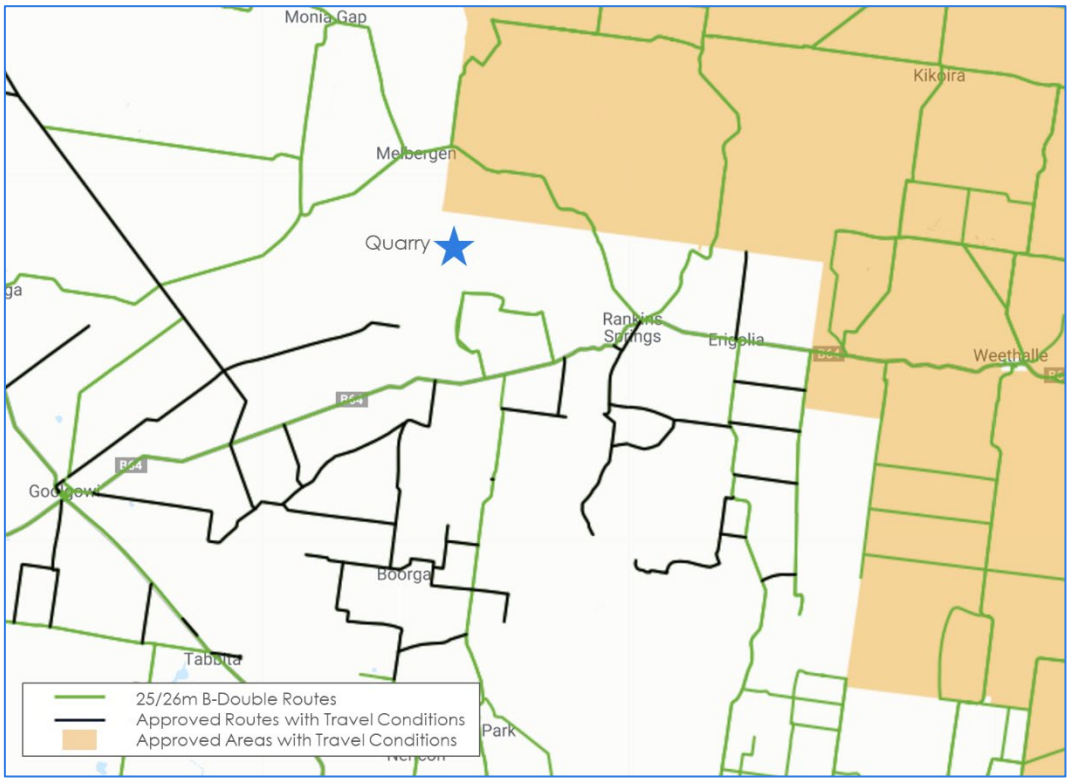
The NSW RFS Fire Trail Standards indicate that tactical fire trails may include multi-purpose trails, and outlines a number of performance criteria for Category 7 trails, which are trails that can be safely traversed by a Category 7 firefighting vehicle. A Category 7 firefighting vehicles is a small truck 6.2m long and 2.04m wide, with a height of 3.05m including aerials. It

has a mass of 7,500 kg and a 17m diameter wall-to-wall turning circle. This vehicle is smaller than those used for transporting material from the Quarry.

3.4 Heavy Vehicle Routes

Mid Western Highway and Munros Road are approved routes for use by 25/26 m GML B-doubles, as shown in Figure 3.2.

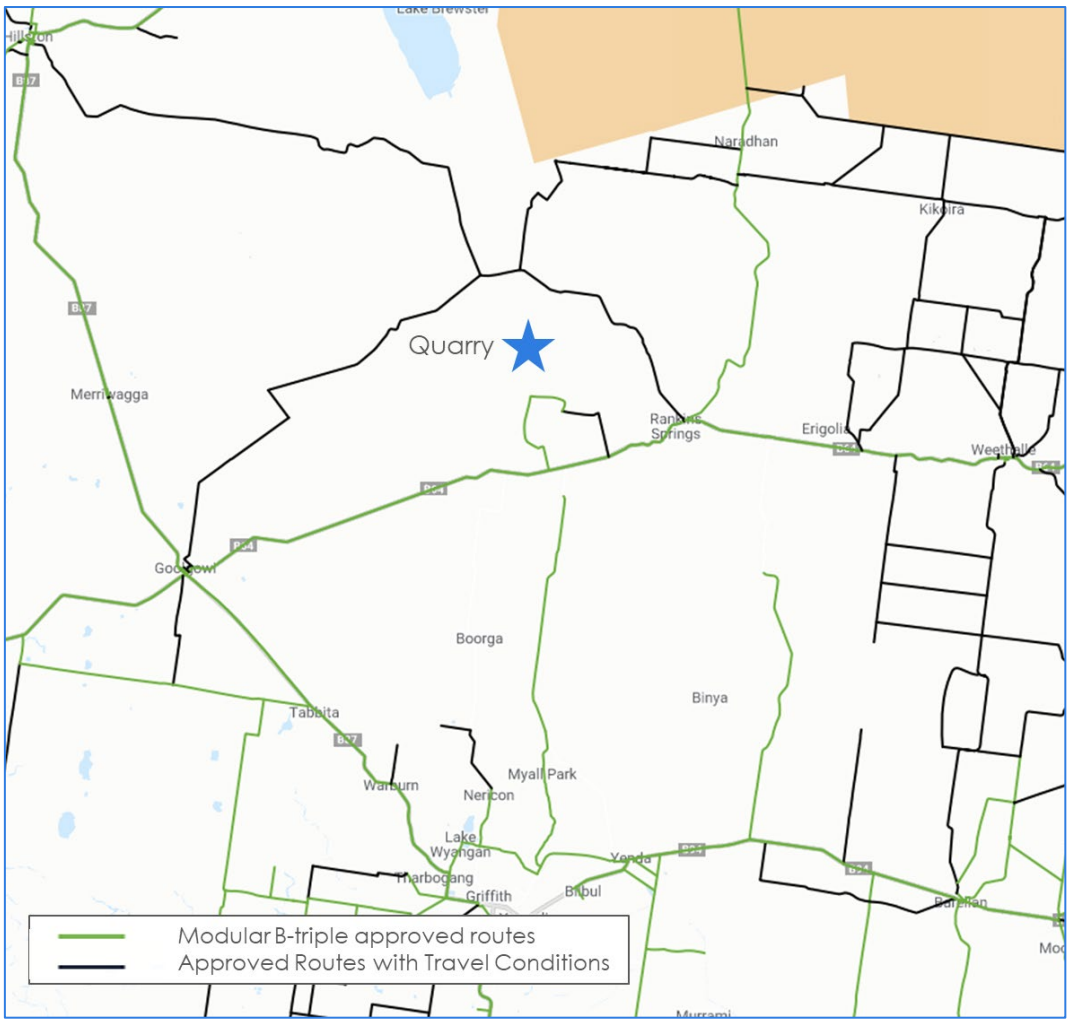
Figure 3.2: NSW Approved Heavy Vehicle Routes



Source: TfNSW, 2021a

Mid Western Highway and Munros Road are also approved for use by Type 1 A-double and Modular B-triple road trains, as shown in Figure 3.3. Use of the eastern leg of Munros Road by road trains is subject to checking with Council regarding road closures.

Figure 3.3: NSW Approved Road Train Routes



Source: TfNSW, 2021b

3.5 Traffic Volumes

3.5.1 Historic Traffic Volumes

Transport for New South Wales (TfNSW) collects and publishes traffic volume data at selected locations on its roads. Available data on roads in the vicinity of the Quarry site were reviewed and collated, noting that only limited data is available in this region. The closest TfNSW count station is located on Mid Western Highway 100m west of Rankins Springs Road (Station ID: 97189).

Data has not been collected at this station since 2010. Notwithstanding, the available Annual Average Daily Traffic (AADT) data are presented in Table 3.1.

Table 3.1: TfNSW Historic Traffic Volume Data

Station	Data Period	Average Vehicles per Day	
		All Days	Weekdays
Mid Western Highway 100 m west of Rankins Springs Road (Station 97189)	16 February 2006 – 27 February 2006	332	353
	12 August 2010 – 22 August 2010	372	393

Reference: TfNSW, 2021c

3.5.2 Proposal Traffic Surveys

To quantify existing traffic conditions in the vicinity of the Proposal, automatic tube counters were used to collect traffic data on:

- Quarry Access Road west of Munros Road;
- Munros Road south of the Quarry Access Road; and
- Mid Western Highway east of Munros Road.

The surveys were conducted over one week from Sunday 16 February to Saturday 22 February 2020 inclusive.

3.5.3 Surveyed Traffic Volumes

The surveys collected details of the day-to-day variation in traffic and the composition of the traffic based on standard vehicle classifications. Light vehicles include motorcycles, cars, vans, four-wheel drives (4WDs), and utilities (including those towing a trailer or caravan). Heavy vehicles include single unit trucks and buses and articulated vehicles such as semitrailers, rigid trucks with trailers, B-doubles and road trains.

Table 3.2 presents a summary of the daily traffic volumes at the surveyed locations, being the total number of vehicles passing the surveyed location in both directions of each 24-hour period.

Table 3.2: Surveyed Daily Traffic Volumes 2020 (vehicles per day)

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Quarry Access Road west of Munros Road	43	45	54	42	25	18	0
Munros Road south of Quarry	55	60	58	41	29	24	4
Mid Western Highway east of Munros Road	368	390	395	346	285	238	235

The results in Table 3.2 demonstrate that traffic conditions are notably different between weekdays and weekend days. As weekdays are the busier days, this assessment will consider the average weekday conditions rather than average daily conditions.

The tube count surveys collected details of the composition of the traffic based on the Austroads standard vehicle classifications. Light vehicles include motorcycles, cars, vans, four-wheel drives, and utilities (including those towing a trailer or caravan). Heavy vehicles include single unit trucks and buses, semi-trailers, rigid trucks with trailers, B-doubles and road trains. The surveyed average weekday composition of traffic are summarised in Table 3.3Table 3.4.

Table 3.3: Surveyed Average Weekday Traffic Volumes 2020 (vehicles per day)

Road and Location	Light	Heavy	Total
Quarry Access Road west of Munros Road	20	22	42
Munros Road south of Quarry	27	22	49
Mid Western Highway east of Munros Road	109	248	357

Table 3.3 demonstrates that heavy vehicles make up a significant proportion of vehicles travelling on the surveyed roads, with 69% of traffic on Mid Western Highway being heavy vehicles. The survey results demonstrate that heavy vehicle traffic on Munros Road south of the Quarry is all generated by the Quarry.

The surveyed temporal distribution of traffic throughout the average weekdays is presented in Figure 3.4, which indicates that on Mid Western Highway, traffic demands increase steadily throughout the morning with no distinct separate morning and evening peak periods. Traffic volumes on the local roads remain steady throughout the day.

Figure 3.4: Average Weekday Hourly Traffic Distribution 2020

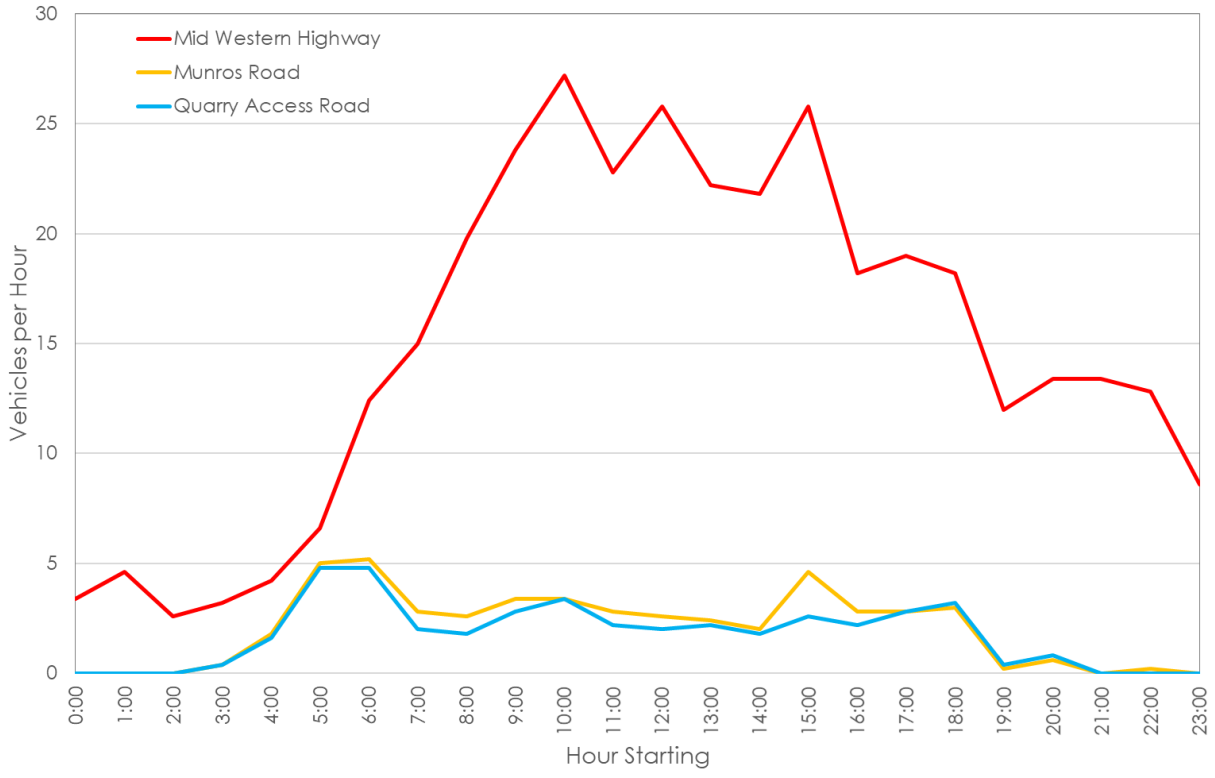


Table 3.4 presents a summary of the surveyed peak hourly traffic volumes at the surveyed locations over the average weekday, being the highest number of vehicles passing the surveyed location in both directions during any one hour before or after midday.

Table 3.4: Surveyed Daily Traffic Volumes 2020 (vehicles per hour)

	AM Peak Hour			PM Peak Hour		
	Hour	Light	Heavy	Hour	Light	Heavy
Quarry Access Road west of Munros Road	6:00	2	3	18:00	2	1
Munros Road south of Quarry	6:00	2	3	15:00	3	1
Mid Western Highway east of Munros Road	10:00	10	17	15:00	9	17

The results in Table 3.4 demonstrate that on weekdays, the highest traffic volumes do not coincide on the three surveyed roads, and that the morning peak traffic on the Quarry Access Road and Munros Road occur prior to the proposed hours of operation for transportation associated with the Proposal. The afternoon peak hour on the Quarry Access Road occurs after the proposed hours of operation for transportation associated with the Proposal. The overall busiest hours are during the morning peak hour.

3.6 Road Safety History

Road crash information was obtained from the Centre for Road Safety (NSW) across a five-year period between 1 July 2015 and 30 June 2019 for those roads in proximity to the Quarry and identified as Proposal heavy vehicle routes. The data include crashes which conform to the national guidelines for reporting and classifying road vehicle crashes based on the following criteria:

- The crash was reported to the police.
- The crash occurred on a road open to the public.
- The crash involved at least one moving vehicle.
- The crash involved at least one person being killed or injured or at least one motor vehicle being towed away.

The review included the Quarry Access Road, Munros Road between the Quarry Access Road and Mid Western Highway, and Mid Western Highway approximately 6 km east and west of Munros Road. Key findings of the review of the crash history on those routes which may be used by Proposal heavy vehicles are summarised below.

Over the period investigated, four crashes were reported, all of which occurred on Mid Western Highway. Key features of those crashes are presented in Table 3.5.

Table 3.5: Road Crash History Summary

Time and Date	Conditions	Crash Details
12:05am on 10 January 2018	Daylight, fine weather and dry road surface	A westbound light truck utility lost control and rolled over on Mid Western Highway approximately 3 km east of Merungi Road. One person was seriously injured and one person was moderately injured.
7:45am on 28 January 2018	Dawn, fine weather and dry road surface	An eastbound utility on Mid Western Highway struck a kangaroo 2 km west of Rankins Springs Road.
6:55am on 4 June 2018	Darkness, fine weather and dry road surface	A westbound utility left the carriageway to the left on a righthand bend on Mid Western Highway and rolled over 70 m east of Sawmill Road. One person was seriously injured. Speeding and fatigue were both nominated as contributing factors.
2:04pm on 13 March 2019	Daylight, fine weather and dry road surface	A westbound 4WD left the carriageway to the left and rolled over approximately 5 km west of Rankins Springs town on Mid Western Highway. One person was seriously injured and one person received minor injuries.

Over the period investigated, no crashes occurred on Munros Road, nor at or near its intersection with Mid Western Highway. The road crash history of the roads does not highlight any particular location with a notably poor crash history which may suggest an inherent concern with the road layout at that location.

3.7 Background Traffic Growth

Changes to existing traffic conditions can be expected to occur which are not directly attributable to any specific development. For the purpose of this assessment, an average growth rate of 2.0 per cent per annum has been assumed to occur on the Proposal heavy vehicle routes in the future, increasing the background (non-Quarry traffic) peak hourly and daily traffic volumes over time. The Quarry's contribution to the surveyed traffic volumes has been estimated assuming that all Quarry-generated traffic travels to and from the east on Mid Western Highway, noting that the volumes would be similar to the west of Munros Road should all Quarry-generated traffic travel to and from the west.

As existing traffic volumes on the Quarry Access Road and Munros Road are low and primarily made up of Quarry-generated traffic, background traffic growth on those roads would be negligible.

3.8 Future Traffic Volumes

A future horizon assuming ten years of growth has been adopted, the forecast baseline traffic volumes assuming the Quarry continues to operate without the Proposal are summarised in Table 3.6. These baseline volumes include the existing traffic generated by the Quarry, and hence assume that the Quarry continues to operate at the existing surveyed level for the next ten years.

Table 3.6: Surveyed and Baseline Future Traffic Volumes

	AM Peak[A] (vehicles per hour)		PM Peak (vehicles per hour)		Daily (vehicles per day)	
	Light	Heavy	Light	Heavy	Light	Heavy
Surveyed 2020						
Quarry Access Road west of Munros Road	2	3	2	1	20	22
Munros Road south of Quarry	2	3	3	1	27	22
Mid Western Highway east of Munros Road	10	17	9	17	109	248
Baseline 2030[B]						
Quarry Access Road west of Munros Road	2	3	2	1	20	22
Munros Road south of Quarry	2	3	3	1	28	22
Mid Western Highway east of Munros Road	12	20	11	21	128	297

[A] *Refer to Table 3.4 for times of peaks hours at the surveyed locations*
[B] *with Quarry operating at 2020 surveyed level of activity, all traffic to/from the east.*

Table 3.6 indicates that with ten years of background growth on the public roads, and the Quarry operating at the same level as surveyed in 2020, Mid Western Highway can be expected to carry up to 32 vehicles per hour and 425 vehicles per day. Munros Road can be expected to carry up to 5 vehicles per hour and 50 vehicles per day.

3.9 Road Network Efficiency

3.9.1 Midblock Level of Service

The capacity of a road is defined as the maximum hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under the prevailing roadway, traffic and control conditions. The capacity of a single traffic lane will be affected by factors such as the pavement width and restricted lateral clearances, the presence of heavy vehicles and grades.

Level of Service (LOS) is defined as a qualitative measure describing the operational conditions within a traffic stream as perceived by drivers and/or passengers. A LOS definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. LOS A provides the best traffic conditions, with no restriction on desired travel speed or overtaking. LOS B to D describes progressively worse traffic conditions. LOS E occurs when traffic conditions are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre in the traffic stream. The service flow rate for LOS E is taken as the capacity of a lane or roadway. In rural situations, LOS C is generally considered to be acceptable. At LOS C, most vehicles are travelling in platoons, and travel speeds are

curtailed. At LOS D, platooning increases significantly, and the demand for passing is high, but the capacity to do so is low. The LOS experienced by drivers on two-way rural roads is dependent on the drivers' expectations regarding the road.

The Austroads (2020a) *Guide to Traffic Management Part 3: Traffic Studies and Analysis* provides guidelines for the capacity and performance of two lane, two-way rural roads, which in turn, refers to the *Highway Capacity Manual* (HCM) (Transportation Research Board, 2016).

The LOS experienced by drivers on two-way rural roads is dependent on the drivers' expectations regarding the road, and three classes of road are defined in the HCM. Class I roads are those on which motorists expect to travel at relatively high speeds. They most often serve long-distance trips or provide connecting links between facilities that serve long-distance trips. Class II roads are those on which motorists do not necessarily expect to travel at high speeds, and may function as access routes to Class I facilities, serve as scenic or recreational routes or pass through rugged terrain. Class III roads serve moderately developed areas, and may be portions of a Class I or Class II highway that pass through small towns or developed recreational areas, where local traffic mixes with through traffic, and the density of unsignalised roadside access points increases.

On Class I roads, LOS is defined in terms of Percent Time Spent Following (PTSF) and Average Travel Speed (ATS), with the worst of these criteria being adopted as the LOS. On Class II roads, LOS is defined only in terms of PTSF. The PTSF is a measure of the level of opportunities to overtake, and is estimated from the demand traffic volumes, the directional distribution of that traffic, and the percentage of no-passing zones. On Class III roads, LOS is defined in terms of Percent of Free-Flow Speed (PFFS), which is the ratio of ATS to the free-flow speed, representing the ability of vehicles to travel at or near the posted speed limit. The LOS criteria for two lane roads are as shown in Table 3.7.

Table 3.7: LOS Criteria for Two Lane Two Way Roads

Level of Service	Class I		Class II	Class III
	Average Travel Speed (km/h)	PTSF (percent)	PTSF (percent)	PFFS (percent)
A	> 90	≤ 35	≤ 40	> 91.7
B	> 80 – 90	> 35 – 50	> 40 – 55	> 83.3 – 91.7
C	> 70 – 80	> 50 – 65	> 55 – 70	> 75.0 – 83.3
D	> 60 – 70	> 65 – 80	> 70 – 85	> 66.7 – 75.0
E	≤ 60	≥ 80	≥ 85	≤ 66.7

Source: Austroads (2020a)

It is noted that the HCM method does not apply to the Quarry Access Road, as the posted speed limit of 40 km/h is below the lower range covered by the HCM method, and the dust raised by vehicles on the gravel surface influences driver behaviour in relation to other vehicles. For the purpose of this assessment Munros Road and Mid Western Highway are

considered to be Class II routes, as drivers would expect some level of delay. Table 3.8 summarises the results of the assessment of midblock LOS on the surveyed roads.

Table 3.8: Average Weekday Midblock Level of Service

	Peak Hour[A]	Inbound to Quarry		Outbound from Quarry	
		PTSF	LOS	PTSF	LOS
Surveyed 2020					
Munros Road south of Quarry	AM Peak	22	A	4	A
	PM Peak	13	A	19	A
Mid Western Highway east of Munros Road	AM Peak	17	A	17	A
	PM Peak	18	A	16	A
Baseline 2030[B]					
Munros Road south of Quarry	AM Peak	22	A	4	A
	PM Peak	13	A	19	A
Mid Western Highway east of Munros Road	AM Peak	17	A	17	A
	PM Peak	19	A	16	A

[A] *Refer to Table 3.4 for times of peaks hours at the surveyed locations*
[B] *with Quarry operating at 2020 surveyed level of activity*

The results indicate that midblock levels of service on Munros Road and Mid Western Highway are currently good during the surveyed morning and evening peak hours. With background growth in traffic demands which are unrelated to the Proposal, levels of service would remain at their current levels, with drivers experiencing only minor delays as a result of other traffic.

3.9.2 Operation of Intersections

At unsignalised intersections with minor roads, where there are relatively low volumes of through and turning vehicles, capacity considerations are usually not significant, and detailed analysis of capacity is not warranted. As a guide, at volumes below the following combinations of maximum hourly volumes at a cross intersection with a two lane two-way road, capacity analysis is not warranted:

- major road 400 vehicles per hour, minor road 250 vehicles per hour;
- major road 500 vehicles per hour, minor road 200 vehicles per hour; and
- major road 650 vehicles per hour, minor road 100 vehicles per hour.

Comparing the surveyed and baseline traffic volumes with the threshold volumes above, it is evident that as the peak hourly volumes on Mid Western Highway are up to 32 vehicles per hour, and on Munros Road are up to 5 vehicles per hour, the future volumes are well below the threshold volumes for analysis, and as such, there is no concern regarding the capacity and operation of the intersections of the Quarry Access Road with Munros Road, and Munros Road with Mid Western Highway.

4 Impacts of the Proposal

4.1 Traffic Generation

The Proposal anticipates an annual production rate of an average of 165,000 tpa up to a maximum of 250,000 tpa of basalt and quartzite material. Based on the Proposal operating hours, haulage would take place up to ten hours per weekday and eight hours per Saturday over 50 weeks per year.

On this basis, Table 4.1 compares the average daily trips generated by the haulage of material for the proposed average and maximum annual production rates. This assumes continuous operation throughout 50 operating weeks per year, 10 hours per weekday and eight hours per Saturday, i.e. total 2,900 operating hours per year.

Table 4.1: Average Proposal Material Haulage Trip Generation

	Average Production 165,000 tpa	Maximum Production 250,000 tpa
Loads per year (32 t per load)	5,156	7,813
Loads per hour	1.8	2.7
Loads per Weekday	18	27
Vehicle Trips per Weekday	**36**	**54**
Loads per Saturday	14	22
Vehicle Trips per Saturday	28	44

On an average weekday at average production, the Proposal would generate 14 additional heavy vehicle trips above that surveyed in February 2020, and on an average weekday at maximum production, the Proposal would generate 32 additional heavy vehicle trips above that surveyed in February 2020.

As haulage would occur on a campaign basis, the number of trips on any particular day would vary from the average. A maximum of 12 loads would be despatched from the Quarry during any one hour, and a maximum of 60 loads would be despatched from the Quarry on any one day. With the inbound movements of the unladen trucks, the maximum trip generation associated with materials haulage would be 24 heavy vehicle trips per hour, and 120 heavy vehicle trips per day. These maximum levels of trip generation associated with product transport would not be sustained on an ongoing basis.

To the extent possible, the importing of up to 1,500 tpa of material for processing and recycling at the Quarry would make use of backloading the trucks used to transport Quarry products from the site. The importing of material would therefore not generate additional trips above those assumed for the peak conditions as described above.

Consistent with the existing Quarry operations, the workforce and non-employee visitors would continue to travel to and from the Quarry site each day, typically in light vehicles. As

the number of employees and visitors would not be altered with the Proposal, these trips are included in the surveyed traffic in February 2020 and would not change as a result of the Proposal.

4.2 Traffic Distribution

All Proposal-generated vehicles would access the Proposal via Mid Western Highway, Munros Road and the Quarry Access Road. On average, it is expected that 20 percent of the Proposal heavy vehicles would travel to and from the east on Mid Western Highway, and 80 percent would travel to and from the west on Mid Western Highway. As haulage occurs on a campaign basis, on any one day, all Proposal-generated heavy vehicles may however approach and depart in one direction, depending on the destination of materials being transported on that day.

4.3 Future Traffic Volumes

The forecast future peak hourly and weekday traffic volumes are summarised in Table 4.2. Consistent with Table 3.6, this assumes all Proposal-generated heavy vehicles may travel east on Mid Western Highway on any one day, noting that the volumes would be similar west of Munros Road should all Proposal traffic travel to and from the west. These forecasts assume that the peak trips generated by the Proposal may coincide with the peak background trips on the road network. As previously noted (Section 3.5), the existing peak traffic on the Quarry Access Road and Munros Road occurs outside of the hours of operation for transportation associated with the Proposal, hence this assumption will result in a small overestimate of future peak hourly traffic volumes.

Table 4.2: Future Weekday Traffic Volumes with the Proposal at Maximum Haulage

	AM Peak[A] (vehicles per hour)		PM Peak[A] (vehicles per hour)		Daily (vehicles per day)	
	Light	Heavy	Light	Heavy	Light	Heavy
2020 with Proposal						
Quarry Access Road west of Munros Road	2	24	2	24	20	120
Munros Road south of Quarry	2	24	3	24	27	120
Mid Western Highway east of Munros Road[B]	10	38	9	40	109	346
2030 with Proposal						
Quarry Access Road west of Munros Road	2	24	2	24	20	120
Munros Road south of Quarry	2	24	3	24	28	120
Mid Western Highway east of Munros Road[B]	12	41	11	44	128	395

[A] *Refer to Table 3.4 for times of peaks hours at the surveyed locations.*
[B] *Assumes all Proposal product haulage occurs to and from the east.*

Table 4.2 indicates that with ten years of background growth on the public roads, and the Proposal operating at its maximum haulage rates during the peak hours and over the day, Mid Western Highway can be expected to carry up to 55 vehicles per hour and 523 vehicles per day. Munros Road can be expected to carry up to 27 vehicles per hour and 148 vehicles per day.

4.4 Future Road Network Efficiency

4.4.1 Future Midblock Level of Service

The impact of the Proposal on the midblock level of service experienced by drivers on the Proposal access roads has been assessed using the HCM analysis method described in Section 3.9.1. The results are summarised in Table 4.3.

Table 4.3: Midblock Level of Service with the Proposal Busy Day

	Peak Hour	Inbound to Quarry		Outbound from Quarry	
		PTSF	LOS	PTSF	LOS
2020 with Proposal					
Munros Road south of Quarry	AM Peak	18	A	16	A
	PM Peak	16	A	18	A
Mid Western Highway east of Munros Road	AM Peak	17	A	16	A
	PM Peak	16	A	18	A
2030 with Proposal					
Munros Road south of Quarry	AM Peak	18	A	16	A
	PM Peak	16	A	18	A
Mid Western Highway east of Munros Road	AM Peak	17	A	16	A
	PM Peak	16	A	18	A

The results indicate that midblock levels of service on Munros Road and Mid Western Highway would remain good during the morning and evening peak hours with the combined effects of background traffic growth and additional Proposal-generated traffic. Drivers would experience only minor delays as a result of other traffic, and the Level of Service would remain unchanged from those expected without the Proposal traffic.

4.4.2 Future Operation of Intersections

The Proposal would increase the number of vehicles turning into and out of the existing intersection of Munros Road with the Quarry Access Road, and Mid Western Highway with Munros Road. Comparing the future peak hour traffic volumes on these roads with the Proposal traffic (Table 4.2) with the threshold volumes for intersection performance described in Section 3.9.2, it is evident that the future peak hourly volumes are well below the threshold volumes for analysis, and as such, there is no capacity concern regarding the operation of the intersections of Munros Road with Mid Western Highway and the Quarry Access Road.

Nevertheless, the operation of the intersection of Munros Road with Mid Western Highway has been assessed using SIDRA INTERSECTION, an analysis program which determines characteristics of intersection operating conditions including the degree of saturation, average delays, and levels of service. The degree of saturation, or x-value, is the ratio of the arrival rate of vehicles to the capacity. The average delay, expressed in seconds per vehicle, is measured over all movements at signalised intersections, and over the movement with the highest average delay at roundabout and priority intersections. Average vehicle delay is the commonly used measure of intersection performance defined by TfNSW. Table 4.4 shows the criteria adopted by TfNSW for assessing the level of service.

Table 4.4: Intersection Level of Service Criteria

Level of Service (LoS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 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	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Note: Average delay per vehicle is measured as seconds per vehicle.

The analyses have considered the forecast future conditions in 2030 with Quarry haulage occurring at the maximum rate of 12 loads per hour (24 heavy vehicle trips per hour) coinciding with the peak conditions on Mid Western Highway. Two options have been considered, one in which all traffic on Munros Road travels to and from the west on Mid Western Highway, and one in which all traffic on Munros Road travels to and from the east on Mid Western Highway.

Table 4.5 presents a summary of the existing and forecast baseline peak hour operating characteristics of the intersection, noting that as the intersection is under priority control, the reported average delay is for the movement with the highest average delay per vehicle. Detailed results, including vehicle queues are presented in Appendix C. The SIDRA analyses have robustly assumed that all heavy vehicles are larger heavy or articulated vehicles.

Table 4.5: Operating Conditions Mid Western Highway and Munros Road

	AM Peak Hour			PM Peak Hour		
	X-Value	Average Delay[B]	LoS	X-Value	Average Delay[B]	LoS
2030 Peak Hourly Haulage to/from West only	0.03	10.7	A	0.03	11.5	A
2030 Peak Hourly Haulage to/from East only	0.04	10.8	A	0.04	11.0	A

[A] *seconds per vehicle for the movement with the highest average delay per vehicle.*

On the basis of the above assessment results and observations of operating conditions, the intersection of Mid Western Highway with Munros Road is expected to continue to operate at good levels of service during peak periods, with spare capacity and acceptable delays regardless of which direction haulage trips are made on Mid Western Highway.

4.5 Intersection Treatments

The geometry of the intersection of Munros Road with Mid Western Highway has been reviewed with regard to its future traffic demands in comparison with the Austroads (2020b) warrants for greenfields rural intersection treatments.

As noted, while the distribution of Proposal-generated haulage trips would be distributed both to the east and west on Mid Western Highway, on any one day, all haulage trips may be to/from the east or the west, thus these two options have been considered with respect to the intersection design requirements. Under both options, the forecast 2030 peak hourly traffic volumes at the intersection of Mid Western Highway and Munros Road warrant the general minimum preferred treatment for rural road intersections. These are Basic Auxiliary Left (BAL) and Basic Auxiliary Right (BAR) treatments. The existing layout generally meets the minimum treatment type, having a widened seal on both sides of Mid Western Highway in the vicinity of the intersection to assist vehicles turning left and right into Munros Road (refer to photographs in Appendix B). No upgrading of the intersection geometry would be required as a result of the Proposal.

4.6 Road Safety

The road crash history of the Proposal access routes did not identify any causation factors which may be exacerbated by increased traffic resulting from the Proposal.

Sight distances at the intersection of Munros Road with Mid Western Highway are good, and adequate for the needs of light and heavy vehicle drivers using the intersection. As described in Section 4.5, the existing intersection geometry is consistent with that suggested by Austroads (2020b) on safety grounds.

4.7 Travelling Stock Reserves

The additional traffic generated by the Proposal may on some days, use those parts of Mid Western Highway where there are existing Category 2 TSRs. On average, compared with the surveyed conditions in February 2020, the Proposal would generate 14 additional heavy vehicle trips per day, and 54 additional heavy vehicle trips on an average day during peak production.

The additional traffic generated by the Proposal would not have a significant impact on the TSRs on or near Mid Western Highway, as the use of the TSRs for travelling stock would be subject to the usual permit conditions, with warning signs to be provided to motorists where stock are on or near the road.

4.8 Fire Trails

The Proposal does not change any aspect of the Quarry Access Road, which is also used as a Category 7 Tactical Fire Trail. The road would continue to be able to be safely traversed by a Category 7 firefighting vehicle, and no upgrades to the road are warranted by the Proposal as a result of its use as a fire trail.

4.9 Mitigation Measures

It is recommended that Consent for the Proposal be conditional upon the number of departing trucks being limited to a maximum of 60 per day and 12 per hour. Consent should also require that accurate records of the number of haulage trucks departing the Quarry be maintained.

It is recommended that drivers of Proposal haulage trucks be subject to operational protocols relating to driver behaviour and interaction with other roads users, which may be included in a Proposal Traffic Management Plan (TMP) as part of the Environmental Management Plan for the operations. The TMP would form part of the employee contract or transport contractual arrangements and would address such matters as:

- compliance with access routes;
- road rules, laws and regulations, including the use of mobile phones;
- respecting the rights of other road users and displaying courtesy to other motorists;
- maintaining safe following distances between vehicles, and increasing separation in poor weather;
- vehicle condition and maintenance;
- medical fitness of the driver;
- covering of loads;
- reporting of any unsafe driving practices or incidents;

- maintaining communication with other drivers to minimise the potential for delays to traffic on the public road near the site access; and
- driver behaviour expectations at any specific locations or situations on the public road network including near schools and TSRs.

With the exception of the Quarry Access Road, the transport routes are sealed roads, so dust is not raised by the movement of trucks. Dust suppression within the Quarry is managed using a mobile water cart as required, and it is recommended that this continue with the Proposal.

As the existing intersection of Munros Road with the Quarry Access Road has an atypical priority, it is recommended that with the increased traffic with the Proposal, the priority be clarified with installation of a "GIVE WAY" sign facing drivers exiting the Quarry Access Road. Vehicles exiting the Quarry would be required to give way to vehicles travelling in both directions on Munros Road.

As described in Section 3.1, there is some pavement damage on Munros Road along the kerbside wheel path of vehicles approaching the intersection of Mid Western Highway that would likely be exacerbated by the increased number of truck movements with the Proposal. The Proposal would contribute to the cost of upgrading the pavement structure to accommodate the Quarry-generated heavy vehicles via contributions made under CSC's *Section 7.12 Fixed Levy Plan*.

5 Summary and Conclusion

This study has found that at average production, the Proposal would generate an average of 36 heavy vehicle trips per weekday, and an average of 54 heavy vehicle trips per weekday at peak production.

A robust assessment of maximum haulage of up to 12 truckloads in any one hour and a maximum of 120 truckloads in any one day has been conducted, which demonstrates that the increased trips would be accommodated on the surrounding road network with acceptable impacts on the capacity, efficiency and safety of the road network. No upgrading of the geometry of existing roads or intersections would be required as a result of the Proposal.

It is recommended that consent for the Proposal be conditional upon:

- limiting the number of departing trucks to a maximum of 60 per day and 12 per hour, and maintaining accurate records of the number of haulage trucks;
- development and implementation of a TMP as part of the Environmental Management Plan for the Proposal, outlining operational protocols relating to driver behaviour and interaction with other road users;
- continued dust suppression within the site;
- installation of a "GIVE WAY" sign facing drivers exiting the Quarry access road at its intersection with Munros Road; and
- contributions being made to the cost of upgrading the damaged pavement structure on Munros Road at Mid Western Highway to accommodate the Quarry-generated heavy vehicles via CSC's *Section 7.12 Fixed Levy Plan*.

Appendix A

Traffic Surveys

Site 4.1 Western Riverina Quarry Access Rd [40] — Eastbound

Day	*Sun*	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*W/Day*	*W/End*	*7 Day*
Time	16/02/20	17/02/2020	18/02/2020	19/02/2020	20/02/2020	21/02/2020	22/02/2020	*Ave.*	*Ave.*	*Ave*
0:00	0	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	0	0	0
5:00	0	0	0	0	0	0	0	0	0	0
6:00	0	3	2	5	2	1	0	3	0	2
7:00	0	0	4	0	0	0	0	1	0	1
8:00	0	0	0	1	1	0	1	0	1	0
9:00	0	2	1	2	0	0	0	1	0	1
10:00	0	3	0	2	2	2	0	2	0	1
11:00	0	1	4	2	1	0	1	2	1	1
12:00	0	0	0	3	1	0	0	1	0	1
13:00	0	0	2	1	1	0	0	1	0	1
14:00	0	1	3	1	0	0	1	1	1	1
15:00	0	1	0	4	0	1	1	1	1	1
16:00	0	1	2	2	1	3	5	2	3	2
17:00	0	2	1	0	4	4	0	2	0	2
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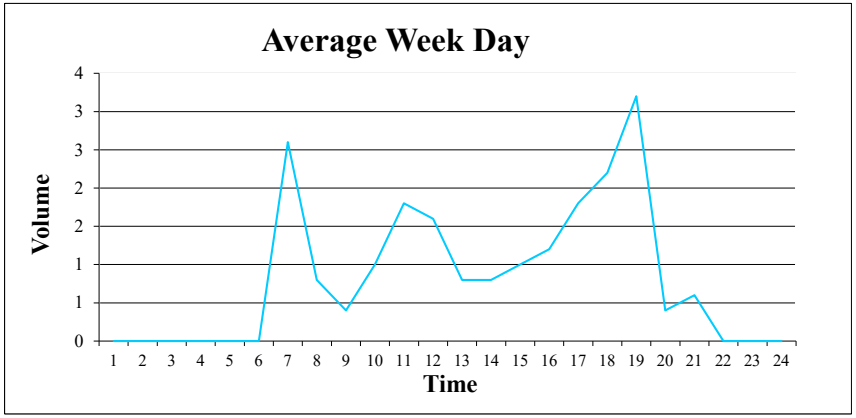
19:00	0	0	0	1	1	0	0	0	0	0
20:00	0	1	1	1	0	0	0	1	0	0
21:00	0	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0
Total	**0**	**20**	**23**	**26**	**20**	**12**	**9**	**20**	**5**	**16**



Summary

	from	to	
AM Peak	6:00 AM	7:00 AM	**5**
PM Peak	6:00 PM	7:00 PM	**6**
		Week Day Average	**20**
		Weekend Day Average	**4**
		7 Day Average	**16**

Site 4.1 Western Riverina Quarry Access Rd [40] — Westbound

Day	*Sun*	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*W/Day*	*W/End*	*7 Day*
Time	16/02/20	17/02/2020	18/02/2020	19/02/2020	20/02/2020	21/02/2020	22/02/2020	*Ave.*	*Ave.*	*Ave*
0:00	0	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0
3:00	0	1	0	1	0	0	0	0	0	0
4:00	0	1	2	0	2	3	0	2	0	1
5:00	0	4	7	7	4	2	5	5	3	4
6:00	0	0	2	3	2	4	1	2	1	2
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10:00	0	1	1	3	2	1	0	2	0	1
11:00	0	0	2	0	1	0	0	1	0	0
12:00	0	1	3	1	1	0	1	1	1	1
13:00	0	2	1	2	1	1	0	1	0	1
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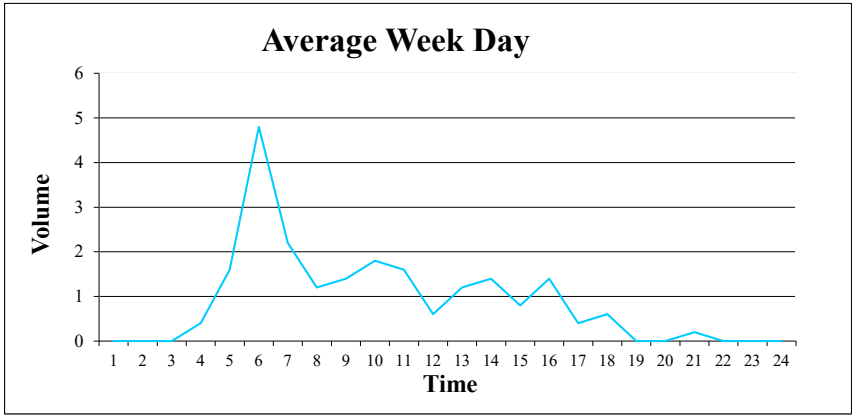
21:00	0	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0
Total	**0**	**23**	**22**	**28**	**22**	**13**	**9**	**22**	**5**	**17**



Summary

	from	to	
AM Peak	5:00 AM	6:00 AM	**7**
PM Peak	3:00 PM	4:00 PM	**4**
		Week Day Average	**22**
		Weekend Day Average	**5**
		7 Day Average	**17**

Site 4.2 Munros Rd S of Quarry Access Rd [80] — Northbound

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	W/Day	W/End	7 Day
Time	16/02/20	17/02/2020	18/02/2020	19/02/2020	20/02/2020	21/02/2020	22/02/2020	Ave.	Ave.	Ave
0:00	1	0	0	0	0	0	1	0	1	0
1:00	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0
3:00	0	1	0	1	0	0	0	0	0	0
4:00	0	1	2	1	2	3	0	2	0	1
5:00	0	4	7	6	4	2	5	5	3	4
6:00	0	1	2	3	2	4	2	2	1	2
7:00	0	4	2	1	3	0	0	2	0	1
8:00	0	2	0	4	3	0	1	2	1	1
9:00	0	4	2	4	0	1	0	2	0	2
10:00	0	2	1	1	1	1	0	1	0	1
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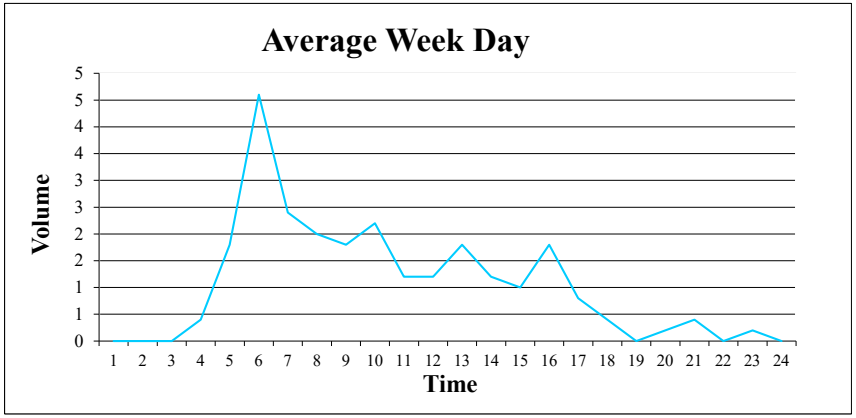
17:00	0	2	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0
19:00	1	0	1	0	0	0	2	0	2	1
20:00	0	0	2	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0	0
22:00	0	0	1	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0
Total	**3**	**28**	**31**	**30**	**22**	**16**	**14**	**25**	**9**	**21**



Summary

	from	to	
AM Peak	5:00 AM	6:00 AM	**7**
PM Peak	12:00 PM	1:00 PM	**4**
		Week Day Average	**25**
		Weekend Day Average	**9**
		7 Day Average	**21**

Site 4.2 Munros Rd S of Quarry Access Rd [80] — Southbound

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	W/Day	W/End	7 Day
Time	16/02/20	17/02/2020	18/02/2020	19/02/2020	20/02/2020	21/02/2020	22/02/2020	Ave.	Ave.	Ave
0:00	0	0	0	0	0	0	0	0	0	0
1:00	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0
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8:00	0	1	0	2	0	1	1	1	1	1
9:00	0	3	2	1	0	0	0	1	0	1
10:00	1	3	1	3	1	3	1	2	1	2
11:00	0	2	3	2	1	0	1	2	1	1
12:00	0	0	0	4	0	0	0	1	0	1
13:00	0	3	1	1	1	0	0	1	0	1
14:00	0	2	2	1	0	0	1	1	1	1
15:00	0	1	4	6	2	1	1	3	1	2
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18:00	0	5	4	1	5	0	0	3	0	2
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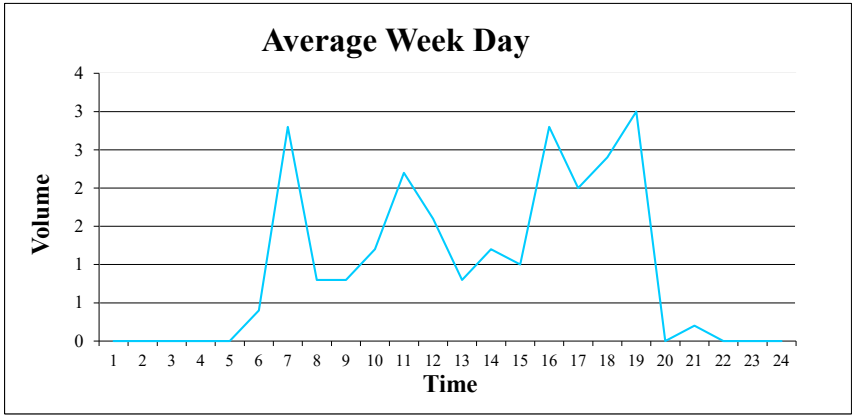
22:00	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0
Total	**1**	**27**	**29**	**28**	**19**	**13**	**10**	**23**	**6**	**18**

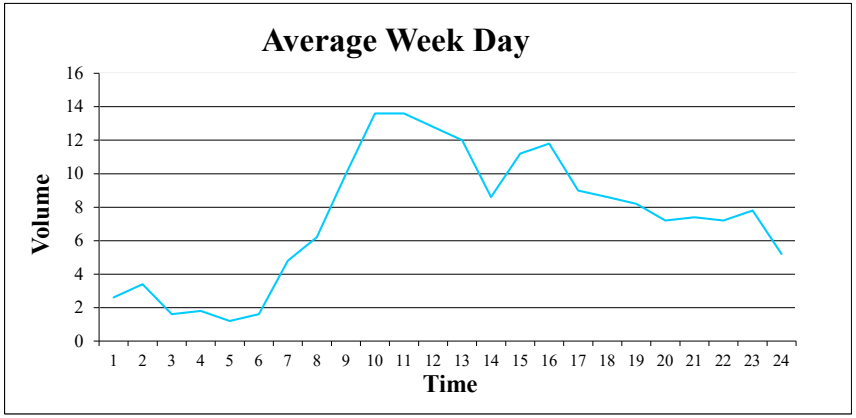


Summary

	from	to	
AM Peak	6:00 AM	7:00 AM	**5**
PM Peak	3:00 PM	4:00 PM	**6**
		Week Day Average	**23**
		Weekend Day Average	**6**
		7 Day Average	**18**

Site 4.3 Mid Western Hwy E of Munros Rd [100] — Eastbound

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	W/Day	W/End	7 Day
Time	16/02/20	17/02/2020	18/02/2020	19/02/2020	20/02/2020	21/02/2020	22/02/2020	Ave.	Ave.	Ave
0:00	2	1	4	2	1	5	4	3	3	3
1:00	0	0	6	3	4	4	2	3	1	3
2:00	2	0	2	5	1	0	1	2	2	2
3:00	1	4	0	2	2	1	1	2	1	2
4:00	1	0	1	0	2	3	0	1	1	1
5:00	1	1	2	2	3	0	2	2	2	2
6:00	0	2	5	5	6	6	3	5	2	4
7:00	4	5	10	6	7	3	2	6	3	5
8:00	3	7	7	14	11	11	16	10	10	10
9:00	8	15	16	12	15	10	11	14	10	12
10:00	5	13	18	15	13	9	8	14	7	12
11:00	8	13	13	10	17	11	8	13	8	11
12:00	9	10	8	22	12	8	4	12	7	10
13:00	8	8	12	6	11	6	7	9	8	8
14:00	5	18	7	14	8	9	5	11	5	9
15:00	3	11	16	11	14	7	7	12	5	10
16:00	4	9	8	10	7	11	5	9	5	8
17:00	2	11	5	11	12	4	4	9	3	7
18:00	9	11	5	7	13	5	2	8	6	7
19:00	3	7	7	8	5	9	6	7	5	6
20:00	3	11	9	7	7	3	5	7	4	6
21:00	4	7	12	7	3	7	6	7	5	7
22:00	3	6	4	12	10	7	5	8	4	7
23:00	2	8	8	5	2	3	2	5	2	4
Total	**90**	**178**	**185**	**196**	**186**	**142**	**116**	**177**	**103**	**156**

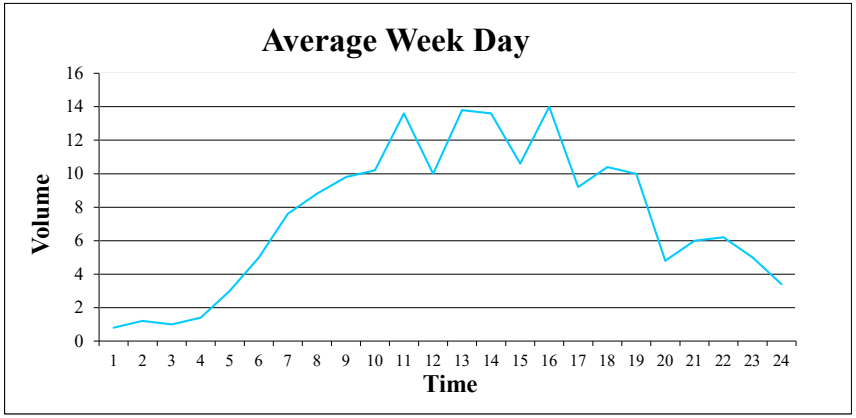


Summary

	from	to	
AM Peak	10:00 AM	11:00 AM	**18**
PM Peak	12:00 PM	1:00 PM	**22**
		Week Day Average	**177**
		Weekend Day Average	**103**
		7 Day Average	**156**

Site 4.3 Mid Western Hwy E of Munros Rd [100] — Westbound

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	W/Day	W/End	7 Day
Time	16/02/20	17/02/2020	18/02/2020	19/02/2020	20/02/2020	21/02/2020	22/02/2020	Ave.	Ave.	Ave
0:00	1	0	0	3	1	0	2	1	2	1
1:00	1	0	3	2	0	1	0	1	1	1
2:00	1	2	1	1	0	1	0	1	1	1
3:00	0	2	2	1	0	2	0	1	0	1
4:00	1	5	2	4	2	2	0	3	1	2
5:00	1	4	7	5	5	4	5	5	3	4
6:00	1	5	10	7	7	9	6	8	4	6
7:00	3	24	6	5	3	6	8	9	6	8
8:00	13	9	10	13	11	6	8	10	11	10
9:00	8	10	9	15	9	8	8	10	8	10
10:00	11	9	15	14	17	13	5	14	8	12
11:00	11	9	14	7	12	8	5	10	8	9
12:00	10	16	20	17	10	6	15	14	13	13
13:00	17	16	13	16	13	10	6	14	12	13
14:00	12	15	10	14	6	8	14	11	13	11
15:00	13	9	14	16	14	17	9	14	11	13
16:00	6	8	7	16	7	8	4	9	5	8
17:00	8	14	16	6	7	9	6	10	7	9
18:00	9	8	16	8	10	8	6	10	8	9
19:00	6	6	4	5	6	3	3	5	5	5
20:00	5	8	6	4	6	6	4	6	5	6
21:00	2	3	11	8	6	3	5	6	4	5
22:00	2	4	6	9	4	2	0	5	1	4
23:00	3	4	3	3	4	3	3	3	3	3
Total	**145**	**190**	**205**	**199**	**160**	**143**	**122**	**179**	**134**	**166**



Summary

	from	to	
AM Peak	7:00 AM	8:00 AM	**24**
PM Peak	12:00 PM	1:00 PM	**20**
		Week Day Average	**179**
		Weekend Day Average	**134**
		7 Day Average	**166**

Appendix B

Photos

Looking North on Munros Road north of Mid Western Highway

Looking North on Munros Road at Quarry Access (on left)

Looking East from Quarry Access to Munros Road Intersection

Looking West on Quarry Access off Munros Road

Looking West on Quarry Access at Site Gate

Looking East on Mid Western Highway at Intersection with Munros Road (on left)

Looking West on Mid Western Highway at Intersection with Munros Road (on right)

Widened Shoulder on Mid Western Highway for Left Turn Exit from Munros Road

Widened Shoulder on South Side of Mid Western Highway at Munros Road

Widened Shoulder on South Side of Mid Western Highway at Munros Road

Pavement Damage on Left Turn from Munros Road to Mid Western Highway

Appendix C

SIDRA Outputs

MOVEMENT SUMMARY

Site: 101 [AM East Mid Western Hwy and Munros Rd]

2030 with Project traffic
to/from East only
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
East: Mid Western Hwy E												
5	T1	17	56.3	0.038	0.3	LOS A	0.2	3.3	0.14	0.29	0.14	93.9
6	R2	15	85.7	0.038	10.8	LOS A	0.2	3.3	0.14	0.29	0.14	51.6
Approach		32	70.0	0.038	5.2	NA	0.2	3.3	0.14	0.29	0.14	67.9
North: Munros Rd												
7	L2	13	100.0	0.021	10.0	LOS A	0.1	2.0	0.16	0.61	0.16	56.8
9	R2	1	0.0	0.021	7.7	LOS A	0.1	2.0	0.16	0.61	0.16	73.3
Approach		14	92.3	0.021	9.9	LOS A	0.1	2.0	0.16	0.61	0.16	57.8
West: Mid Western Hwy W												
10	L2	1	0.0	0.016	7.8	LOS A	0.0	0.0	0.00	0.04	0.00	86.3
11	T1	16	60.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	97.0
Approach		17	56.3	0.016	0.5	NA	0.0	0.0	0.00	0.04	0.00	96.3
All Vehicles		62	71.2	0.038	4.9	NA	0.2	3.3	0.11	0.30	0.11	70.8

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 [AM West Mid Western Hwy and Munros Rd]

2030 with Project traffic
to/from West only
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
East: Mid Western Hwy E												
5	T1	17	56.3	0.016	0.0	LOS A	0.0	0.1	0.02	0.04	0.02	97.3
6	R2	1	0.0	0.016	7.6	LOS A	0.0	0.1	0.02	0.04	0.02	86.0
Approach		18	52.9	0.016	0.5	NA	0.0	0.1	0.02	0.04	0.02	96.5
North: Munros Rd												
7	L2	1	0.0	0.030	7.9	LOS A	0.1	2.3	0.23	0.65	0.23	72.8
9	R2	13	100.0	0.030	10.7	LOS A	0.1	2.3	0.23	0.65	0.23	55.2
Approach		14	92.3	0.030	10.6	LOS A	0.1	2.3	0.23	0.65	0.23	56.2
West: Mid Western Hwy W												
10	L2	15	85.7	0.034	10.6	LOS A	0.0	0.0	0.00	0.32	0.00	53.4
11	T1	16	60.0	0.034	0.0	LOS A	0.0	0.0	0.00	0.32	0.00	94.9
Approach		31	72.4	0.034	5.1	NA	0.0	0.0	0.00	0.32	0.00	69.0
All Vehicles		62	71.2	0.034	5.0	NA	0.1	2.3	0.05	0.31	0.05	71.3

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 [PM East Mid Western Hwy and Munros Rd]

2030 with Project traffic
to/from East only
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
East: Mid Western Hwy E												
5	T1	17	62.5	0.039	0.4	LOS A	0.2	3.4	0.14	0.28	0.14	95.3
6	R2	14	92.3	0.039	11.0	LOS A	0.2	3.4	0.14	0.28	0.14	50.5
Approach		31	75.9	0.039	5.1	NA	0.2	3.4	0.14	0.28	0.14	68.2
North: Munros Rd												
7	L2	17	81.2	0.025	10.9	LOS A	0.1	2.1	0.15	0.62	0.15	49.8
9	R2	1	0.0	0.025	7.7	LOS A	0.1	2.1	0.15	0.62	0.15	73.5
Approach		18	76.5	0.025	10.7	LOS A	0.1	2.1	0.15	0.62	0.15	50.8
West: Mid Western Hwy W												
10	L2	1	0.0	0.016	7.8	LOS A	0.0	0.0	0.00	0.05	0.00	85.4
11	T1	15	71.4	0.016	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	95.9
Approach		16	66.7	0.016	0.5	NA	0.0	0.0	0.00	0.05	0.00	95.1
All Vehicles		64	73.8	0.039	5.6	NA	0.2	3.4	0.11	0.32	0.11	66.4

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 [PM West Mid Western Hwy and Munros Rd]

2030 with Project traffic
to/from West only
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
East: Mid Western Hwy E												
5	T1	17	62.5	0.017	0.0	LOS A	0.0	0.1	0.02	0.04	0.02	96.9
6	R2	1	0.0	0.017	7.6	LOS A	0.0	0.1	0.02	0.04	0.02	85.8
Approach		18	58.8	0.017	0.5	NA	0.0	0.1	0.02	0.04	0.02	96.2
North: Munros Rd												
7	L2	1	0.0	0.034	7.9	LOS A	0.1	2.3	0.22	0.64	0.22	73.1
9	R2	17	81.2	0.034	11.5	LOS A	0.1	2.3	0.22	0.64	0.22	48.2
Approach		18	76.5	0.034	11.3	LOS A	0.1	2.3	0.22	0.64	0.22	49.2
West: Mid Western Hwy W												
10	L2	14	92.3	0.034	10.8	LOS A	0.0	0.0	0.00	0.32	0.00	52.2
11	T1	15	71.4	0.034	0.0	LOS A	0.0	0.0	0.00	0.32	0.00	95.8
Approach		28	81.5	0.034	5.2	NA	0.0	0.0	0.00	0.32	0.00	68.3
All Vehicles		64	73.8	0.034	5.6	NA	0.1	2.3	0.07	0.33	0.07	66.5

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.

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Appendix 4

Air Quality Impact Assessment

prepared by

Northstar Air Quality Pty Ltd

(Total No. of pages including blank pages = 92)

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This document has been prepared for **R.W. Corkery & Co. Pty Limited** on behalf of **Rockwoods Investment Group Pty Ltd**:

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Western Riverina Quarry

Air Quality Impact Assessment

Addressee(s):	Rockwoods Investment Group Pty Ltd
Site Address:	Lot 1 DP821515
Report Reference:	20.1064.FR3V2
Date:	9 February 2022

Quality Control

Study	Status	Prepared by	Checked by	Authorised by
INTRODUCTION	Final	Northstar Air Quality	GCG	MD
THE QUARRY	Final	Northstar Air Quality	GCG	MD
LEGISLATION, REGULATION AND GUIDANCE	Final	Northstar Air Quality	GCG	MD
EXISTING CONDITIONS	Final	Northstar Air Quality	GCG	MD
APPROACH TO ASSESSMENT	Final	Northstar Air Quality	GCG	MD
AIR QUALITY IMPACT ASSESSMENT	Final	Northstar Air Quality	GCG	MD
GREENHOUSE GAS ASSESSMENT	Final	Northstar Air Quality	GCG	MD
MITIGATION AND MONITORING	Final	Northstar Air Quality	GCG	MD
CONCLUSION	Final	Northstar Air Quality	GCG	MD

Report Status

Northstar References		Report Status	Report Reference	Version
Year	Job Number	(Draft: Final)	(R*x*)	(V*x*)
20	1064	F	R3	V2
Based upon the above, the specific reference for this version of the report is:				**20.1064.FR3V2**

Final Authority

This report must by regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below.

Martin Doyle **9th February 2022**

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Non-Technical Summary

R.W. Corkery & Co. Pty Limited has engaged Northstar Air Quality Pty Ltd on behalf of Rockwoods Investment Group Pty Ltd to perform an air quality impact assessment and greenhouse gas assessment for the continued operation and extension of the Western Riverina Quarry located within Lot 1 DP821515.

This air quality impact assessment forms part of the Environmental Impact Statement prepared to accompany the development application for the Proposal under Part 4 of the *Environmental Planning and Assessment Act* 1979.

The air quality impact assessment has been performed in accordance with the New South Wales Environment Protection Authority Approved Methods document and includes a detailed description of the operations to be performed as part of the Proposal and includes a description of the management measures that will be employed to minimise particulate generation. The locations of surrounding sensitive receptor locations, a description of existing air quality and meteorology, and a description of the method used to assess potential impacts are also provided.

The results of the air quality impact assessment indicate that, during both stages assessed (Stage 1 and Stage 3), the impacts of the Proposal are predicted to be minor at all surrounding receptor locations.

In relation to annual average criteria (PM_{10}, $PM_{2.5}$, dust deposition and silica), the addition of those minor incremental impacts to existing background air quality results in the achievement of all criteria.

The Proposal is predicted not to result in any additional exceedances of the 24-hour maximum PM_{10} and $PM_{2.5}$ concentrations. Exceedances are identified in the air quality data adopted to represent the existing environment, and are likely due to grassfires, bushfires, or agricultural activities. For clarity, the Proposal is not anticipated to result in any increases in particulate concentrations which would result in additional exceedances of the criteria.

A range of management measures would be adopted as part of the Proposal, and their implementation would be a responsibility of the Quarry manager.

Greenhouse gas emissions anticipated as a result of the Proposal have been calculated in accordance with Australian Government methods. Emissions resulting from the Proposal are calculated to be insignificant, contributing less than 0.0014 % of New South Wales total greenhouse gas emissions and less than 0.0003 % of Australian total GHG emissions in 2018.

A range of management measures are to be considered which would result in further reductions in GHG emissions.

It is respectfully considered that the Proposal should not be rejected on the grounds of air quality

CONTENTS

1. INTRODUCTION 7

1.1 Assessment Requirements 7

2. THE QUARRY 9

2.1 Overview 9

2.2 Identified Potential for Emissions to Air 19

3. LEGISLATION, REGULATION AND GUIDANCE 20

3.1 NSW EPA Approved Methods 20

3.2 Protection of the Environment Operations Act 1997 21

3.3 Protection of the Environment (Clean Air) Regulation 2010 21

3.4 Greenhouse Gas Legislation and Guidance 22

4. EXISTING CONDITIONS 24

4.1 Surrounding Land Sensitivity 24

4.2 Meteorology 26

4.3 Air Quality 27

4.4 Topography 29

4.5 Potential for Cumulative Impacts 29

4.6 Greenhouse Gas 29

5. APPROACH TO ASSESSMENT 31

5.1 Air Quality Impact Assessment 31

5.2 Greenhouse Gas Assessment 35

6. AIR QUALITY IMPACT ASSESSMENT 39

6.1 Particulate Matter – Annual Average PM_{10} and $PM_{2.5}$ 39

6.2 Particulate Matter – Annual Average Dust Deposition Rates 41

6.3 Particulate Matter - Maximum 24-hour Average 43

6.4 Emissions Associated with Offsite Transportation 50

7. GREENHOUSE GAS ASSESSMENT 51

7.1 Calculation of GHG Emissions 51

7.2 Greenhouse Gas Emissions in Context 51

7.3 Management of GHG Emissions 52

8. MITIGATION AND MONITORING 53

8.1 Air Quality Mitigation 53

8.2 Greenhouse Gas Mitigation 53

8.3 Monitoring 54

9. CONCLUSION 55

10. REFERENCES 56

APPENDIX A 58

APPENDIX B 61

APPENDIX C 70

APPENDIX D 76

Tables

Table 1 Relevant requirements of the SEARs 7

Table 2 Proposed characteristics of the Quarry operation 15

Table 3 NSW EPA air quality standards and goals 20

Table 4 POEO (Clean Air) Regulation – General standards of concentration 21

Table 5 Discrete sensitive receptor locations used in the study 25

Table 6 Closest DPIE AQMS to the Quarry Site 27

Table 7 Summary of background air quality used in the AQIA 29

Table 8 Summary of emission reduction methods adopted as part of Quarry operation 32

Table 9 Greenhouse gas emission types 35

Table 10 Greenhouse gas emission scopes 36

Table 11 Greenhouse gas emission sources 37

Table 12 Calculated activity data 37

Table 13 Greenhouse gas emission factors 38

Table 14 Predicted annual average TSP, PM10 and PM2.5 concentrations – Stage 1 39

Table 15 Predicted annual average TSP, PM10 and PM2.5 concentrations – Stage 3 41

Table 16 Predicted annual average dust deposition – Stage 1 42

Table 17 Predicted annual average dust deposition – Stage 3 43

Table 18 Predicted maximum incremental 24-hour PM10 and PM2.5 concentrations 44

Table 19 Summary of contemporaneous impact and background – PM10 – Stage 1 46

Table 20 Summary of contemporaneous impact and background – PM10 – Stage 3 47

Table 21 Summary of contemporaneous impact and background – PM2.5 – Stage 1 48

Table 22	Summary of contemporaneous impact and background – PM2.5 – Stage 3	48
Table 23	Calculated Proposal GHG emissions	51
Table 24	Proposal GHG emissions in context	51
Table 25	Summary of emission reduction methods adopted as part of Quarry operation	53

Figures

Figure 1	Quarry location	10
Figure 2	Quarry layout	12
Figure 3	Proposed annual material flows	13
Figure 4	Proposed maximum daily material flows	14
Figure 5	Quarry layout – Stage 1 and Stage 3	18
Figure 6	Population density and sensitive receptors surrounding the Quarry Site	25
Figure 7	Statistical analysis of PM10 concentrations at Wagga Wagga North, 2014 to 2017	28
Figure 8	Calculated uncontrolled & controlled annual particulate emissions (Stage 1)	33
Figure 9	Calculated uncontrolled & controlled annual particulate emissions (Stage 3)	33
Figure 10	Calculated uncontrolled & controlled peak 24-hour particulate emissions (Stage 1)	34
Figure 11	Calculated uncontrolled & controlled peak 24-hour particulate emissions (Stage 3)	34
Figure 12	Incremental 24-hour PM_{10} concentrations – Stage 3	49

1. INTRODUCTION

R.W. Corkery & Co. Pty Limited has engaged Northstar Air Quality Pty Ltd (Northstar) on behalf of Rockwoods Investment Group Pty Ltd (the Applicant) to perform an air quality impact assessment (AQIA) and greenhouse gas assessment (GHGA) for the continued operation and extension of the Western Riverina Quarry (the Quarry) located within Lot 1 DP821515 (the Quarry Site).

This AQIA forms part of the Environmental Impact Statement (EIS) prepared to accompany the development application for the Quarry under Part 4 of the *Environmental Planning and Assessment Act* 1979.

The AQIA presents an assessment of the impacts of activities associated with the operational phases of the Quarry. The AQIA has used a quantitative dispersion modelling approach, performed in accordance with the relevant NSW guidelines. The results of the assessment are presented as predicted incremental change, and as a cumulative impact accounting for the prevailing background air quality conditions.

The GHGA presents a quantification of the likely GHG emissions associated with the operation of the Quarry and presents a comparison of these emissions with National and State GHG emissions totals. Opportunities for GHG reduction are also provided.

The AQIA and GHGA are both presented within this report.

1.1 Assessment Requirements

Planning Secretary's Environmental Assessment Requirements (EAR 1353) have been provided for the Quarry by the NSW Department of Planning, Industry & Environment (DPIE) on 17 July 2019. The SEARs included input from NSW Environment Protection Authority (EPA). **Table 1** provides a summary of the SEARs relevant to this AQIA.

Table 1 Relevant requirements of the SEARs

Authority	Requirement	Relevant section
SEARs	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 6
NSW EPA (12 June 2019)	The goals of the project in relation to air quality should be to ensure sensitive receptors are protected from adverse impacts from dust	Section 3

Authority	Requirement	Relevant section
	Details would need to be provided on the proposed measures to manage dust from all sources. Measures to prevent or control the emission of dust from the quarrying activities must be detailed based on the outcome of an assessment of dust emissions undertaken in accordance with the Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales (DECC, 2005). All potentially impacted residential or sensitive premises likely to be impacted by the development must be identified and included in the assessment.	Section 5.1.3 Section 5.1.2 Section 4.1
	The EIS should identify any other existing impacts on air quality within the area and if necessary, provide an assessment and commentary on the predicted cumulative impacts that may arise.	Section 4.3 Section 6
	Emissions from any plant must meet the design criteria detailed in the Protection of the Environment Operations (Clean Air) Regulation 2010. Details need to be provided on the proposed air pollution control techniques from any air emission points, including proposed measures to manage and monitor efficiency and performance.	Section 3.3

Further to the above, the policies, guidelines and plans which have been referenced during the performance of the AQIA include:

- Protection of the Environment Operations (Clean Air) Regulation 2010.
- Approved Methods for the Modelling and Assessment of Air Quality in NSW (DISER, 2020a).
- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (NSW EPA, 2017)

It is noted that there are no specific requirements relating to the GHG assessment provided within the SEARs, although this has been performed in accordance with standard practice and requirements (refer **Section 3.4**).

2. THE QUARRY

The following provides a description of the Quarry and describes the potential sources of air emissions associated with the operational phases.

2.1 Overview

The Applicant operates the Western Riverina Quarry located approximately 17 kilometres (km) northwest of Rankins Springs and 61 km southeast of Hillston, NSW. The Quarry currently operates under Development Consent DA2/91 issued by Carrathool Shire Council (Council) on 19 July 1991. The Quarry currently has consent to extract, process and transport up to 5 000 cubic metres (m^3) of basalt per year although it is noted that annual production has exceeded this limit in recent years.

The Applicant is seeking development consent for the continued operation and extension of extraction operations within the Western Riverina Quarry which would include the following.

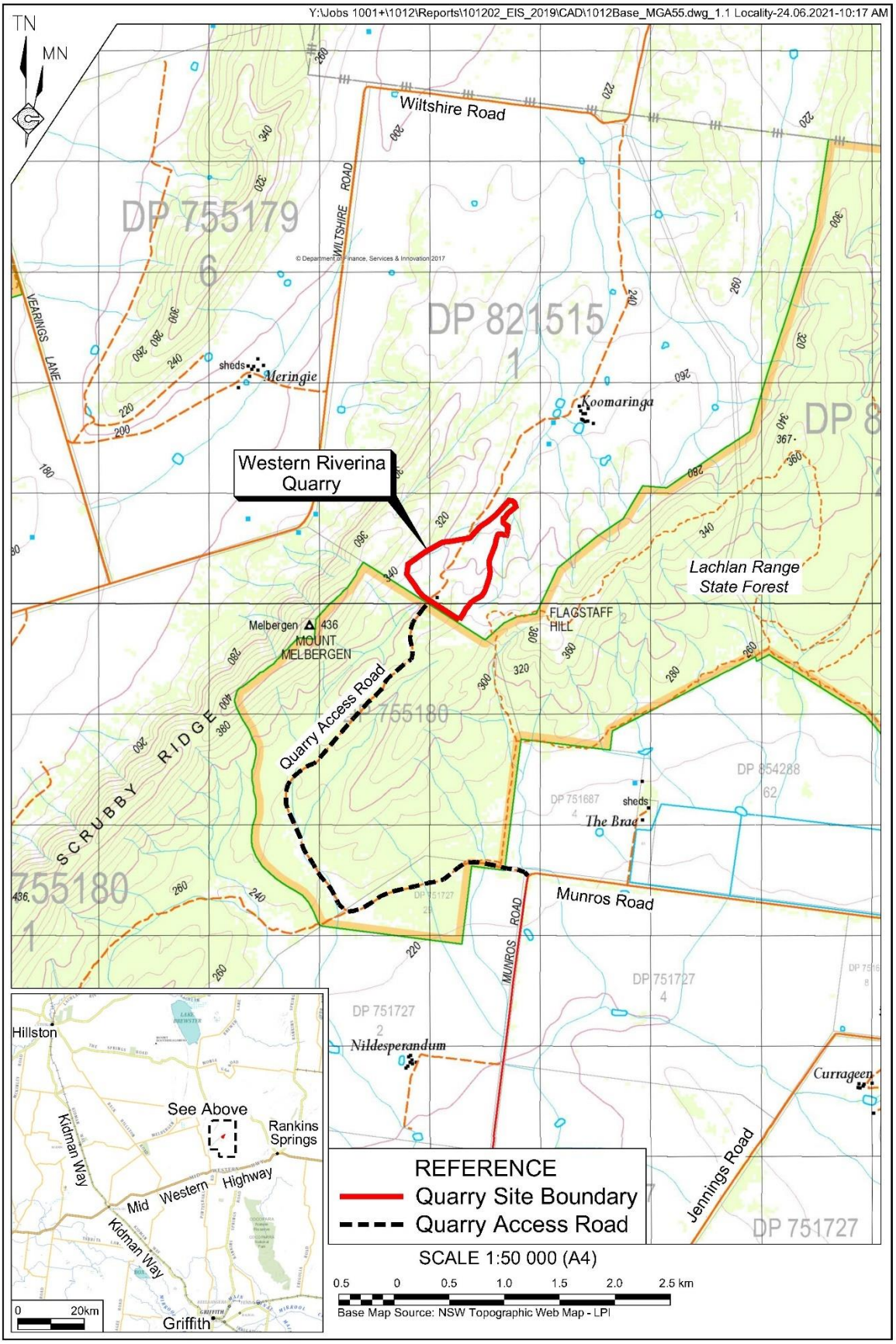
- Extraction of basalt and quartzite from within the proposed extraction area to produce up to 250 000 tonnes per annum (tpa) of Quarry products.
- Importation of up to 1 500 tpa of concrete washout and other construction materials for recycling and incorporation in products produced within the Quarry.
- Crushing and screening of fragmented rock and imported materials on site using a fixed processing plant.
- Pre-coating of up to 20 000 tpa of aggregates.
- Transportation of up to 250 000 tpa Quarry products to end points of use within the Carrathool Local Government Area (LGA) and the broader Riverina Region.
- Progressive and final rehabilitation of the Quarry to develop a final landform suitable for grazing and passive biodiversity conservation.

These activities are collectively referred to as "the Proposal" and the site of the development referred to as the Quarry Site. The location of the Quarry Site is presented in **Figure 1**. The Quarry Site is located in an area zoned RU1 (Primary Production) under the Carrathool Local Environmental Plan 2012, which permits extractive industries with consent.

Material will be extracted from the extraction area using drill and blast techniques with between eight and 12 blasts undertaken per year. The fragmented material will then be loaded and hauled to a crushing and screening plant for processing prior to stockpiling and product despatch.

Two scenarios have been developed to assess the potential impact of the Proposal over its operational lifetime. These scenarios reflect operations in Stage 1 and Stage 3 of the Proposal, with the layout in each of those stages presented in **Figure 5**.

Figure 1 Quarry location



A detailed description of material extraction, processing, pre-coat, and material transport operations is provided in section 2.5, section 2.6, section 2.7 and section 2.8 of the main EIS document, respectively. Relevant information, as it relates to each stage assessed in the AQIA, is reproduced in **Table 2**. **Figure 2** displays the proposed indicative Quarry Site layout.

Flows of material to, around, and from the Quarry Site are complex, and to aid the understanding of those flows, **Figure 3** and **Figure 4** present the proposed annual and daily maximum flows through the Quarry Site, which is applicable to Stage 1 and Stage 3 although the locations of activities changes. These flows have been adopted in the performance of the AQIA and are reflected in **Table 2**.

Table 2 provides a summary of the operational characteristics of the Quarry in Stages 1 and 3. It is noted that the operations in Stage 1 and Stage 3 are identical in terms of the materials being extracted and processed. The principal difference in the two stages is the locations of operations, and areas exposed to wind erosion, which are shown in **Figure 5**. Transportation distances between the Quarry entrance and the plant are also increased in Stage 3 when compared to Stage 1.

Figure 2 Quarry layout

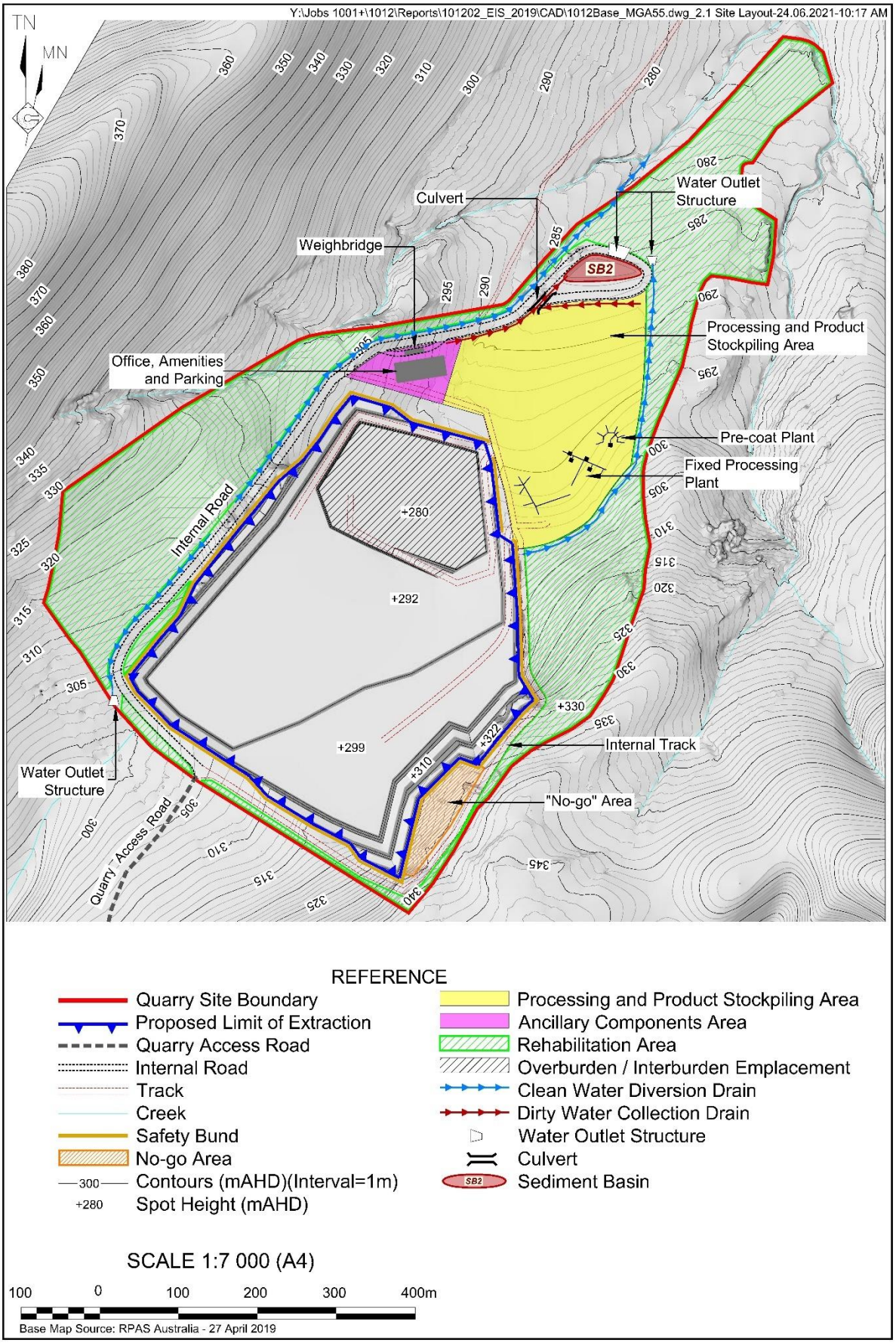


Figure 3 Proposed annual material flows

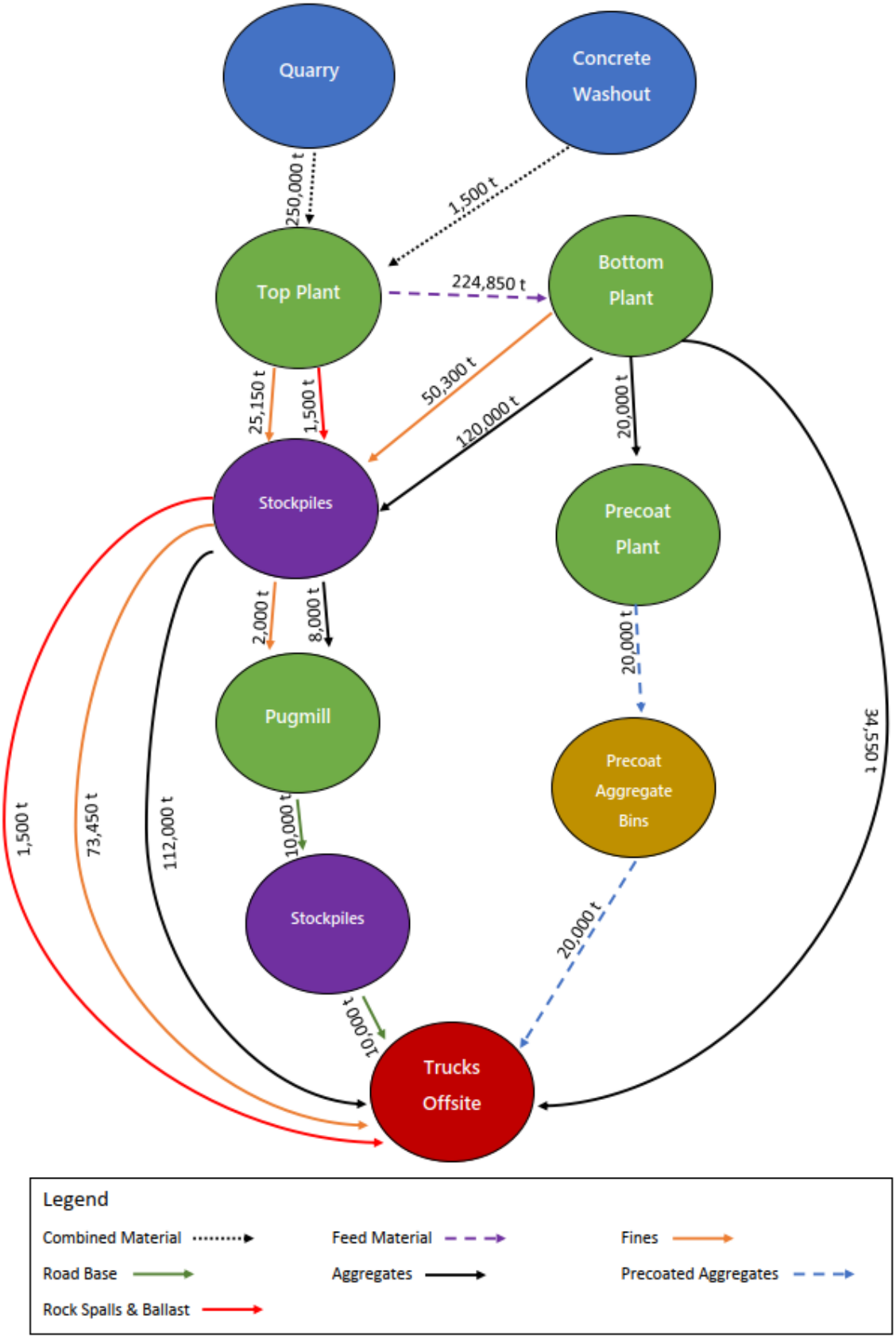


Figure 4 Proposed maximum daily material flows

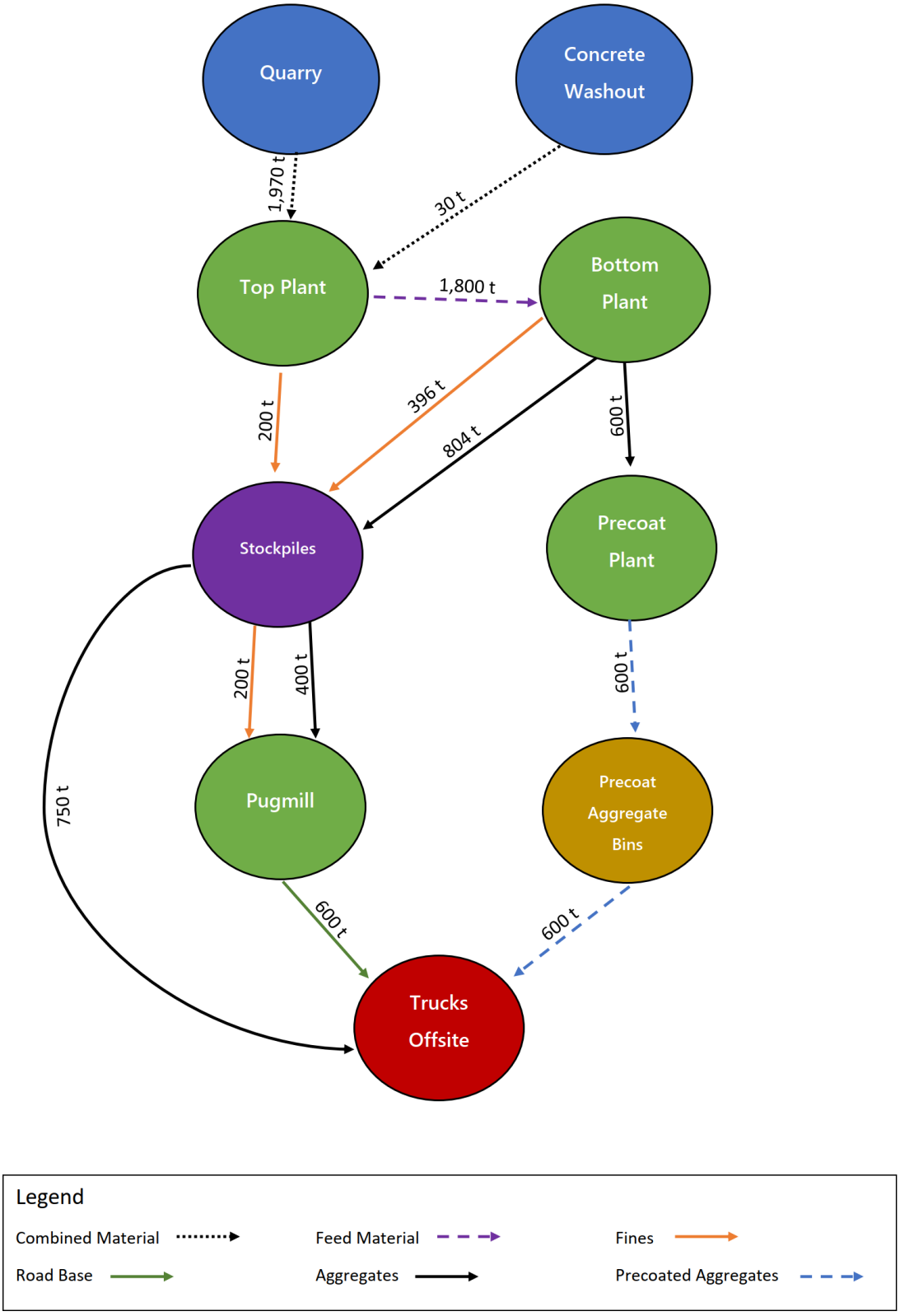


Table 2 Proposed characteristics of the Quarry operation

Parameter	Stage 1	Stage 3
Site establishment and construction Extraction operations Blasting operations Processing operations Product dispatch	7 am to 7 pm, Mon to Fri, 7 am to 3 pm, Sat. 7 am to 7 pm, Mon to Fri, 7 am to 3 pm, Sat. 10 am to 3 pm, Mon to Fri 7 am to 7 pm, Mon to Fri, 7 am to 3 pm, Sat.. 7 am to 5 pm, Mon to Fri, 7 am to 3 pm, Sat. No operations Sunday or Public Holiday	
Maintenance	24 hours per day	
Operating days per year	300 days	300 days
Material extraction		
Annual rock extraction rate	250 000 tpa	250 000 tpa
Average daily rock extraction rate	833 t	833 t
Maximum daily rock extraction rate	1 970 t	1 970 t
Annual overburden generation rate	10 000 t	10 000 t
Average daily overburden generation rate	100 t	100 t
Annual interburden generation rate	70 000 t	70 000 t
Average daily interburden generation rate	233 t	233 t
Number of blast holes drilled	768 per year / 154 per blast	768 per year / 154 per blast
Blast holes spacing	2.5 m	2.5 m
Blasting frequency	typically no more than once per month	typically no more than once per month
Volume of material removed per blast	Up to 50 000 t	Up to 50 000 t
Annual import of materials for blending with product	1 500 t	1 500 t
Equipment (type, or equivalent)	1× Hydraulic Drill (Atlas Copco 35T) 1× Excavator (Volvo 38T) 1× Mini Excavator (Cat 6T) 1× Dump Truck (Komatsu 35T) 1× Front End Loader (CAT 966) 1× Front End Loader (Volvo 220) 1× Bulldozer (Cat D11) 1× Water Cart (15 000 L)	
Material processing		
Annual material processing rate	251 500 tpa (Top Plant) 224 850 tpa (Bottom Plant) 10 000 tpa (Pug mill) 20 000 tpa (Pre-coat Plant)	251 500 tpa (Top Plant) 224 850 tpa (Bottom Plant) 10 000 tpa (Pug mill) 20 000 tpa (Pre-coat Plant)

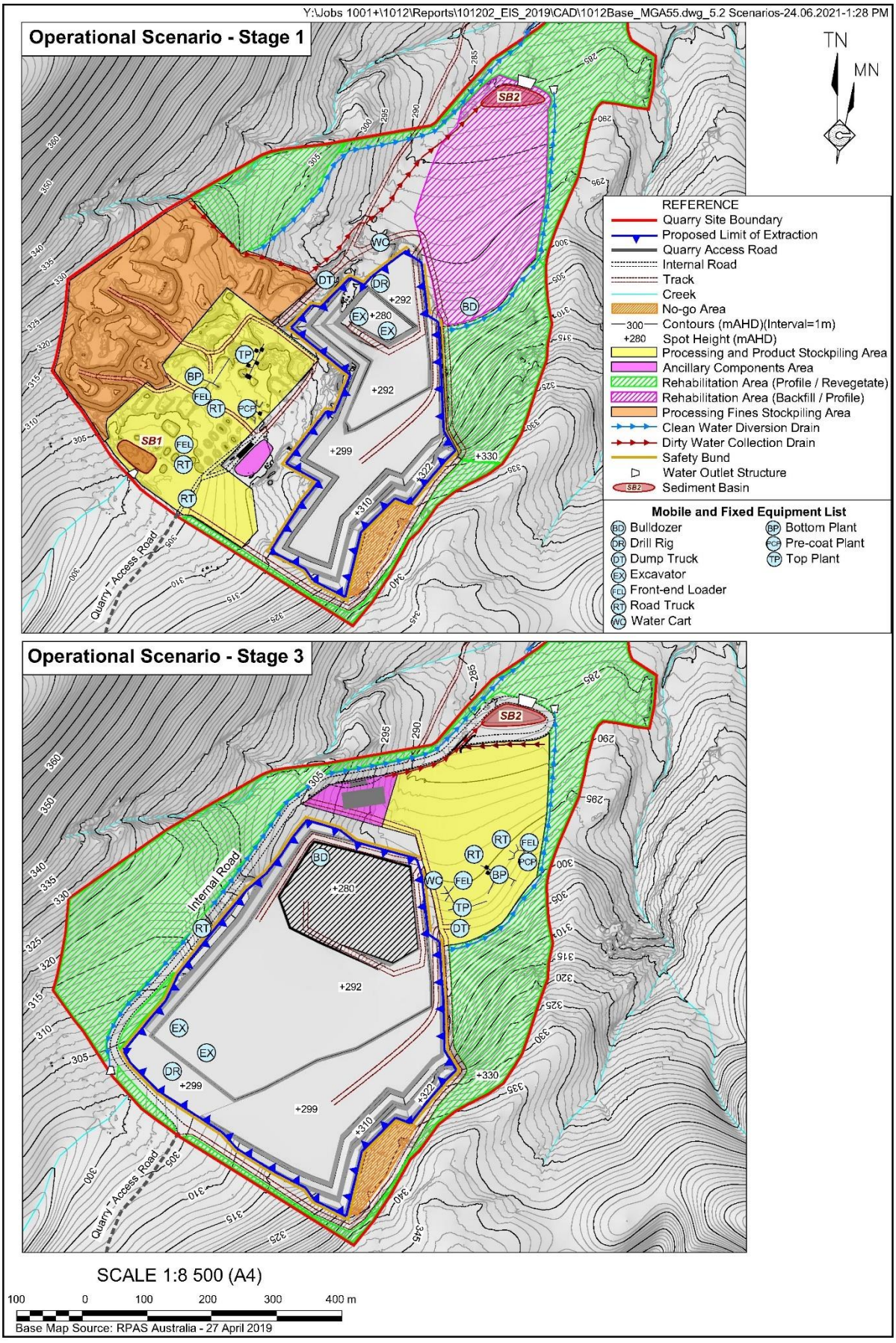
Parameter	Stage 1	Stage 3
Average daily processing rate	838.3 t (Top Plant) 749.9 t (Bottom Plant) 33.3 t (Pug mill) 66.7 t (Pre-coat Plant)	838.3 t (Top Plant) 749.9 t (Bottom Plant) 33.3 t (Pug mill) 66.7 t (Pre-coat Plant)
Maximum daily processing rate	2 000 t (Top Plant) 1 800 t (Bottom Plant) 600 t (Pug mill) 600 t (Pre-coat Plant)	2 000 t (Top Plant) 1 800 t (Bottom Plant) 600 t (Pug mill) 600 t (Pre-coat Plant)
Equipment (type, or equivalent)	Top Plant 1× Jianshe Jaw Crusher 1× Cedar Rapids Cone Crusher (4ft) 1× Symons Cone Crusher (3ft) 1× Hawk Screen (twin deck) Bottom Plant 1× Auspactor Vertical Shaft Impactor (VSI) 1× Hawk Screen (triple deck) 1× Global Screen (triple deck) A pugmill is located adjacent to the Bottom Plant which is used to produce specified and unspecified road base. The pre-coat plant includes a feeder bin, conveyor, pre-coat spray system, 5× pre-coated aggregate bays and a pre-coat storage tank (28 000 L)	
Offsite material haulage		
Annual material haulage rate	251 500 t[(B)]	251 500 t[(B)]
Average daily haulage rate	833 t	833 t
Maximum daily haulage rate	1 920 t	1 920 t
Haulage truck capacity	Average 32 t	Average 32 t
Annual vehicle trips	7 812[(B)]	7 812[(B)]
Peak daily vehicle trips	60	60
Average daily vehicle trips	26	26
Annual quantity of material brought to site for crushing and blending	1 500 t	1 500 t
Maximum daily quantity of material brought to site for crushing and blending	30 t	30 t
Exposed areas		
Disturbance area (in pit)	7.4 ha	18.2 ha
Disturbance area (remainder)	27.7 ha	12.5 ha

Notes (A) Product transport would be capped at 250 000 tpa or 7 812 laden HV movements per annum. The annual material flows presented above include the addition of 1 500 tpa of concrete which have not been considered in maximum transport limits. Therefore, these inputs to the model are conservative and overestimate the traffic generated which would be limited as above.

Assumptions adopted in the construction of **Table 2** are presented below:

- The maximum annual extraction and transportation rate from the Quarry will be 250 000 t. Up to 1 500 t of concrete and other building materials may be brought to site for use in product blending. To represent a worst-case scenario, those quantities have been assumed to be processed (i.e. a processing rate of 251 500 tpa). To represent a worst-case haulage rate, which includes the extracted material, plus additional concrete and other building materials, a haulage rate of 251 500 tpa has been assumed.
- Maximum material processing rates have been based on the maximum potential throughputs of processing equipment (i.e. 2 000 $t \cdot day^{-1}$ for the Top Plant and 1 800 $t \cdot day^{-1}$ for the Bottom Plant, with 200 $t \cdot day^{-1}$ lost as fines from the Top Plant).
- Blasting would occur on a campaign basis, with blasting occurring between eight and 12 times per year, typically no more than once per month. Up to 50 000 t of material would be fragmented during each blast and it is likely that during the day of blasting, other operations such as overburden handling, processing etcetera would be limited below their relevant maximum capacities. However, to provide a worst-case assessment, blasting has been assumed to occur concurrently with all other activities at their maximum rates to provide confidence that the Proposal can be operated without exceedance of the relevant short-term air quality criteria (refer **Section 3**).
- Peak daily transportation of material from the Quarry has been assumed to consist of 60× 32 t loads (1 920 $t \cdot day^{-1}$). Average daily transportation has been assumed to consist of 26× 32 t loads (833 $t \cdot day^{-1}$).

Figure 5 Quarry layout – Stage 1 and Stage 3



2.2 Identified Potential for Emissions to Air

The processes which may result in the emission of pollutants to air during quarrying operations would include:

- Pushing of overburden to create the safety bund;
- Drilling and blasting;
- Loading of dump truck and transport to Top Plant;
- Loading of processing equipment, processing of rock, and storage in stockpiles;
- Operation of pre-coat plant and pugmill;
- Loading of product trucks, and transport offsite;
- Use of overburden and interburden as backfill in historical extraction areas, placed on benches as a substrate for vegetation, and emplaced on the floor of the extraction area;
- Profiling of landforms in the rehabilitation areas;
- Wind erosion of disturbed areas; and
- Emissions from vehicle and equipment exhaust.

The specific pollutants of interest associated with those activities are:

- Total suspended particulate (TSP);
- Particulate matter with an aerodynamic diameter of 10 microns (PM_{10});
- Particulate matter with an aerodynamic diameter of 2.5 microns ($PM_{2.5}$); and
- Silica (Si).

Emissions of oxides of nitrogen (NO_X) would be anticipated from blast fume, and (primarily) emissions of NO_X, carbon monoxide (CO) and sulphur dioxide (SO_2) related to diesel combustion would also be experienced (in addition to particulates considered above).

Given the distances between the Quarry and nearest sensitive receptors (approximately 2.2 km), and the quantity of equipment operating on site, it is not anticipated that emissions associated with diesel combustion, other than particulate matter which have been assessed, would be an issue of concern and have not been addressed further.

In relation to blast fume, the timing of any blasts would be managed to ensure that meteorological conditions are appropriate for those to occur.

3. LEGISLATION, REGULATION AND GUIDANCE

3.1 NSW EPA Approved Methods

State air quality guidelines adopted by the NSW EPA are published in the *'Approved Methods for the Modelling and Assessment of Air Quality in NSW'* (the Approved Methods (NSW EPA, 2017)) which has been consulted during the preparation of this assessment report.

The Approved Methods lists the statutory methods that are to be used to model and assess emissions of criteria air pollutants from stationary sources in NSW. Section 7.1 of the Approved Methods clearly outlines the impact assessment criteria to be applied.

The criteria listed in the Approved Methods are derived from a range of sources (including National Health and Medical Research Council [NHMRC], National Environment Protection Council [NEPC], Department of Environment [DoE], and World Health Organisation [WHO]).

The criteria specified in the Approved Methods are the defining ambient air quality criteria for NSW. The standards adopted to protect members of the community from health impacts in NSW are presented in **Table 3**.

Table 3 NSW EPA air quality standards and goals

Pollutant	Averaging period	Units	Criterion	Notes
Particulates (as PM_{10})	24 hours	$\mu g \cdot m^{-3}$ (a)	50	Numerically equivalent to the Ambient Air Quality National Environment Protection Measure (AAQ NEPM)(b) standards and goals.
	1 year	$\mu g \cdot m^{-3}$	25	
Particulates (as $PM_{2.5}$)	24 hours	$\mu g \cdot m^{-3}$	25	
	1 year	$\mu g \cdot m^{-3}$	8	
Particulates (as total suspended particulate [TSP])	1 year	$\mu g \cdot m^{-3}$	90	
Deposited dust	1 year	$g \cdot m^{-2} \cdot month^{-1}$(c)	2	Assessed as insoluble solids as defined by AS 3580.10.1
		$g \cdot m^{-2} \cdot month^{-1}$(d)	4	

Notes: (a): micrograms per cubic metre of air
(b): National Environment Protection (Ambient Air Quality) Measure
(c): Maximum increase in deposited dust level
(d): Maximum total deposited dust level

Given the nature of the material to be extracted at the Quarry, silica may be generated during extraction activities. NSW EPA do not provide air quality criteria for this pollutant, although VIC EPA in the State Environmental Planning Policy (SEPP) Protocol for Environmental Management: Mining and Extractive Industries (PEM) (VIC EPA, 2007) do include a criterion for respirable crystalline silica (as $PM_{2.5}$) as 3 $\mu g \cdot m^{-3}$ (annual average), which has been adopted from the California EPA Office for Environmental Health Hazard Assessment Reference Exposure Levels.

This criterion is referenced in this assessment and calculates respirable crystalline silica by adjusting annual average $PM_{2.5}$ modelling results pro-rata to account for the determined maximum free silica content of the extracted material (29 %). Respirable crystalline silica is generally an occupational health and safety issue rather than an environmental issue when considering quarrying activities but has been presented within this AQIA.

3.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations* (POEO) *Act* (1997) sets the statutory framework for managing air quality in NSW, including establishing the licensing scheme for major industrial premises and a range of air pollution offences and penalties.

Should the Quarry gain approval the operations would be defined as a scheduled activity under the POEO Act. As such, an Environment Protection Licence (EPL) would be required to be obtained from NSW EPA and once issued would contain a range of conditions related to minimisation of emissions from the site.

3.3 Protection of the Environment (Clean Air) Regulation 2010

The Protection of the Environment Operations (POEO) (Clean Air) Regulation (2010) sets standards of concentration for emissions to air from both scheduled and non-scheduled activities. For the activities performed at the Quarry, the POEO (Clean Air) Regulation provides general standards of concentration for scheduled premises which are presented in **Table 4** for the pollutants of relevance to this assessment. Requirements associated with nitrogen dioxide (NO_2) have been included in **Table 4** but have not been included as part of this impact assessment, for the reasons discussed in **Section 2.2**.

Table 4 POEO (Clean Air) Regulation – General standards of concentration

Air Impurity	Activity	Standard of Concentration (Group 6)[1]
Solid particles (total)	Any activity or plant (except as listed below)	50 $mg \cdot m^{-3}$
	Any crushing, grinding, separating or materials handling activity	20 $mg \cdot m^{-3}$

Air Impurity	Activity	Standard of Concentration (Group 6)[1]
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	Any activity or plant (except boilers, gas turbines and stationary reciprocating internal combustion engines listed below)	350 $mg \cdot m^{-3}$

Note: (1) Group 6 – pursuant to application made on or after 1 September 2005

Further to the requirements in **Table 4** Part 4 Clause 15 of the POEO (Clean Air) Regulation requires that motor vehicles do not emit excessive air impurities which may be visible for a period of more than 10-seconds when determined in accordance with the relevant standard.

Although Schedule 8 of the POEO (Clean Air) Regulation does not indicate that burning of vegetation is prohibited in the Carrathool Shire Council LGA, no burning of materials would be performed as part of the quarrying operations.

All vehicles, plant and equipment to be used either at the Quarry Site or to transport materials to and from the Quarry Site will be maintained regularly and in accordance with manufacturers' requirements, where these vehicles are under the operational control of the proponent.

3.4 Greenhouse Gas Legislation and Guidance

The Australian Government Clean Energy Regulator administers schemes legislated by the Australian Government for measuring, managing, reducing or offsetting Australia's carbon emissions.

Schemes administered by the Clean Energy Regulator include:

- National Greenhouse and Energy Reporting Scheme, under the *National Greenhouse and Energy Reporting Act* (2007).
- Emissions Reduction Fund, under the *Carbon Credits (Carbon Farming Initiative) Act* (2011).
- Renewable Energy Target, under the *Renewable Energy (Electricity) Act* (2000).
- Australian National Registry of Emissions Units, under the *Australian National Registry of Emissions Units Act* (2011).

3.4.1 National Greenhouse and Energy Reporting Scheme

The National Greenhouse and Energy Reporting (NGER) scheme, established by the *National Greenhouse and Energy Reporting Act* (2007) (NGER Act), is a national framework for reporting and disseminating company information about greenhouse gas emissions, energy production, energy consumption and other information specified under NGER legislation.

The objectives of the NGER scheme are to:

- inform government policy.
- inform the Australian public.
- help meet Australia's international reporting obligations.
- assist Commonwealth, state and territory government programmes and activities.
- avoid duplication of similar reporting requirements in the states and territories.

Further information on the NGER scheme, specifically the definitions of various scopes and types of GHG emissions which have also been adopted for the purposes of this assessment, is provided in **Section 5.2**.

3.4.2 Relevant NSW Legislation

There is no specific GHG legislation administered within NSW. The NGER scheme (and other identified Commonwealth schemes in **Section 3.4.1**) forms the applicable legislation within NSW.

3.4.3 Guidance

The GHG accounting and reporting principles adopted within this GHG assessment are based on the following financial accounting and reporting standards:

- Australian Government Department of the Environment, Australian National Greenhouse Accounts, National Greenhouse Accounts Factors, October 2020 (DISER, 2020a).
- The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) GHG Protocol: A Corporate Accounting and Report Standard (WRI, 2004).
- ISO 14064-1:2006 (Greenhouse Gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of GHG emissions and removal).
- ISO 14064-2:2006 (Greenhouse Gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of GHG emission reductions or removal enhancements).
- ISO 14064-3:2006 (Greenhouse Gases – Part 3: Specification with guidance for the validation and verification of GHG assertions) guidelines (internationally accepted best practice).

4. EXISTING CONDITIONS

4.1 Surrounding Land Sensitivity

4.1.1 Discrete Receptor Locations

Air quality assessments typically use a desk-top mapping study to identify 'discrete receptor locations', which are intended to represent a selection of locations that may be susceptible to changes in air quality. In broad terms, the identification of sensitive receptors refers to places at which humans may be present for a period representative of the averaging period for the pollutant being assessed. Typically, these locations are identified as residential properties although other sensitive land uses may include schools, medical centres, places of employment, recreational areas or ecologically sensitive locations.

It is noted that in addition to the identified 'discrete' receptor locations, the entire modelling area is gridded with 'uniform' receptor locations (see **Section 4.1.2**) that are used to plot out the predicted impacts, and as such the accidental non-inclusion of a location sensitive to changes in air quality does not render the AQIA invalid, or otherwise incapable of assessing those potential risks.

To ensure that the selection of discrete receptors for the AQIA are reflective of the locations in which the population of the area surrounding the Proposal site reside, population density data has been examined. Population density data based on the 2016 census have been obtained from the Australian Bureau of Statistics (ABS) for a 1 square kilometre (km^2) grid, covering mainland Australia Invalid source specified.. Using a Geographical Information System (GIS), the locations of sensitive receptor locations have been confirmed with reference to their population densities.

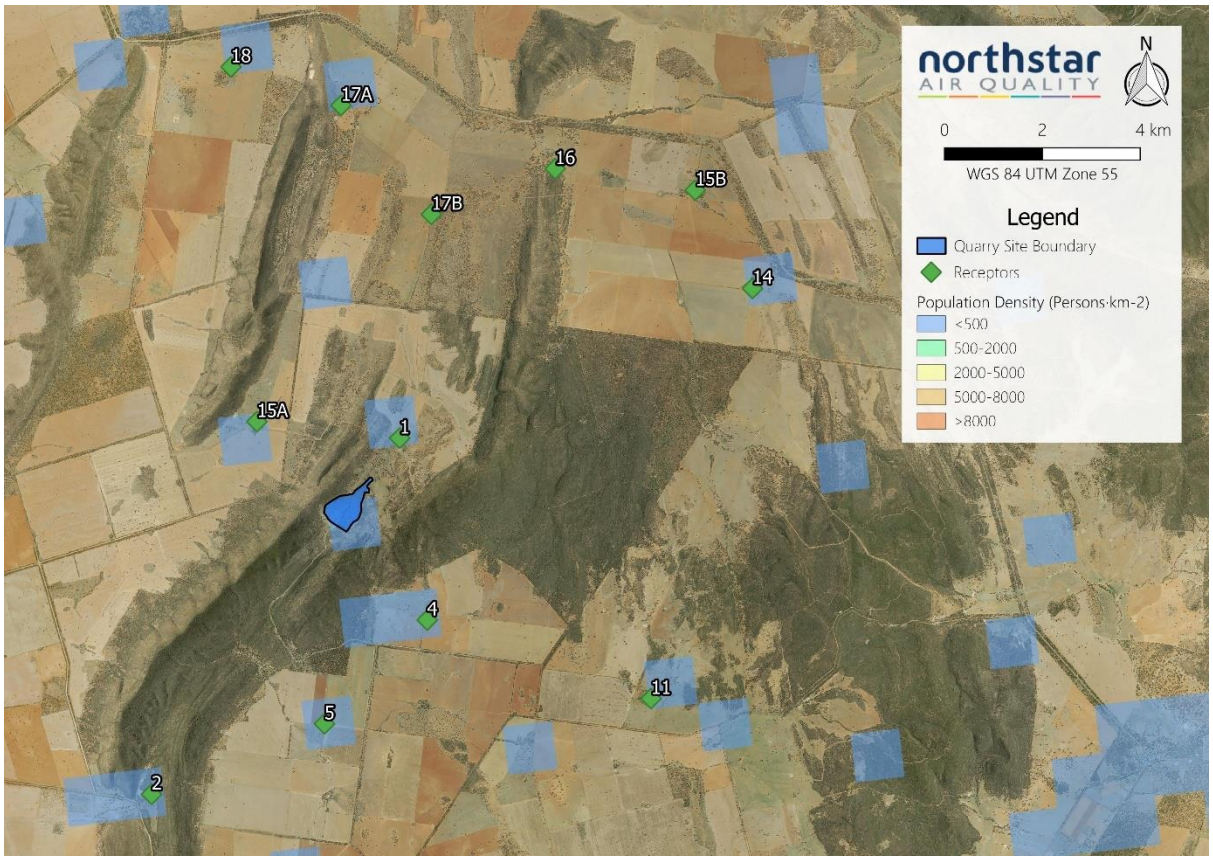
For clarity, the ABS use the following categories to analyse population density (persons·km^{-2}):

- Very high > 8 000
- High > 5 000
- Medium > 2 000
- Low > 500
- Very low < 500
- No population 0

Using ABS data in a GIS, the population density of the area surrounding the Proposal site are presented in **Figure 6**. The Quarry Site is located in an area of low to very low population density (between 0 and <500 persons·km^{-2}).

A number of residential locations surrounding the Quarry Site have been identified and these receptors have been adopted for use within this AQIA as presented in **Table 5**.

Figure 6 Population density and sensitive receptors surrounding the Quarry Site



Note: Areas with no colour represents a 1 km^2 grid cell with zero population

Figure 6 identifies a number of 1 km^2 grids that are identified by the ABS as being populated. The desk-top mapping study performed for this AQIA examined those grid cells to ensure all relevant receptor locations had been identified. For a number of cells, sheds or unmaintained (assumed derelict) structures were identified that appear to have been erroneously assumed to be residential properties, and for other cells no structures were identified. Receptors 1 and 2 are identified as being project related and are not considered further within this assessment. Results are provided at those locations, but discussion of any impacts relates to privately owned receptor locations.

Table 5 Discrete sensitive receptor locations used in the study

ID	Landowner	Comment	Location (m, UTM 55)	
			Eastings	Northings
1	Kalrag Pty Ltd	Project related	416 366	6 261 775
2	Estate: perpetual lease – PA Woods, BL Woods	Project related	411 295	6 254 487
4	RI Munro	Privately owned	416 929	6 258 052
5	JW Dwyer	Privately owned	414 828	6 255 927
11	TJD Vearing, SA Vearing	Privately owned	421 504	6 256 444
14	RB Argent-Smith, SA Argent-Smith	Privately owned	423 578	6 264 840
15A	DG Groat	Privately owned	413 446	6 262 113

ID	Landowner	Comment	Location (m, UTM 55)	
			Eastings	Northings
15B	DG Groat	Privately owned	422 407	6 266 852
16	IA Nevinson	Privately owned	419 544	6 267 289
17A	GS Walker	Privately owned	415 167	6 268 586
17B	GS Walker	Privately owned	417 014	6 266 356
18	DG Thompson	Privately owned	412 917	6 269 374

4.1.2 Uniform Receptor Locations

Additional to the sensitive receptors identified in **Section 4.1.1**, a grid of uniform receptor locations has been used in the AQIA to allow presentation of contour plots of predicted impacts.

4.2 Meteorology

In accordance with the requirements of the NSW EPA Approved Methods, the AQIA is required to describe and account for the influence of the prevailing meteorological conditions.

The meteorology experienced within an area can govern the generation (in the case of wind dependent emission sources), dispersion, transport and eventual fate of pollutants in the atmosphere. The meteorology of the area surrounding the Quarry Site has been examined using data collected by the Australian Government Bureau of Meteorology (BoM) at the Griffith Airport Automatic Weather Station (AWS), which is approximately 50 km south of the Quarry Site. This AWS is considered the most representative station for the area surrounding the Quarry Site.

To provide a characterisation of the meteorology which would be expected at the Quarry Site, a meteorological modelling exercise has been performed.

Data from the year 2014 have been selected for use in the AQIA to provide an approximation of 'representative' conditions surrounding the Quarry. This year has been selected through examination of meteorology and background air quality conditions for the five-year period 2014 to 2018. The year 2014 was selected as being most representative as wind speed and direction measured at Griffith Airport AWS in 2014 were considered to be most representative of the five-year period examined.

A summary of the inputs and outputs of the meteorological modelling assessment, including model validation, is presented in **Appendix B**. This analysis includes a discussion of data availability and variability.

4.3 Air Quality

The air quality experienced at any location will be a result of emissions generated by natural and anthropogenic sources on a variety of scales (local, regional and global). The relative contributions of sources at each of these scales to the air quality at a location will vary based on a wide number of factors including the type, location, proximity and strength of the emission source(s), prevailing meteorology, land uses and other factors affecting the emission, dispersion and fate of those pollutants.

When assessing the impact of any particular source of emissions on the potential air quality at a location, the impact of all other sources of an individual pollutant should also be assessed. This 'background' (sometimes called 'baseline') air quality will vary depending on the pollutants to be assessed and can often be characterised by using representative air quality monitoring data.

The Quarry Site is located at significant distance from any of the air quality monitoring stations (AQMS) operated by NSW DPIE. The locations of the nearest AQMS (listed by proximity) are briefly summarised in **Table 6** and presented in **Appendix C**. The year 2014 is indicated in **Table 6** as this is the year selected for assessment. Further information is provided below.

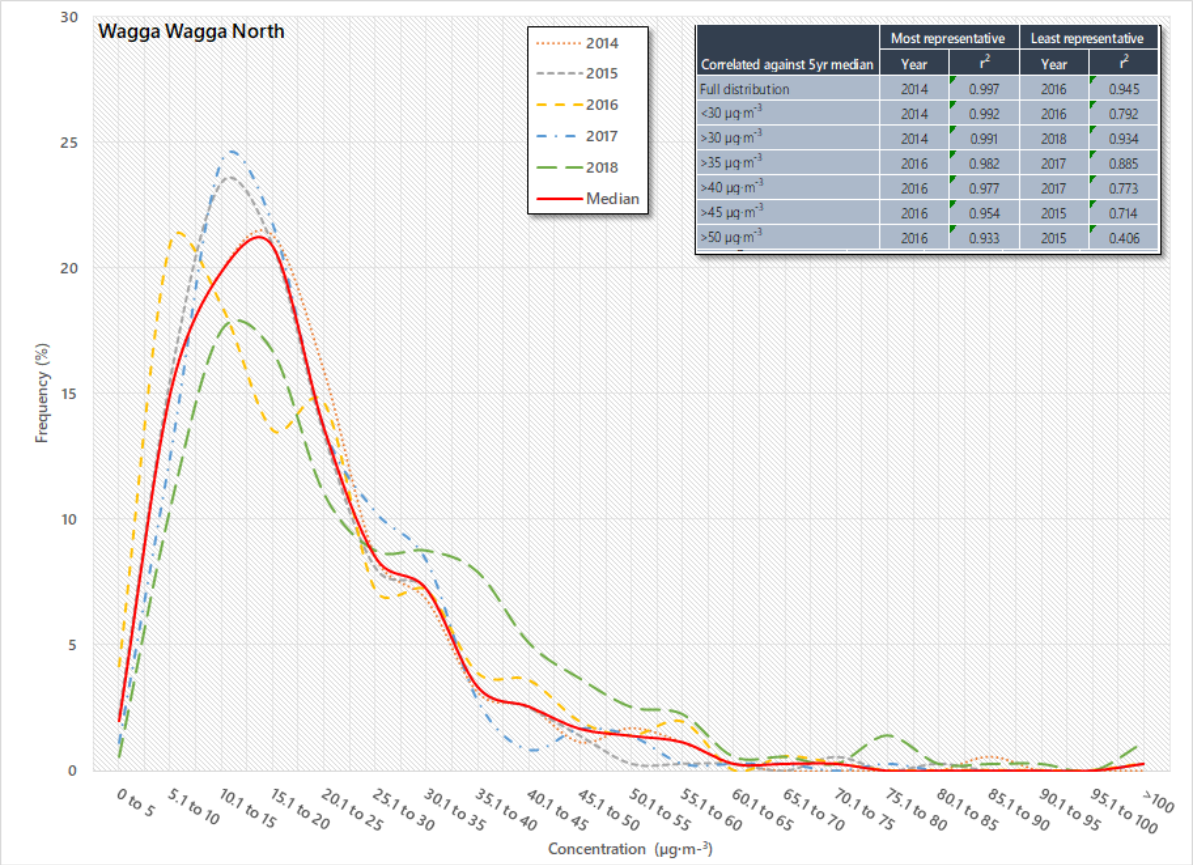
Table 6 Closest DPIE AQMS to the Quarry Site

AQMS Location	Approximate distance to Quarry (km)	Screening Parameters			
		2014 Data	Measurements		
			PM_{10}	$PM_{2.5}$	TSP
Wagga Wagga North	186	✓	✓	✓	×
Wagga Wagga	188	×	×	×	×
Albury	264	✓	✓	×	×
Bathurst	327	✓	✓	×	×

The closest representative AQMS with data available for the assessment year (see below) of 2014 is noted to be located at Wagga Wagga North and is considered to be the monitoring location most reflective of the conditions at the Quarry Site. The adoption of air quality monitoring data, often collected at significant distances from proposed projects, to represent conditions at those locations is a routinely adopted approach in NSW. NSW DPIE operates an extensive air quality monitoring network, generally reflective of the most populated areas of the State. Site specific air quality monitoring funded by proponents can sometimes be used, although for the purposes of use within an AQIA, at least a full year of continuous measurement is required.

Data from the year 2014 have been selected for use in the AQIA to provide an approximation of 'representative' conditions surrounding the Quarry (see **Section 4.2**). This year has been selected through examination of meteorology and air quality for the five-year period 2014 to 2018. In terms of background air quality, the year 2014 was selected as being most representative as PM_{10} data measured at the Wagga Wagga North AQMS in 2014 were statistically shown to be most representative of the five-year median particulate distribution at that location, when considering the full particulate distribution (see **Figure 7**).

Figure 7 Statistical analysis of PM10 concentrations at Wagga Wagga North, 2014 to 2017



Correlated against 5yr median	Most representative		Least representative	
	Year	r^2	Year	r^2
Full distribution	2014	0.997	2016	0.945
<30 µg·m^{-3}	2014	0.992	2016	0.792
>30 µg·m^{-3}	2014	0.991	2018	0.934
>35 µg·m^{-3}	2016	0.982	2017	0.885
>40 µg·m^{-3}	2016	0.977	2017	0.773
>45 µg·m^{-3}	2016	0.954	2015	0.714
>50 µg·m^{-3}	2016	0.933	2015	0.406

It is noted from **Figure 7** that the 24-hour PM_{10} distribution in the year 2016 is shown to be most representative of the 5-year median conditions when considering higher particulate concentrations, particularly those greater than 35 µg·m^{-3}. Data from the year 2016 has not been selected for use as background in this assessment for two reasons:

- PM_{10} data collected in 2016 at Wagga Wagga North is shown to be the least representative of all five years assessed, when considering the full particulate distribution; and
- Wind direction data collected in 2016 at Griffith Airport AWS is shown to not be representative of the broader 5-year period studied.

Appendix C provides a detailed assessment of the background air quality monitoring data collected at the Wagga Wagga North AQMS.

It is noted that none of the AQMS identified in **Table 6** measured concentrations of TSP in the year 2014. This pollutant is of relevance to the expected emissions from the Quarry. Other sources of data have been adopted to allow representation of the TSP environment in the area surrounding the Quarry, and a full discussion is provided in **Appendix C**.

A summary of the air quality monitoring data used in this assessment is presented in **Table 7**. A discussion of the measured exceedances of the 24-hour PM_{10} and $PM_{2.5}$.

Table 7 Summary of background air quality used in the AQIA

Pollutant	Ave Period	Measured Value	Notes
Particles (as TSP)	Annual $\mu g \cdot m^{-3}$	48.4	Estimated on a TSP:PM_{10} ratio of 2.3404 : 1
Particles (as PM_{10})	24-hour $\mu g \cdot m^{-3}$	Daily Varying	The 24-hour maximum PM_{10} in 2014 at Wagga Wagga North was measured to be 88.2 $\mu g \cdot m^{-3}$
	Annual $\mu g \cdot m^{-3}$	20.7	
Particles (as $PM_{2.5}$)	24-hour $\mu g \cdot m^{-3}$	Daily Varying	The 24-hour maximum $PM_{2.5}$ in 2014 at Wagga Wagga North was measured to be 27.6 $\mu g \cdot m^{-3}$
	Annual $\mu g \cdot m^{-3}$	7.6	
Dust deposition	Annual $g \cdot m^{-2} \cdot month^{-1}$	2	Difference in NSW EPA maximum allowable and incremental impact criterion

Note: Reference should be made to **Appendix C**

The AQIA has been performed to assess the contribution of the operations at the Quarry to the air quality of the surrounding area. A full discussion of how the Quarry may impact upon air quality is presented in **Section 1**.

4.4 Topography

The elevation of the Proposal site is between approximately 280 m and 350 m Australian Height Datum (AHD). The Quarry is located at the northern end of two ridge formations (refer **Figure 1**). Receptors are located around and within those ridgeline formations. The topography of the area, and the locations of surrounding receptors in relation to the Quarry and surrounding topography has informed the approach to meteorological modelling (refer **Section 5.1**).

4.5 Potential for Cumulative Impacts

The area surrounding the Quarry Site is generally agricultural in nature, with no significant sources of particulate matter that may impact cumulatively with the Quarry on nearby sensitive receptors. The inclusion of the background air quality data as described in **Section 4.3** would appropriately account for any potential cumulative impacts associated with surrounding land uses.

4.6 Greenhouse Gas

Emissions of GHG are tracked by the Commonwealth of Australia via the Australian National Greenhouse Accounts program. This program, and the reports and data submitted as part of the program, fulfils Australia's international and domestic reporting requirements. Carbon emission totals by State and Territory by year and by sector are reported in the 'State and Territory Greenhouse Gas Inventories' report each year.

These data are used to:

- meet Australia's reporting commitments under the United Nations Framework Convention on Climate Change (UNFCCC);
- track progress against Australia's emission reduction commitments; and,
- inform policy makers and the public.

Data from the 2018 report for Australia (DISER, 2020b) and NSW (DISER, 2020c) have been obtained for the purposes of this GHG assessment. These reports are the most recent available at the time of reporting.

Emissions of GHG from Australia in 2018 across all economic sectors were 537.5 Mt carbon dioxide equivalent (CO_2-e). Emissions from the quarrying industry sector (including metal ore and non-metallic mineral mining and quarrying) accounted for 12.7 Mt CO_2-e, or 2.3 % of total emissions (DISER, 2020b).

GHG emissions in NSW in 2018 were 131.7 Mt CO_2-e with no information provided on the sectoral split of these emissions (DISER, 2020c).

5. APPROACH TO ASSESSMENT

5.1 Air Quality Impact Assessment

5.1.1 Dispersion Modelling

A dispersion modelling assessment has been performed using the NSW EPA approved CALPUFF atmospheric dispersion model. The modelling has been performed in CALPUFF 3-dimensional (3-D) mode, adopting a 'No-Obs' meteorological modelling simulation, in accordance with NSW DPIE guidance (Barclay & Scire, 2011) (please refer to **Appendix B** for further information). This approach allows the inclusion of topographical features which are present in the area surrounding the Quarry, as discussed in **Section 4.4**.

An assessment of the impacts of the operation of activities at the Quarry has been performed which characterises the likely day-to-day operation of the Quarry, approximating average operational characteristics which are appropriate to assess against longer term (annual average) criteria for particulate matter. The likely peak activities at the Quarry have also been characterised to allow comparison of potential impacts against shorter term (24-hour) criteria for particulate matter.

The modelling scenarios provide an indication of the air quality impacts of the operation of activities at the Quarry Site. Added to these impacts are background air quality concentrations (where available and discussed in **Section 4.2** and **Appendix C**) which represent the air quality which may be expected within the area surrounding the Quarry Site, without the impacts of the Quarry itself.

The following provides a description of the determination of appropriate emissions of air pollutants resulting from the operation of the Quarry.

5.1.2 Emissions Estimation

The estimation of emissions from a process is typically performed using direct measurement or through the application of factors which appropriately represent the processes under assessment. This assessment has adopted emission factors for drilling, blasting, materials handling processes, movement of trucks on unpaved site roads, crushing and screening, and wind erosion contained within the US EPA AP-42 emission factor compendium (US EPA, 1995 and updates) to represent the emission of particulate matter resulting from the operations occurring at the Quarry Site as described in **Section 2.2**. These factors are appropriate for adoption in Australia and are routinely adopted in the assessment of operations of this nature.

Potential emissions of particulate matter during Stage 1 and Stage 3 of operations have been quantified, with an emissions inventory associated with the average operational characteristics, and peak characteristics during each stage calculated.

The estimation of annual emissions associated with the Proposal has assumed that operations are being performed at a steady rate across the year which is appropriate. In the assessment of maximum potential 24-hour impacts, it has been assumed that the day of maximum activity occurs on every day of the year. The assessment is required to be performed in this way to ensure that potential worst-case meteorological conditions are assumed at the same time as potential worst-case emissions, although the resulting impacts should be viewed with that conservatism in mind. Importantly, the AQIA is provided to confirm that the Proposal can be operated to be compliant with the air quality criteria in **Section 3**.

A full description of the emission sources included in the assessment, and the emission factors and assumptions adopted are presented in **Appendix D**.

5.1.3 Emissions Controls

Emissions controls will be employed at the Quarry Site. The application of these controls results in quantifiable reductions in the quantity of particulate matter being emitted as part of the Quarry operation.

A summary of the emissions reductions measures that would be adopted as part of the Quarry construction and operation is presented in **Table 8**. These emission reductions are outlined in the NPI EETM for Mining (NPI, 2012) and relevant AP-42 documentation (US EPA, 1995).

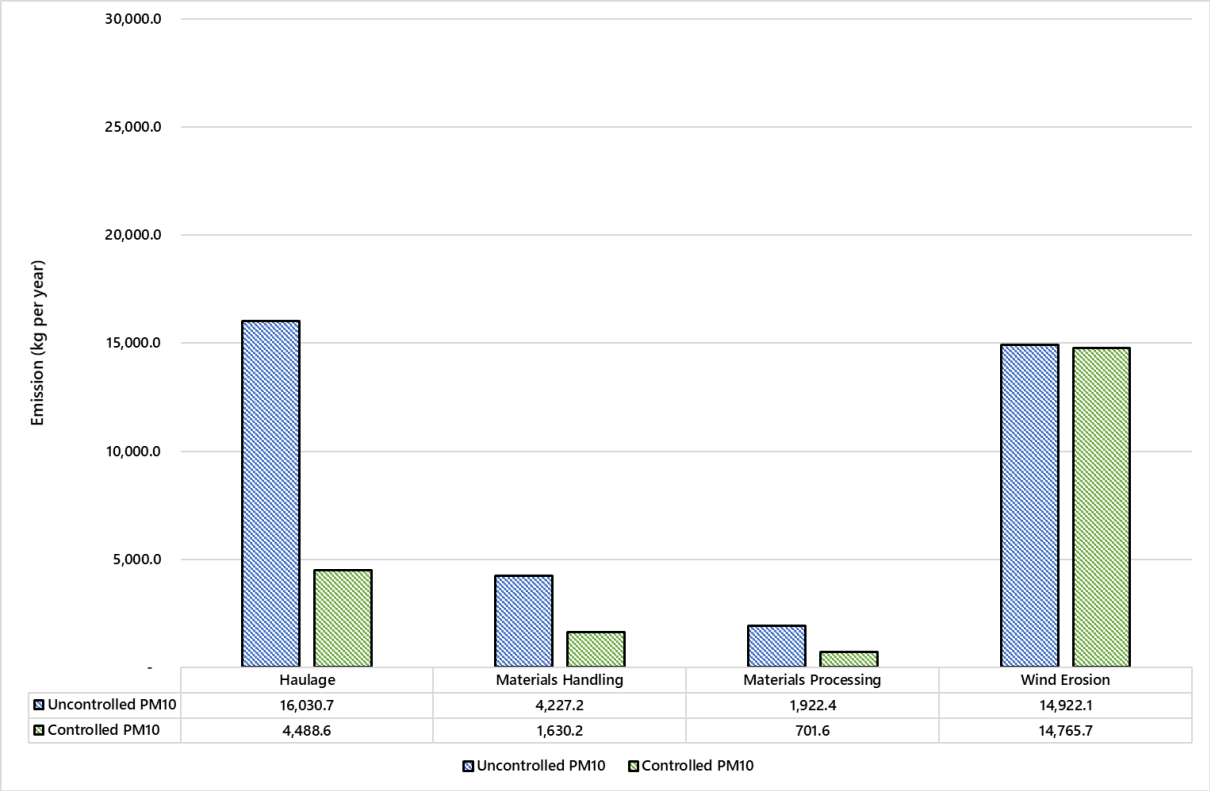
Table 8 Summary of emission reduction methods adopted as part of Quarry operation

Emission control method	Control efficiency (%)
Fabric filters on drill rigs	99
Application of water on unsealed haulage routes (internal) < 2 $L \cdot m^{-2} \cdot hr^{-1}$	50
Reduction in vehicle speeds below 40 $km \cdot hr^{-1}$ (A)	44
Application of water sprays on materials crushing operations	77.7
Application of water sprays on materials screening operations	91.2
Application of pre-coat emulsion to aggregates	100 (assumed wet process)
Retention of particulate matter within the pit, for activities occurring in the pit	50 (TSP) 5 (PM_{10}, $PM_{2.5}$)
Covering loads with a tarpaulin	Not quantified
Limit load sizes to ensure material is not above the level of truck sidewalls	Not quantified

Note: (A) Vehicle speeds on site roads would be limited to 20 $km \cdot hr^{-1}$ and the emission control efficiency is likely to be greater than that assumed here.

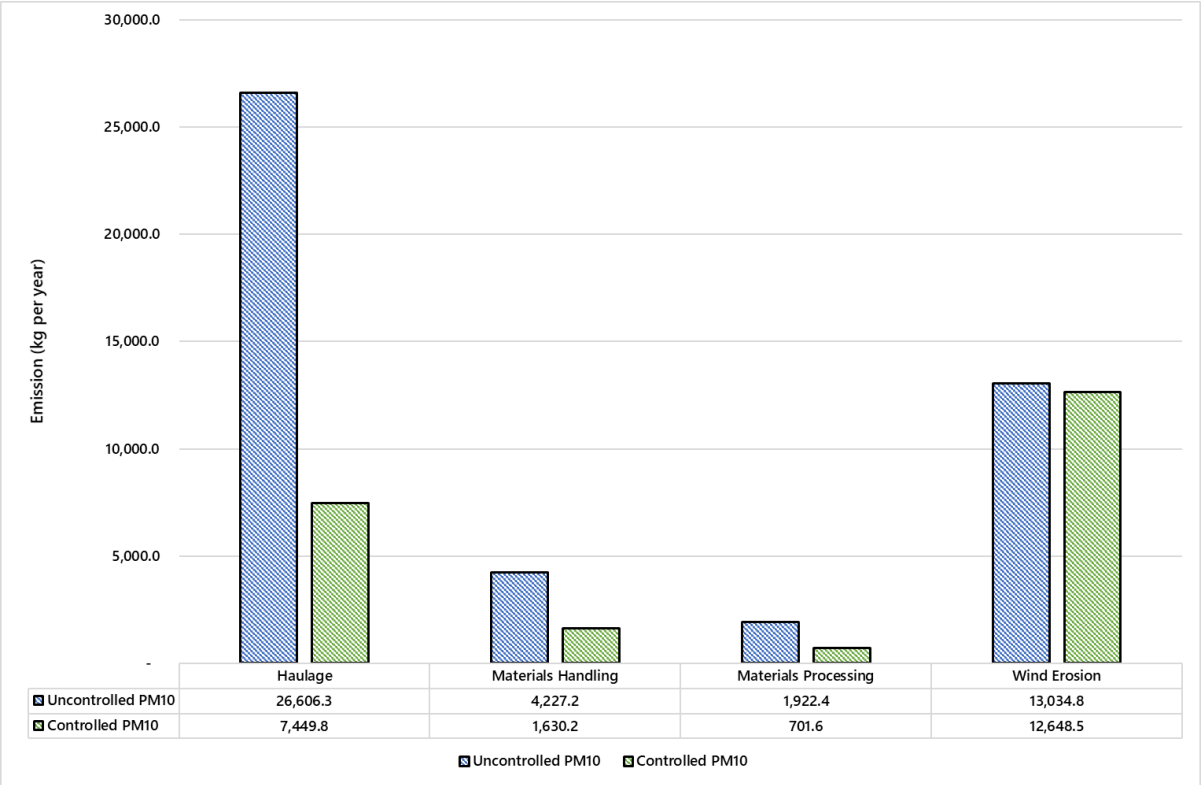
Based on the foregoing, and the information provided in **Appendix D**, the distribution of controlled particulate emissions in each stage of development is presented in **Figure 8** and **Figure 9** (annual emissions totals) and **Figure 10** and **Figure 11** (peak daily emissions).

Figure 8 Calculated uncontrolled & controlled annual particulate emissions (Stage 1)



	Haulage	Materials Handling	Materials Processing	Wind Erosion
Uncontrolled PM10	16,030.7	4,227.2	1,922.4	14,922.1
Controlled PM10	4,488.6	1,630.2	701.6	14,765.7

Figure 9 Calculated uncontrolled & controlled annual particulate emissions (Stage 3)



	Haulage	Materials Handling	Materials Processing	Wind Erosion
Uncontrolled PM10	26,606.3	4,227.2	1,922.4	13,034.8
Controlled PM10	7,449.8	1,630.2	701.6	12,648.5

Figure 10 Calculated uncontrolled & controlled peak 24-hour particulate emissions (Stage 1)

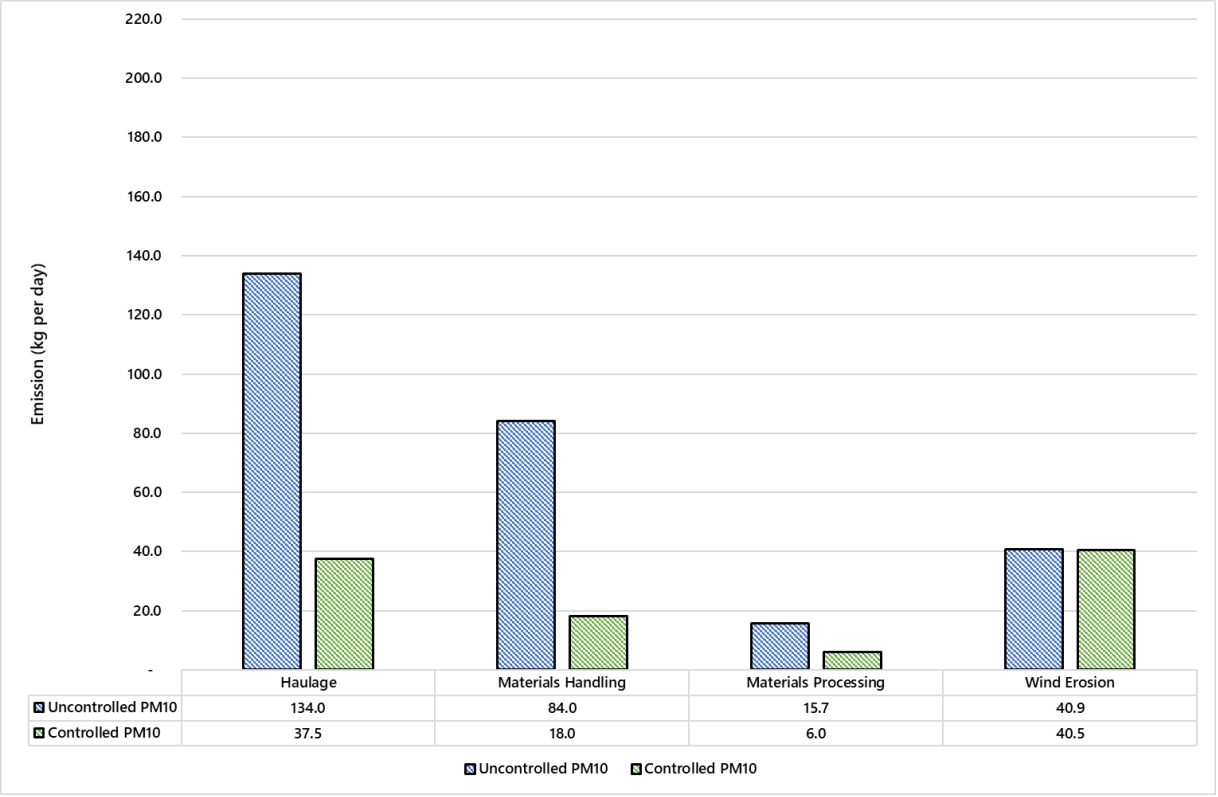
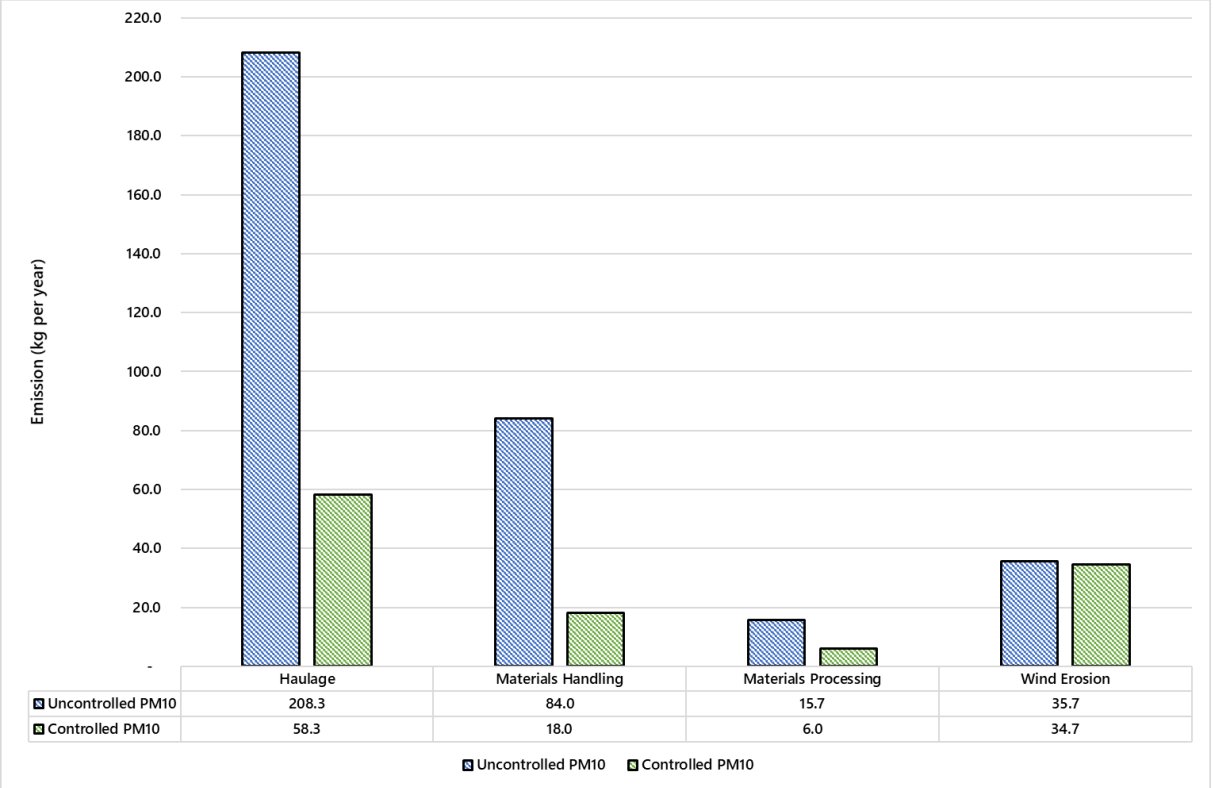


Figure 11 Calculated uncontrolled & controlled peak 24-hour particulate emissions (Stage 3)



5.2 Greenhouse Gas Assessment

The purpose of the GHG assessment is to examine the potential impacts of the operation of the Quarry relating to emissions of GHG. A quantitative assessment of emissions is performed with direct emissions compared with total national and NSW GHG emissions for context (refer **Section 4.6**).

The scope of the GHG assessment is to provide a quantitative assessment of GHG emissions arising from the operation of the Quarry. This report does not provide a definitive quantification of GHG emissions arising from the Quarry operation but provides the general context of the likely quantum of emissions.

Opportunities for reduction of GHG emissions are discussed.

5.2.1 Emission Types

The Australian Government Department of the Environment (DoE) document, "National Greenhouse Accounts Factors" Workbook (NGA Factors) (DISER, 2020a), defines two types of GHG emissions (see **Table 9**), namely 'direct' and 'indirect' emissions. This assessment considers both direct emissions and indirect emissions resulting from the operation of the Quarry.

Table 9 Greenhouse gas emission types

Emission Type	Definition
Direct	Produced from sources within the boundary of an organisation and as a result of that organisation's activities (e.g. consumption of fuel in on-site vehicles)
Indirect	Generated in the wider economy as a consequence of an organisation's activities (particularly from its demand for goods and services), but which are physically produced by the activities of another organisation (e.g. consumption of purchased electricity).

Note: Adapted from NGA Factors Workbook (DISER, 2020a)

5.2.2 Emission Scopes

The NGA Factors (DISER, 2020a) identifies two 'scopes' of emissions for GHG accounting and reporting purposes as shown in **Table 10**.

Table 10 Greenhouse gas emission scopes

Emission Scope	Definition
Scope 1	Direct (or point-source) emission factors give the kilograms of carbon dioxide equivalent (CO_2-e) emitted per unit of activity at the point of emission release (i.e. fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.). These factors are used to calculate Scope 1 emissions.
Scope 2	Indirect emission factors are used to calculate Scope 2 emissions from the generation of the electricity purchased and consumed by an organisation as kilograms of CO_2-e per unit of electricity consumed. Scope 2 emissions are physically produced by the burning of fuels (coal, natural gas, etc.) at the power station.

Note: Adapted from NGA Factors Workbook (DISER, 2020a)

A third scope of emissions, Scope 3 Emissions, are also recognised in some GHG assessments. The Greenhouse Gas Protocol (GHG Protocol) (WRI, 2004) defines Scope 3 emissions as "other indirect GHG emissions":

> *"Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Some examples of Scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services."*

Scope 3 emissions related to the extraction and transport of fuels, and the use of fuels in employee transport have been considered. Emissions associated with the transport of materials from the Quarry are considered in this assessment as Scope 1 emissions as they are under the operational control of the Applicant.

5.2.3 Emission Source Identification

The geographical boundary set for this GHG assessment covers the Quarry Site and also includes the transport of materials from the Quarry to market. All Scope 1 and Scope 3 emissions within the defined boundary have been identified and reported as far as possible.

The GHG emission sources associated with the operation of the Quarry have been identified through the review of the proposed broad activities as described in **Section 1**. The activities/operations being performed, as part of the Quarry, which have the potential to result in emissions of GHG, are presented in **Table 11** below.

Table 11 Greenhouse gas emission sources

Proposal Component	Scope	Emission Source Description
Consumption of diesel fuel in mobile plant and equipment at the Quarry Site	1,3	Emissions from combustion of fuel (Scope 1) Emissions associated with the extraction and processing of fuel (Scope 3)
Consumption of diesel fuel / unleaded fuel for material transport purposes	1,3	Emissions from combustion of fuel (Scope 1) Emissions associated with the extraction and processing of fuel (Scope 3)
Consumption of diesel fuel / unleaded fuel for employee transport purposes	3	Emissions associated with the extraction and processing of fuel (Scope 3)

5.2.4 Emissions Estimation

Emissions of GHG from the source identified in **Table 11** have been calculated using activity data for the source per annum (i.e. per kilolitre (kL) of diesel) and the relevant emission factor for each source. The assumptions used in the calculation of activity data for the emission source and emission factors, are presented below.

Activity Data

The assumptions relating to activity data are outlined in **Table 12** below.

Table 12 Calculated activity data

Component	Assumptions	Activity	Units
Consumption of diesel fuel in mobile plant and equipment at the Quarry	Information provided by the Applicant indicates the diesel fuel use to be 300 000 L per annum in mobile equipment and to provide power to the processing plant. Light vehicles and product transport trucks may also be refuelled on site, although the fuel use associated with trucks is considered separately below.	300	$kL \cdot annum^{-1}$

Component	Assumptions	Activity	Units
Consumption of diesel fuel / unleaded fuel for employee transport purposes	Four full-time equivalent positions to be generated by the Quarry (including 4 to twelve truck drivers). Assume employees reside in Goolgowi (102 km as a two-way journey) 300 days per year 10.6 L per 100km fuel efficiency (ABS, 2017)	25.9	$kL \cdot annum^{-1}$
Consumption of diesel fuel / unleaded fuel for material transport purposes	Laden trucks to travel 26.2 km to Rankins Springs (20 % of loads) and 49.2 km to Goolgowi (80 % of loads) Up to 7 812 return trips each year (1 562 to Rankins Springs, 6 250 to Goolgowi) 56.3 L per 100 km fuel efficiency (ABS, 2017)	375.5	$kL \cdot annum^{-1}$

Emission Factors

Emissions factors used for the assessment of GHG emissions associated with the operation of the Proposal have been sourced from the NGA Factors (DISER, 2020a) (refer to **Table 13**).

Table 13 Greenhouse gas emission factors

Emission Scope	Emission Source	Emission Factor	Energy Content Factor
Scope 1	Diesel fuel for mobile plant and equipment and material transport	70.2 kg CO_2-e$\cdot GJ^{-1}$	38.6 $GJ \cdot kL^{-1}$
Scope 3	Diesel fuel for mobile plant and equipment	3.6 kg CO_2-e$\cdot GJ^{-1}$	38.6 $GJ \cdot kL^{-1}$
	Unleaded fuel for employee transport	3.6 kg CO_2-e$\cdot GJ^{-1}$	34.2 $GJ \cdot kL^{-1}$
	Diesel fuel for material transport	3.6 kg CO_2-e$\cdot GJ^{-1}$	38.6 $GJ \cdot kL^{-1}$

6. AIR QUALITY IMPACT ASSESSMENT

This section presents the results of the dispersion modelling assessment and uses the following terminology:

- Incremental impact – relates to the concentrations predicted as a result of the construction and operation of the Quarry in isolation.
- Cumulative impact – relates to the incremental concentrations predicted as a result of the construction and operation of the Quarry PLUS the background air quality concentrations discussed in **Section 4.2**.

The results are presented in this manner to allow examination of the likely impact of the Quarry in isolation and the contribution to air quality impacts in a broader sense.

In the presentation of results, the tables included shaded cells which represent the following:

Model prediction	Pollutant concentration / deposition rate less than the relevant criterion	**Pollutant concentration / deposition rate equal to, or greater than the relevant criterion**

6.1 Particulate Matter – Annual Average PM_{10} and $PM_{2.5}$

The predicted annual average particulate matter concentrations (as TSP, PM_{10} and $PM_{2.5}$) resulting from the operations in Stage 1 and Stage 3 at the Quarry Site are presented in **Table 14** and **Table 15**, respectively.

The maximum incremental annual average concentrations of TSP, PM_{10} and $PM_{2.5}$ predicted at the privately owned receptors during both Stage 1 and Stage 3 operations are all less than (<) 0.1 $\mu g \cdot m^{-3}$. These represent < 0.2 %, < 0.4 %, and < 1.25 % of the relevant criteria, respectively.

The addition of existing background concentrations (refer **Section 4.2**) results in predicted concentrations of annual average TSP being < 53.9 %, PM_{10} < 83.2 %, and $PM_{2.5}$ < 96.2 % of the relevant criteria at all privately owned residences during both Stages assessed.

Table 14 Predicted annual average TSP, PM_{10} and $PM_{2.5}$ concentrations – Stage 1

Receptor	Annual Average Concentration ($\mu g \cdot m^{-3}$)								
	TSP			PM_{10}			$PM_{2.5}$		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
4	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
5	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
11	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7

Receptor	Annual Average Concentration (µg·m^{-3})								
	TSP			PM_{10}			$PM_{2.5}$		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
14	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
15A	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
15B	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
16	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
17A	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
17B	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
18	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
Criterion	-	90		-	25		-	8	
Project related receptors									
1	0.2	48.4	48.6	0.1	20.7	20.8	<0.1	7.6	7.7
2	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7

No contour plots of annual average TSP, PM_{10} or $PM_{2.5}$ are presented, given the minor predicted contribution from the operations at the Proposal site at the nearest relevant sensitive receptors.

In relation to silica, even assuming that 100 % of annual average $PM_{2.5}$ incremental impacts are silica (the actual content is more likely to be 29 %, as discussed in **Section 3.1**), the Proposal operation is anticipated to result in impacts far below the relevant criterion of as 3 µg·m^{-3} (annual average), which has been adopted from the California EPA Office for Environmental Health Hazard Assessment Reference Exposure Levels (refer **Section 3**).

Solely for the purposes of assurance, even assuming 100 % of $PM_{2.5}$ is silica (which is a conservative assumption) impacts are predicted to be < 3.4 % of the annual average RCS criterion at all surrounding receptors, during both Stages subject to assessment.

Table 15 Predicted annual average TSP, PM_{10} and $PM_{2.5}$ concentrations – Stage 3

Receptor	Annual Average Concentration (µg·m^{-3})								
	TSP			PM_{10}			$PM_{2.5}$		
	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact	Incremental Impact	Background	Cumulative Impact
4	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
5	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
11	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
14	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
15A	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
15B	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
16	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
17A	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
17B	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
18	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7
Criterion	-	90		-	25		-	8	
Project related receptors									
1	0.3	48.4	48.7	0.2	20.7	20.9	<0.1	7.6	7.7
2	<0.1	48.4	48.5	<0.1	20.7	20.8	<0.1	7.6	7.7

6.2 Particulate Matter – Annual Average Dust Deposition Rates

Table 16 and **Table 17** present the annual average dust deposition predicted as a result of the operations at the Quarry in Stage 1 and Stage 3, respectively.

An assumed background dust deposition of 2 g·m^{-2}·month^{-1} is presented in **Table 16** and **Table 17**, although comparison of the incremental concentration with the incremental criterion of 2 g·m^{-2}·month^{-1} is also valid (as discussed within **Section 3**). In either case, the resulting conclusions drawn are identical. The Proposal in either stage of operations is predicted to result in incremental increases of dust deposition < 0.1 g·m^{-2}·month^{-1} which represents < 5 % of the incremental criterion. Addition of an assumed background dust deposition of 2 g·m^{-2}·month^{-1} results in predicted dust deposition in both stages being < 52 % of the criterion.

No contour plots of annual average dust deposition are presented, given the minor predicted contribution from the operations at the Quarry at the nearest sensitive receptors.

Table 16 Predicted annual average dust deposition – Stage 1

Receptor	Annual Average Dust Deposition ($g \cdot m^{-2} \cdot month^{-1}$)		
	Incremental Impact	Background	Cumulative Impact
4	<0.1	2.0	2.1
5	<0.1	2.0	2.1
11	<0.1	2.0	2.1
14	<0.1	2.0	2.1
15A	<0.1	2.0	2.1
15B	<0.1	2.0	2.1
16	<0.1	2.0	2.1
17A	<0.1	2.0	2.1
17B	<0.1	2.0	2.1
18	<0.1	2.0	2.1
Criterion	2.0	-	4.0
Project related receptors			
1	<0.1	2.0	2.1
2	<0.1	2.0	2.1

Table 17 Predicted annual average dust deposition – Stage 3

Receptor	Annual Average Dust Deposition ($g \cdot m^{-2} \cdot month^{-1}$)		
	Incremental Impact	Background	Cumulative Impact
4	<0.1	2.0	2.1
5	<0.1	2.0	2.1
11	<0.1	2.0	2.1
14	<0.1	2.0	2.1
15A	<0.1	2.0	2.1
15B	<0.1	2.0	2.1
16	<0.1	2.0	2.1
17A	<0.1	2.0	2.1
17B	<0.1	2.0	2.1
18	<0.1	2.0	2.1
Criterion	2.0	-	4.0
Project related receptors			
1	<0.1	2.0	2.1
2	<0.1	2.0	2.1

6.3 Particulate Matter - Maximum 24-hour Average

Presented in **Table 18** are the maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations predicted to occur at the nearest sensitive receptors as a result of the Stage 1 and Stage 3 operations at the Quarry. No background concentrations are included within this table. Maximum concentrations at privately owned residences in each stage are highlighted in bold.

Table 18 Predicted maximum incremental 24-hour PM_{10} and $PM_{2.5}$ concentrations

Receptor	Maximum incremental 24-hour average concentration ($\mu g \cdot m^{-3}$)			
	Stage 1		Stage 3	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
4	1.1	0.2	1.4	0.2
5	0.8	0.1	1.0	0.1
11	0.6	<0.1	0.4	<0.1
14	0.5	<0.1	0.6	<0.1
15A	**1.9**	**0.3**	**2.2**	**0.3**
15B	0.5	<0.1	0.4	<0.1
16	0.4	<0.1	0.5	<0.1
17A	0.9	0.2	1.0	0.2
17B	0.7	0.1	1.0	0.1
18	0.3	<0.1	0.3	<0.1
Criterion	50	25	50	25
Project related receptors				
1	2.6	0.4	4.3	0.6
2	0.5	<0.1	0.6	<0.1

The predicted incremental concentrations of PM_{10} and $PM_{2.5}$ are not demonstrated to be significant, with impacts at surrounding sensitive receptor locations predicted to be slightly higher during Stage 3 operations. Maximum incremental PM_{10} and $PM_{2.5}$ impacts are predicted to be 2.2 $\mu g \cdot m^{-3}$ and 0.3 $\mu g \cdot m^{-3}$, respectively at receptor 15A during Stage 3. These maximum incremental impacts represent 4.4 % and 1.2 % of the relevant criteria.

The following tables present the predicted maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations resulting from the operation of the Proposal, with background included.

Results are presented for the privately owned receptor at which the highest incremental PM_{10} and $PM_{2.5}$ impacts have been predicted (receptor 15A), and also for the privately owned receptors at which the highest cumulative impacts (increment plus background) have been predicted, which are indicated within each table.

The left side of the tables show the predicted concentration on days with the highest cumulative impacts (typically driven by the days of the highest contemporaneous background), and the right side shows the total predicted cumulative impact on days with the highest predicted incremental concentrations.

Model predictions presented in **Table 19** and **Table 20** indicate that there are exceedances of the 24-hour average PM_{10} criterion at surrounding receptors, although as identified in **Section 4.3** and discussed in **Appendix C**, these were often the result of bushfires or grassfires in the area of the Wagga Wagga North AQMS (from which background data has been adopted). Importantly, the results indicate that:

- the Proposal is not predicted to result in any additional exceedances of the maximum 24-hour PM_{10} criterion; and
- when considering the maximum modelled incremental 24-hour PM_{10} impact from the Proposal, this would not result in an exceedance of the relevant criterion.

The same conclusions are drawn in relation to maximum 24-hour $PM_{2.5}$, with those results presented in **Table 21** and **Table 22**. For clarity,

- the Proposal is not predicted to result in any additional exceedances of the maximum 24-hour $PM_{2.5}$ criterion; and
- when considering the maximum modelled incremental 24-hour $PM_{2.5}$ impact from the Proposal, this would not result in an exceedance of the relevant criterion.

Although incremental impacts associated with all pollutants are predicted to be minor at all surrounding receptor locations, to allow a visualisation of the extent of any impacts surrounding the Proposal site, a contour plot of the incremental contribution to the 24-hour average PM_{10} concentration during Stage 3 operations is presented in **Figure 12**.

Table 19 Summary of contemporaneous impact and background – PM_{10} – Stage 1

Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$) – Receptor 15A			Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$) – Receptor 15A		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
31/01/2014	<0.1	88.2	88.3	20/08/2014	1.9	16.3	18.2
10/02/2014	0.2	87.3	87.5	9/06/2014	1.3	24.2	25.5
8/02/2014	<0.1	62.4	62.5	20/07/2014	1.3	17.5	18.8
18/01/2014	<0.1	58.8	58.9	12/08/2014	0.9	17.9	18.8
29/12/2014	<0.1	58.0	58.1	4/06/2014	0.9	10.3	11.2
15/01/2014	<0.1	57.7	57.8	4/09/2014	0.9	18.1	19.0
20/01/2014	<0.1	55.3	55.4	28/08/2014	0.9	24.5	25.4
14/11/2014	<0.1	54.8	54.9	7/05/2014	0.8	18.7	19.5
17/03/2014	<0.1	54.4	54.5	15/04/2014	0.7	19.5	20.2
9/02/2014	<0.1	53.8	53.9	13/08/2014	0.7	22.3	23.0
29/01/2014	<0.1	52.6	52.7	30/08/2014	0.7	22.0	22.7
18/03/2014	<0.1	52.1	52.2	27/11/2014	0.7	17.4	18.1
20/11/2014	<0.1	50.8	50.9	13/04/2014	0.7	12.8	13.5
22/01/2014	0.7	50.0	50.7	22/01/2014	0.7	50.0	50.7
4/02/2014	0.2	46.8	47.0	21/09/2014	0.6	22.8	23.4
21/03/2014	<0.1	46.4	46.5	13/03/2014	0.6	18.3	18.9
These data represent the highest Cumulative Impact 24-hour PM_{10} predictions (outlined in red) as a result of the operation of the project.				These data represent the highest Incremental Impact 24-hour PM_{10} predictions (outlined in blue) as a result of the operation of the project.			

Table 20 Summary of contemporaneous impact and background – PM_{10} – Stage 3

Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$) – Receptor 15A			Date	24-hour average PM_{10} concentration ($\mu g \cdot m^{-3}$) – Receptor 15A		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
31/01/2014	<0.1	88.2	88.3	20/08/2014	2.2	16.3	18.5
10/02/2014	0.2	87.3	87.5	20/07/2014	2.2	17.5	19.7
8/02/2014	<0.1	62.4	62.5	9/06/2014	1.4	24.2	25.6
18/01/2014	<0.1	58.8	58.9	4/09/2014	1.1	18.1	19.2
29/12/2014	<0.1	58.0	58.1	12/08/2014	1.1	17.9	19.0
15/01/2014	<0.1	57.7	57.8	30/08/2014	1.1	22.0	23.1
20/01/2014	<0.1	55.3	55.4	20/10/2014	0.9	21.0	21.9
14/11/2014	<0.1	54.8	54.9	4/06/2014	0.9	10.3	11.2
17/03/2014	<0.1	54.4	54.5	7/05/2014	0.9	18.7	19.6
9/02/2014	<0.1	53.8	53.9	13/03/2014	0.8	18.3	19.1
29/01/2014	<0.1	52.6	52.7	21/09/2014	0.8	22.8	23.6
18/03/2014	<0.1	52.1	52.2	28/08/2014	0.8	24.5	25.3
20/11/2014	<0.1	50.8	50.9	27/11/2014	0.8	17.4	18.2
22/01/2014	0.7	50.0	50.7	22/01/2014	0.7	50.0	50.7
4/02/2014	0.3	46.8	47.1	15/04/2014	0.7	19.5	20.2
21/03/2014	<0.1	46.4	46.5	13/08/2014	0.7	22.3	23.0
These data represent the highest Cumulative Impact 24-hour PM_{10} predictions (outlined in red) as a result of the operation of the project.				These data represent the highest Incremental Impact 24-hour PM_{10} predictions (outlined in blue) as a result of the operation of the project.			

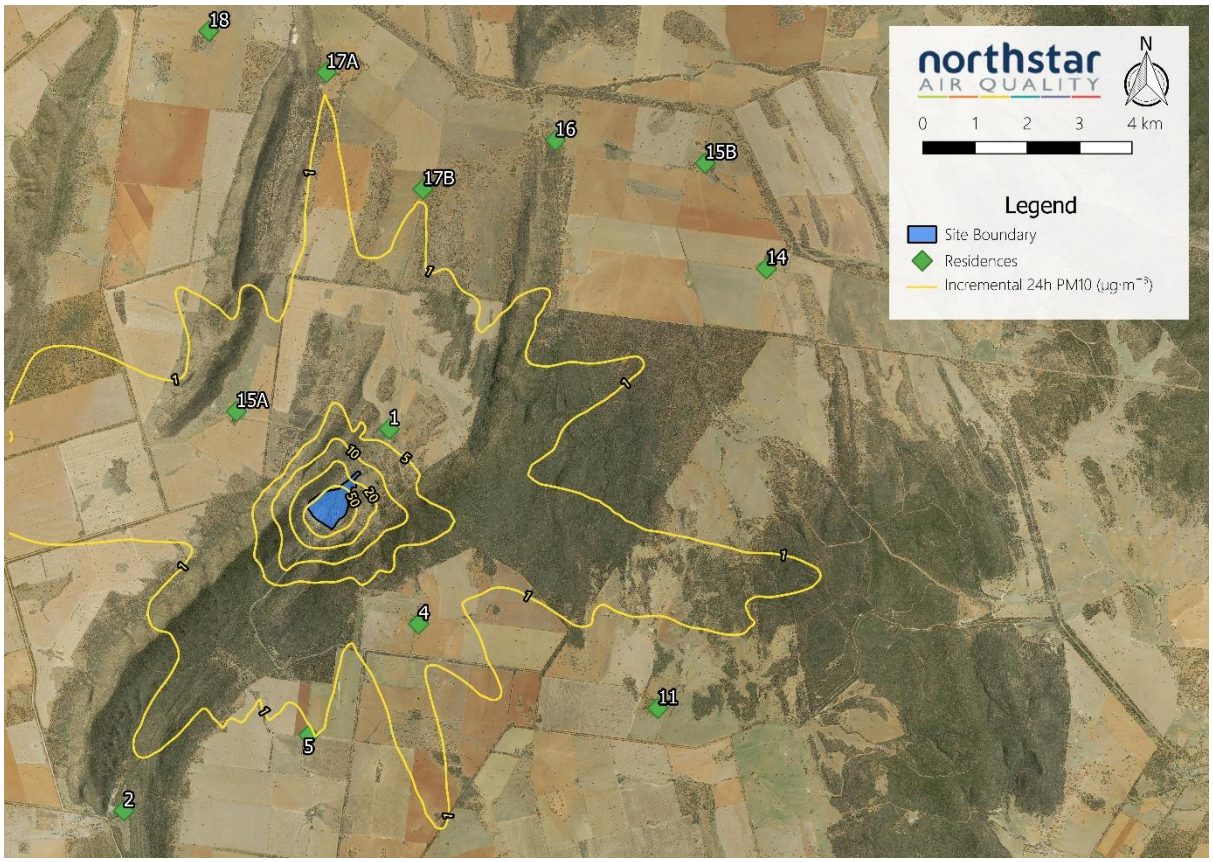
Table 21 Summary of contemporaneous impact and background – $PM_{2.5}$ – Stage 1

Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$) – Receptor 15A			Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$) – Receptor 15A		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
4/02/2014	<0.1	27.6	27.7	20/08/2014	0.3	11.4	11.7
9/06/2014	0.2	26.7	26.9	20/07/2014	0.2	17.6	17.8
10/02/2014	<0.1	24.1	24.2	9/06/2014	0.2	26.7	26.9
10/06/2014	<0.1	20.2	20.3	12/08/2014	0.1	6.9	7.0
15/01/2014	<0.1	19.0	19.1	24/05/2014	0.1	10.3	10.4
20/07/2014	0.2	17.6	17.8	4/06/2014	0.1	4.7	4.8
16/05/2014	<0.1	17.2	17.3	28/08/2014	0.1	8.7	8.8
3/08/2014	<0.1	16.5	16.6	4/09/2014	0.1	10.4	10.5
23/02/2014	<0.1	15.2	15.3	30/08/2014	0.1	14.3	14.4
8/06/2014	<0.1	14.6	14.7	7/05/2014	0.1	13.9	14.0
These data represent the highest Cumulative Impact 24-hour $PM_{2.5}$ predictions (outlined in red) as a result of the operation of the Proposal.				These data represent the highest Incremental Impact 24-hour $PM_{2.5}$ predictions (outlined in blue) as a result of the operation of the Proposal.			

Table 22 Summary of contemporaneous impact and background – $PM_{2.5}$ – Stage 3

Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$) – Receptor 7			Date	24-hour average $PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$) – Receptor 1		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
4/02/2014	<0.1	27.6	27.7	20/07/2014	0.3	17.6	17.9
9/06/2014	0.2	26.7	26.9	20/08/2014	0.3	11.4	11.7
10/02/2014	<0.1	24.1	24.2	30/08/2014	0.2	14.3	14.5
10/06/2014	<0.1	20.2	20.3	9/06/2014	0.2	26.7	26.9
15/01/2014	<0.1	19.0	19.1	12/08/2014	0.1	6.9	7.0
20/07/2014	0.3	17.6	17.9	4/09/2014	0.1	10.4	10.5
16/05/2014	<0.1	17.2	17.3	18/06/2014	0.1	6.4	6.5
3/08/2014	<0.1	16.5	16.6	20/10/2014	0.1	7.1	7.2
23/02/2014	<0.1	15.2	15.3	7/05/2014	0.1	13.9	14.0
8/06/2014	<0.1	14.6	14.7	4/06/2014	0.1	4.7	4.8
These data represent the highest Cumulative Impact 24-hour $PM_{2.5}$ predictions (outlined in red) as a result of the operation of the Proposal.				These data represent the highest Incremental Impact 24-hour $PM_{2.5}$ predictions (outlined in blue) as a result of the operation of the Proposal.			

Figure 12 Incremental 24-hour PM_{10} concentrations – Stage 3



Note 1: Criterion = 50 µg·m^{-3} (cumulative)

6.4 Emissions Associated with Offsite Transportation

As required within the SEARs (refer **Section 1.1**), an assessment of the impact of road haulage is required to be provided. Impacts associated with road haulage have been assessed from onsite and offsite haulage, with those impacts being assessed from the junction of the Quarry Entrance and the Quarry Access Road. The impacts of haulage within that boundary on the surrounding sensitive receptors is therefore an intrinsic component of the results presented in **Section 6**.

As outlined in section 2.8 of the main EIS document, Quarry products would be transported south via the Quarry Access Road and Munros Road to the Mid Western Highway, and then either east on the Mid Western Highway (approximately 20 % of loads) or west (approximately 80 % of loads). The addition of a proposed maximum (total) 60 heavy vehicles per day on those largely sealed roads is anticipated to result in no measurable increase in air quality impacts at receptors in proximity to that haulage route.

7. GREENHOUSE GAS ASSESSMENT

This section presents the results of the GHG assessment, compares direct emissions totals with NSW and Australian totals, and provides a range of measures which might be considered to reduce GHG emissions.

7.1 Calculation of GHG Emissions

Based on the activity data for the operation of the Proposal and the emission factors outlined in **Section 5.2**, annual GHG emissions have been calculated and are presented in **Table 23**. The Proposal is calculated to result in direct (Scope 1) GHG emissions of 1 825 t CO_2-e per annum.

Table 23 Calculated Proposal GHG emissions

Scope		Activity Rate	Units	Energy Content	Units	Emission Factor		CO_2-e ($t \cdot yr^{-1}$)
1	Diesel fuel in plant and machinery on site	300	$kL \cdot year^{-1}$	38.6	$GJ \cdot kL^{-1}$	70.2	kg CO_2-e·GJ^{-1}	812.9
	Material transport	373.5						1 012.1
Scope 1 (subtotal)								1 825.0
3	Diesel fuel in plant and machinery on site	300	$kL \cdot year^{-1}$	38.6	$GJ \cdot kL^{-1}$	3.6	kg CO_2-e·GJ^{-1}	41.7
	Material transport	373.5						51.9
	Employee travel	25.9		34.2				3.2
Scope 3 (subtotal)								96.8

7.2 Greenhouse Gas Emissions in Context

A comparison of the calculated GHG emissions associated with the Proposal against Australian (DISER, 2020b) and NSW (DISER, 2020c) total emissions in 2018 is presented **Table 24.**

These data indicate that the operation of the Proposal, would contribute less than 0.0014 % of NSW total GHG emissions and less than 0.0004 % of Australian total GHG emissions in 2018.

Table 24 Proposal GHG emissions in context

Proposal Phase	Emissions (t CO_2-e per annum)		
	Proposal	NSW (2018)	Australia (2018)
		Total 131 685 000	Total 537 446 000
Operation	1 825.0	0.0014 %	0.0003 %

7.3 Management of GHG Emissions

The above assessment indicates that GHG emissions resulting from the operation of the Proposal are anticipated to be small, although emissions could be further reduced through the application of a number of measures:

- All vehicles/plant and machinery should be turned off when not in use and regularly serviced to ensure efficient operation, including the optimisation of tyre pressures;
- Truck routes and loading capacity should be designed to reduce the distance and effort required by the vehicles;
- Maintenance of roads in good condition to avoid meandering of vehicles;
- Reducing gradients around site where feasible; and
- Where possible, B5 fuel should be used in plant and equipment.

8. MITIGATION AND MONITORING

8.1 Air Quality Mitigation

Based on the findings of the operational phase air quality impact assessment, it is considered that the particulate control measures proposed to be implemented will be more than sufficient to ensure that air quality impact at surrounding receptor locations are adequately controlled.

A number of mitigation measures are proposed to be implemented as part of the Quarry operation. Where defensible quantification of the control efficiencies afforded by these measures can be determined, these have been applied within the assessment.

The mitigation measures which will be used as part of the Quarry activities are summarised in **Table 25**.

Table 25 Summary of emission reduction methods adopted as part of Quarry operation

Emission control method	Control efficiency (%)
Fabric filters on drill rigs	99
Application of water on unsealed haulage routes (internal) < 2 $L \cdot m^{-2} \cdot hr^{-1}$	50
Reduction in vehicle speeds below 40 $km \cdot hr^{-1}$ (A)	44
Application of water sprays on materials crushing operations	77.7
Application of water sprays on materials screening operations	91.2
Application of pre-coat emulsion to aggregates	100 (assumed wet process)
Retention of particulate matter within the pit, for activities occurring in the pit	50 (TSP) 5 (PM_{10}, $PM_{2.5}$)
Covering loads with a tarpaulin	Not quantified
Limit load sizes to ensure material is not above the level of truck sidewalls	Not quantified

Note: (A) Vehicle speeds on site roads would be limited to 20 $km \cdot hr^{-1}$ and the emission control efficiency is likely to be greater than that assumed here.

The Environmental Management Plan for the Quarry site will include the measures identified above. The Quarry Manager will be responsible for ensuring that no operations are performed without the inclusion of the relevant controls.

8.2 Greenhouse Gas Mitigation

Emissions of GHG resulting from the Proposal operation would be minimised to the maximum extent practical by consideration of the following measures:

- All vehicles/plant and machinery should be turned off when not in use and regularly serviced to ensure efficient operation, including the optimisation of tyre pressures;
- Truck routes and loading capacity should be designed to reduce the distance and effort required by the vehicles;

- Maintenance of roads in good condition to avoid meandering of vehicles;
- Reducing gradients around site where feasible; and
- Where possible, B5 fuel should be used in plant and equipment.

8.3 Monitoring

The predictions presented in this AQIA indicate that there would be no predicted exceedances of the adopted air quality criteria as a result of the Quarry operation. Additionally, given the distances between the Quarry and the receptor locations, the incremental impacts associated with the Proposal operation are predicted to be minor. Therefore, it is anticipated that no air quality monitoring would be required to be performed, although it is recommended that regular audits are performed to ensure that the Quarry is implementing the air quality control measures appropriately, as outlined within this report.

9. CONCLUSION

R.W. Corkery & Co. Pty Limited has engaged Northstar on behalf of Rockwoods Investment Group Pty Ltd to perform an AQIA and GHGA for the continued operation and extension of the Western Riverina Quarry located within Lot 1 DP821515.

This AQIA forms part of the Environmental Impact Statement (EIS) prepared to accompany the development application for the Proposal under Part 4 of the *Environmental Planning and Assessment Act* 1979.

The AQIA has been performed in accordance with the NSW EPA Approved Methods document and includes a detailed description of the operations to be performed as part of the Proposal and includes a description of the management measures that will be employed to minimise particulate generation. The locations of surrounding sensitive receptor locations, a description of existing air quality and meteorology, and a description of the method used to assess potential impacts are also provided.

The results of the AQIA indicate that, during both stages assessed (Stage 1 and Stage 3), the impacts of the Proposal are predicted to be minor at all surrounding receptor locations.

In relation to annual average criteria (PM_{10}, $PM_{2.5}$, dust deposition and silica), the addition of those minor incremental impacts to existing background air quality results in the achievement of all criteria.

The Proposal is predicted to result in no any additional exceedances of the 24-hour maximum PM_{10} and $PM_{2.5}$ concentrations. Exceedances are identified in the air quality data adopted to represent the existing environment, and are likely due to grassfires, bushfires, or agricultural activities. For clarity, the Proposal is anticipated to result in no increases in particulate concentrations which would result in additional exceedances of the criteria.

A range of management measures would be adopted as part of the Proposal, and their implementation would be a responsibility of the Quarry manager.

GHG emissions anticipated as a result of the Proposal have been calculated in accordance with Australian Government methods. Emissions resulting from the Proposal are calculated to be insignificant, contributing less than 0.0014 % of NSW total GHG emissions and less than 0.0003 % of Australian total GHG emissions in 2018.

A range of management measures are to be considered which would result in further reductions in GHG emissions.

It is respectfully considered that the Proposal should not be rejected on the grounds of air quality

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APPENDIX A

Report Units and Common Abbreviations

Units Used in the Report

All units presented in the report follow the International System of Units (SI) conventions, unless derived from references using non-SI units. In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol. For example:

- 50 micrograms per cubic metre would be presented as 50 $\mu g \cdot m^{-3}$ and not 50 $\mu g/m^3$; and,
- 0.2 kilograms per hectare per hour would be presented as 0.2 $kg \cdot ha^{-1} \cdot hr^{-1}$ and not 0.2 kg/ha/hr.

Table A1 Common Abbreviations

Abbreviation	Term
ABS	Australian Bureau of Statistics
AHD	Australian height datum
AQIA	air quality impact assessment
AQMS	air quality monitoring station
AWS	automatic weather station
BoM	Bureau of Meteorology
°C	degrees Celsius
CO	carbon monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPIE	NSW Department of Planning, Industry and Environment
EETM	emission estimation technique manual
EPA	Environmental Protection Authority
FEL	front end loader
GDA	Geocentric Datum of Australia
GIS	geographical information system
$g \cdot m^{-2} \cdot month^{-1}$	grams per square metre per month
K	kelvin (-273°C = 0 K, ±1°C = ±1 K)
kW	kilowatt
MGA	Map Grid of Australia
$mg \cdot m^{-3}$	milligram per cubic metre of air
$\mu g \cdot m^{-3}$	microgram per cubic metre of air
NCAA	National Clean Air Agreement
NEPM	National Environment Protection Measure
OEH	NSW Office of Environment and Heritage (now defunct)
PM	particulate matter

Abbreviation	Term
PM_{10}	particulate matter with an aerodynamic diameter of 10 µm or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 µm or less
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEE	Statement of Environmental Effects
TAPM	The Air Pollution Model
TPM	total particulate matter
TSP	total suspended particulates
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VKT	vehicle kilometres travelled

APPENDIX B

Meteorology

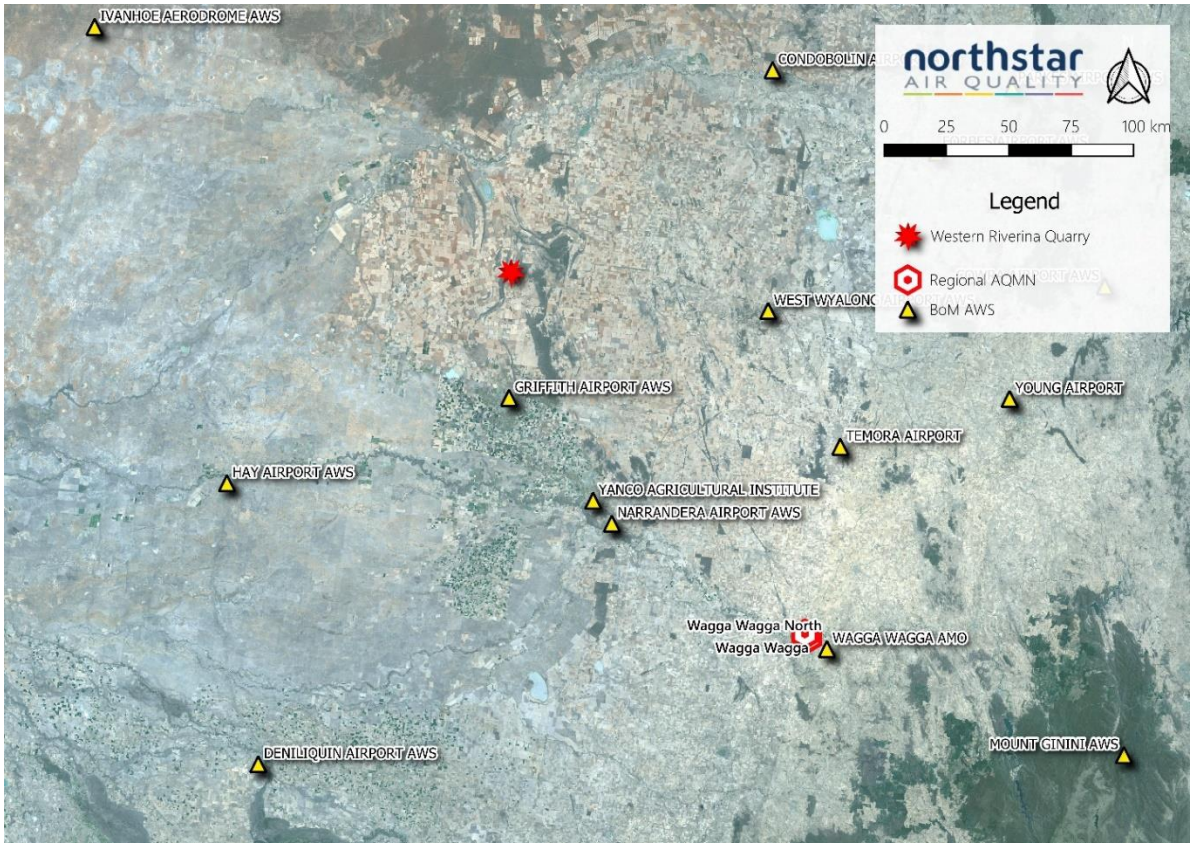
As discussed in **Section 4.2** a meteorological modelling exercise has been performed to characterise the meteorology of the Quarry Site in the absence of site-specific measurements. The meteorological modelling has been based on measurements taken at a number of surrounding automatic weather stations (AWS) operated by the Australian Government Bureau of Meteorology (BoM).

A summary of the relevant AWS is provided in **Table B1** and also displayed in **Figure B1**.

Table B1 Details of the meteorological monitoring surrounding the Proposal site

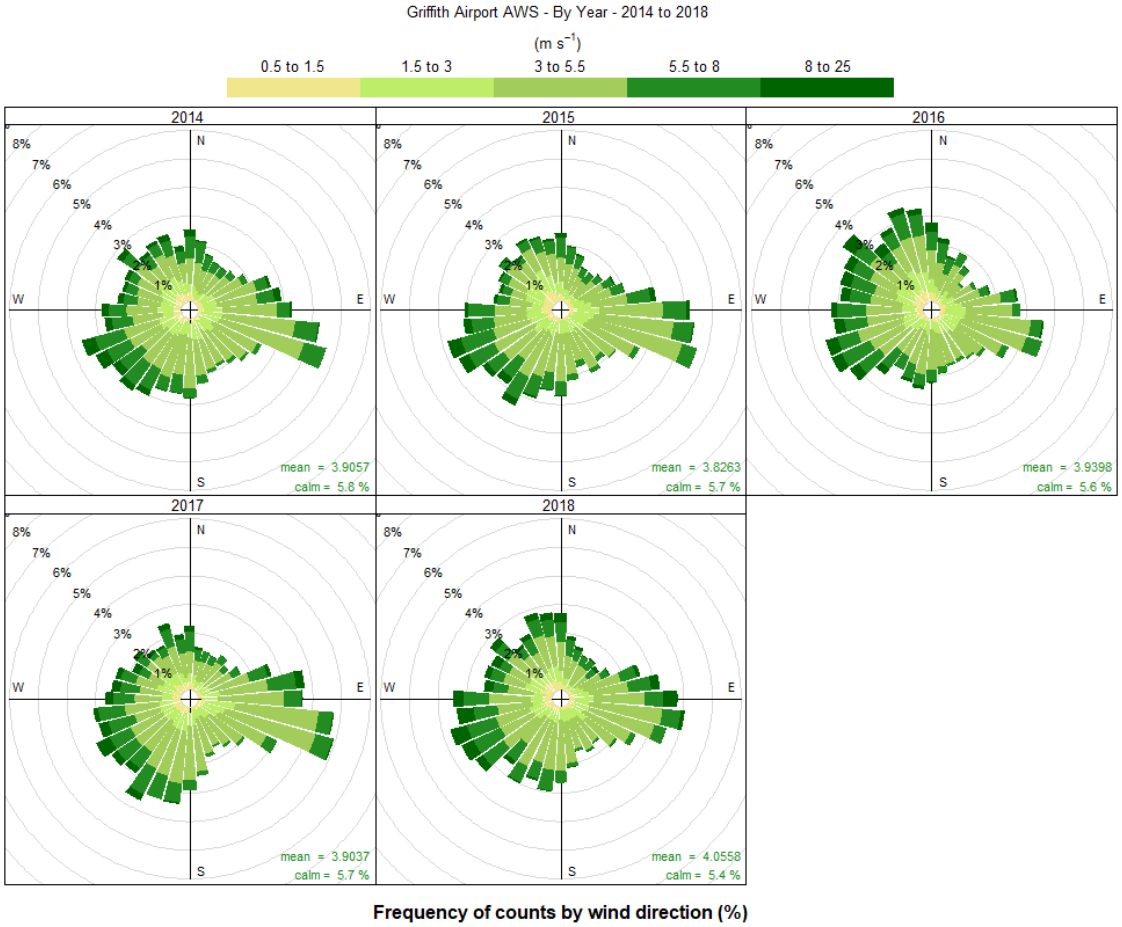
Site Name	Source	Approximate Location (UTM)		Approximate Distance
		mE	mS	km
Griffith Airport AWS #075041	BoM	414 320	6 209 876	50.3
Yanco Agricultural Institute AWS #074037	BoM	447 986	6 168 705	97.3
West Wyalong Airport AWS #050017	BoM	518 132	6 244 679	104.3
Narrandera Airport AWS #074148	BoM	455 493	6 159 563	108.5
Temora Airport AWS #073151	BoM	547 016	6 190 290	149.5

Figure B1 Meteorological and air quality monitoring surrounding the Quarry Site



Meteorological conditions at Griffith Airport AWS have been examined to determine a 'typical' or representative dataset for use in dispersion modelling. Annual wind roses for the most recent years of data (2014 to 2018) are presented in **Figure B2**.

Figure B2 Annual wind roses 2014 to 2018, Griffith Airport AWS



The wind roses indicate that from 2014 to 2018, winds at Griffith Airport AWS shows a predominant east south-easterly and south-westerly component to the wind direction.

The majority of wind speeds experienced at Griffith Airport AWS over the 5-year period, 2014 to 2018 are generally in the range <3 metres per second ($m \cdot s^{-1}$) to 5.5 $m \cdot s^{-1}$ with the highest wind speeds (greater than 8 $m \cdot s^{-1}$) occurring from a south-westerly or north-westerly direction, although winds of this speed are also observed from the east north-east. Winds of this speed are not frequent, occurring during approximately 5 % of the observed hours over the 5-year period at Griffith Airport AWS. Calm winds (<0.5 $m \cdot s^{-1}$) occur during 5.6 % of hours on average across the 5-year period.

Given the wind distributions across the years examined, data for the year 2014 has been selected as being appropriate for further assessment, as it best represents the general trend across the 5-year period studied. It is noted that wind direction data collected during the year 2016 shows a variation to average conditions, with an increased frequency of winds experienced from the northwest. Given this variation from average conditions, data collected during 2016 cannot be considered to be representative and has not been taken forward for further assessment.

Presented in **Figure B3** are the annual wind rose for the 2014 to 2018 period and the year 2014 and in **Figure B4** the annual wind speed distribution for Griffith Airport AWS. These figures indicate that the distribution of wind speed and direction in 2014 is very similar to that experienced across the longer-term period.

It is concluded that conditions in 2014 may be considered to provide a suitably representative dataset for use in dispersion modelling.

Figure B3 Annual wind roses 2014 to 2018, and 2014 Griffith Airport AWS

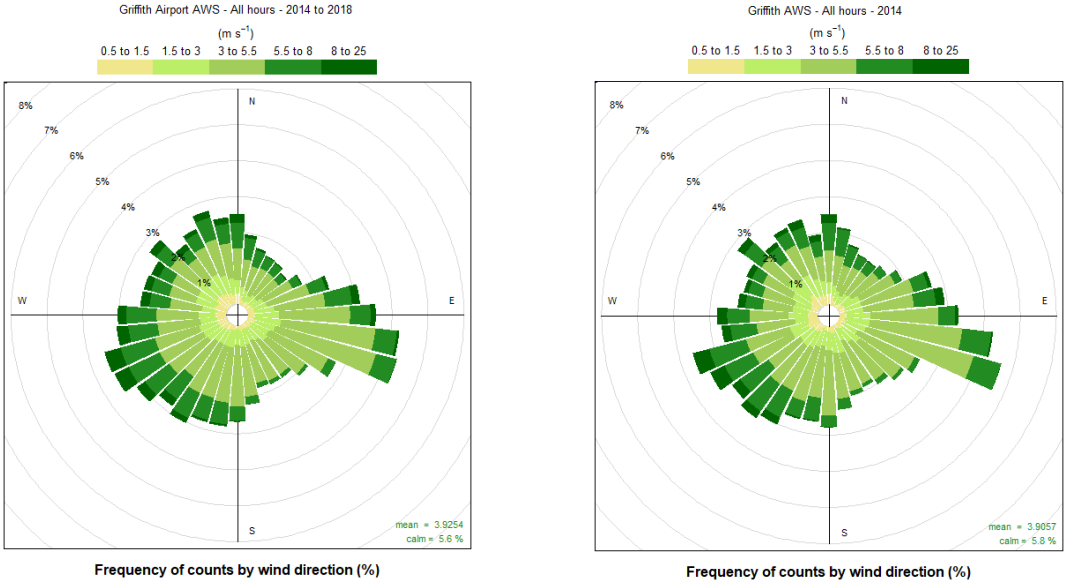
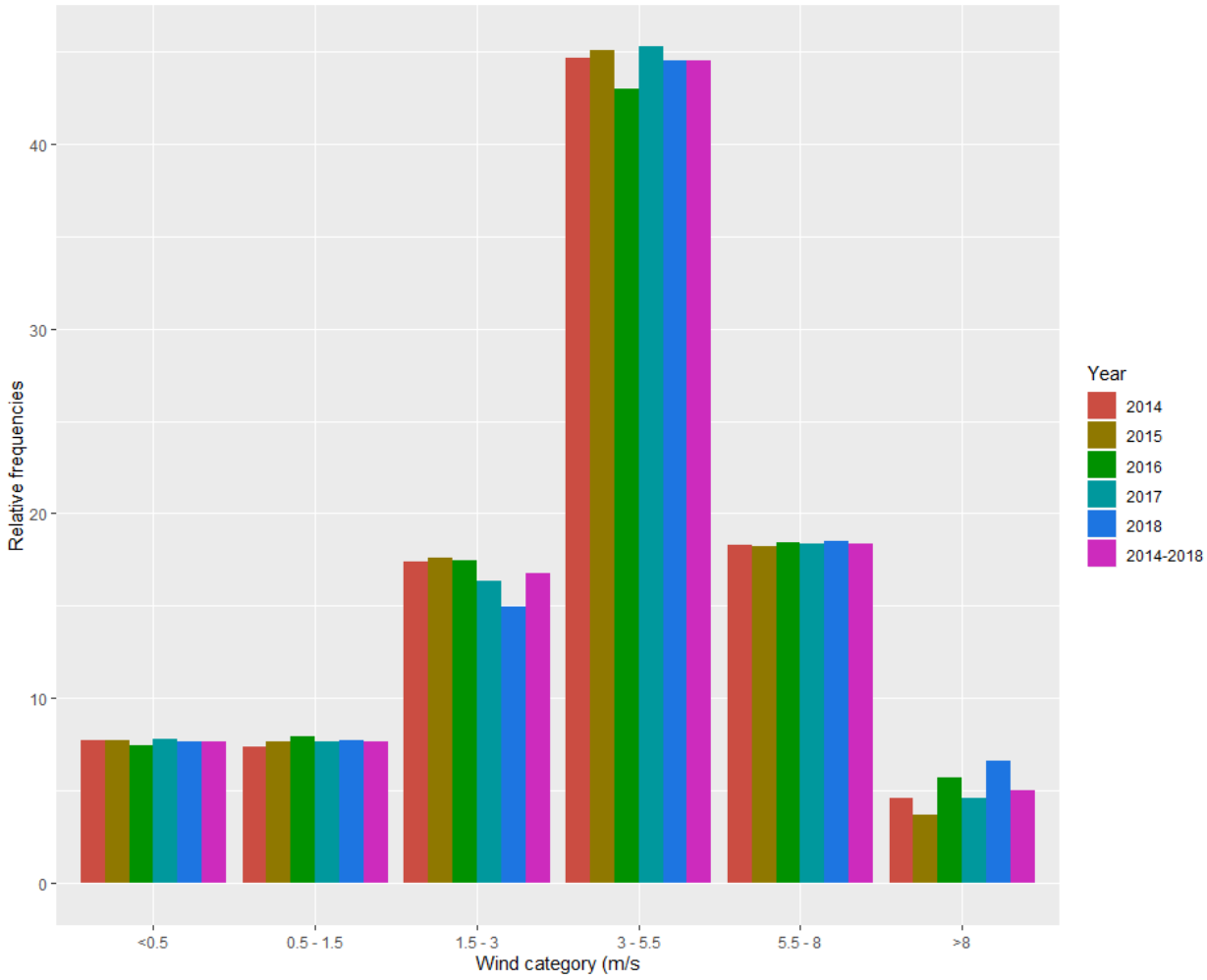


Figure B4 Annual wind speed distribution – Griffith Airport AWS



Meteorological Modelling

The BoM data adequately covers the issues of data quality assurance, however it is limited by its location compared to the Quarry Site. To address these uncertainties, a multi-phased assessment of the meteorological data has been performed.

In absence of any measured onsite meteorological data, site representative meteorological data for this Quarry was generated using the CALMET meteorological model in a format suitable for using in the CALPUFF dispersion model (refer **Section 4.2**).

CALMET is a meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field and thus the final wind field reflects the influences of local topography and current land uses.

In this study, CALMET has been run in no-observations (no-obs) mode using gridded prognostic data generated by The Air Pollution Model (TAPM, v 4.0.5), developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

TAPM is a prognostic model which predicts wind speed and direction, temperature, pressure, water vapour, cloud, rainwater and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations at user-defined levels within the atmosphere.

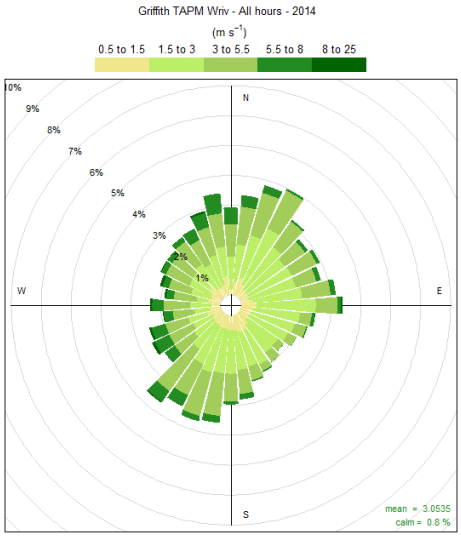
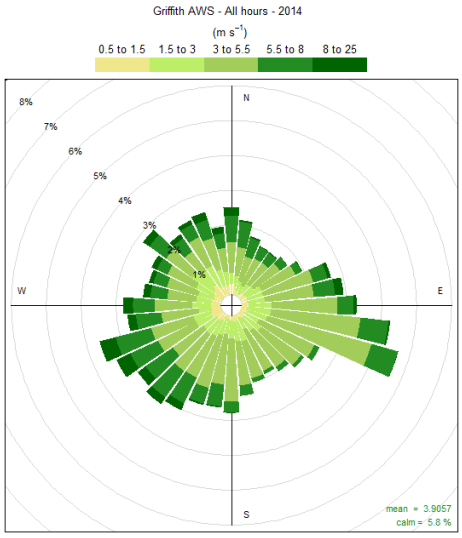
The parameters used in TAPM and CALMET modelling are presented in **Table B2**.

Table B2 Meteorological parameters used for this study

TAPM v 4.0.5	
Modelling period	1 January 2014 to 31 December 2014
Centre of analysis	416 180 mE, 6 241 170 mS (UTM Coordinates)
Number of grid points	67 x 67 x 25
Number of grids (spacing)	4 (30 km, 10 km, 3 km, 1 km)
Terrain	AUSLIG 9 second DEM
Data assimilation	No data assimilation
CALMET	
Modelling period	1 January 2014 to 31 December 2014
South-West corner of analysis	405 500 mS, 6 249 500 mS (UTM Coordinates)
Meteorological grid domain (resolution)	24 km x 24 km (0.25 km)
Vertical resolution (cell heights)	10 (0 m, 20 m, 40 m, 80 m, 160 m, 320 m, 640 m, 1200 m, 2000 m, 3000 m, 4000 m)
Data assimilation	No-obs approach using TAPM – 3D.DAT file

A comparison of the TAPM generated meteorological data, and that observed at the Griffith Airport AWS are presented in **Figure B5**. Comparison of the two windroses does not show a favourable comparison with observations at the Griffith Airport AWS. A further level of meteorological processing through CALMET results in the windrose presented in **Figure B7** which does provide data which, given the topography of the Quarry Site, looks intuitively sensible. Validation of these wind conditions cannot be performed as no on-site observations are available, nor any AWS in closer proximity that Griffith Airport AWS at a distance of over 50 km.

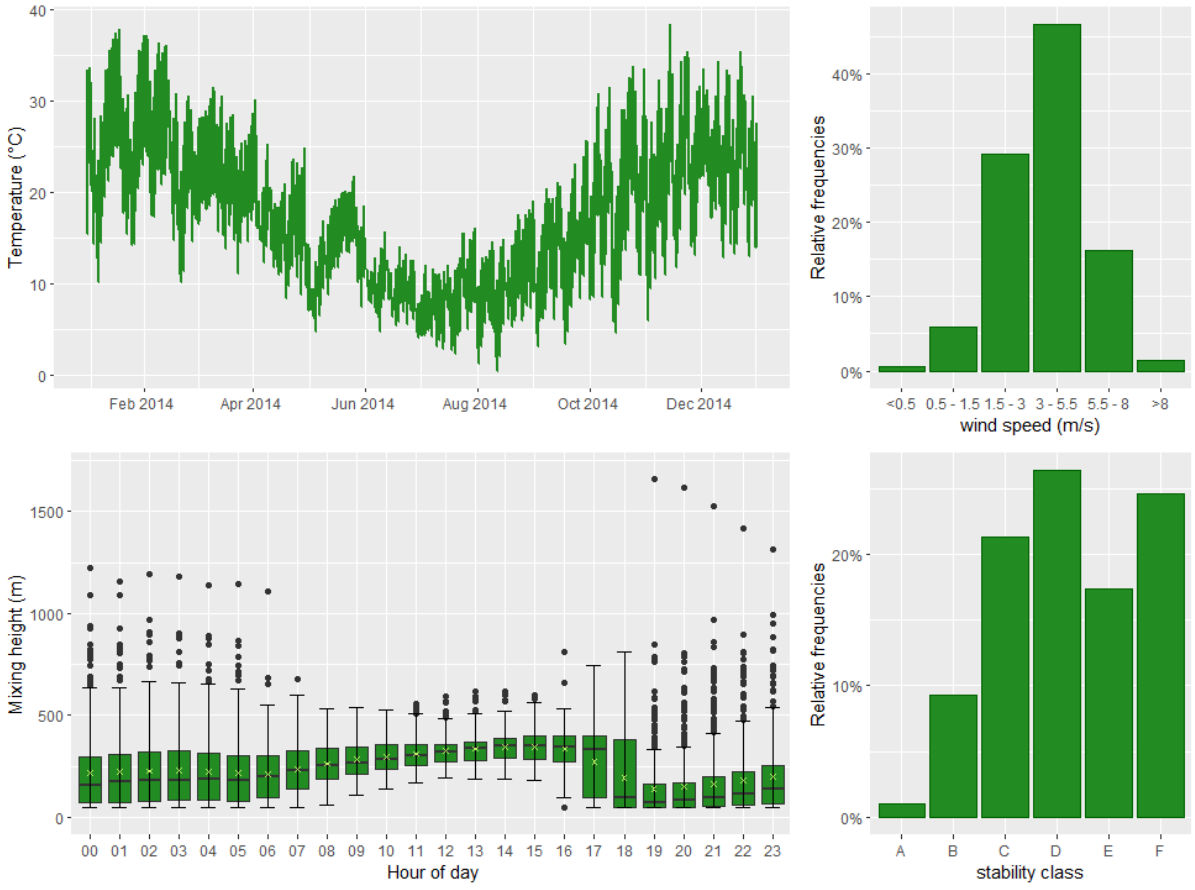
Figure B5 Modelled and observed meteorological data – Griffith Airport AWS, 2014

Griffith Airport TAPM generated windrose	Observations at Griffith Airport AWS
	
Frequency of counts by wind direction (%)	Frequency of counts by wind direction (%)

As generally required by the NSW EPA the following provides a summary of the modelled meteorological dataset. Given the nature of the pollutant emission sources at the Quarry Site, detailed discussion of the humidity, evaporation, cloud cover, katabatic air drainage and air recirulation potential of the Quarry Site has not been provided. Details of the CALMET predictions of wind speed and direction, mixing height, temperature and stability class at the Quarry Site are provided in **Figure B6**.

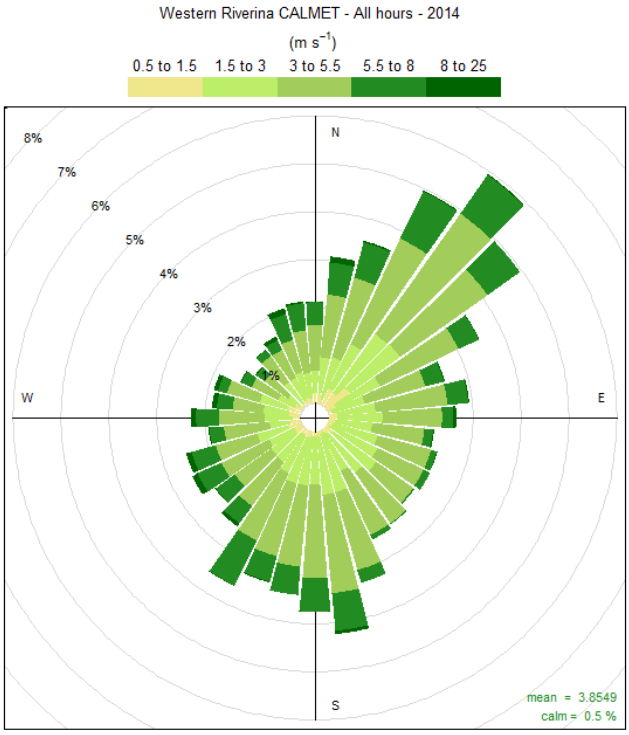
Diurnal variations in maximum and average mixing heights during the 2014 period shows that, as expected, an increase in mixing height during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground based temperature inversions and growth of the convective mixing layer.

Figure B6 Predicted temperature, mixing height and wind speed frequency – Quarry Site 2014



The modelled wind speed and direction at the Quarry Site during 2014 are presented in **Figure B8**.

Figure B7 Predicted wind speed and direction – Quarry Site 2014



Frequency of counts by wind direction (%)

APPENDIX C

Background Air Quality Data

Air quality is not monitored at the Quarry Site and therefore air quality monitoring data measured at a representative location has been adopted for the purposes of this assessment. Determination of data to be used as a location representative of the Quarry Site and during a representative year can be complicated by factors which include:

- the sources of air pollutant emissions around the Quarry Site and representative air quality monitoring station(s); and
- the variability of particulate matter concentrations (often impacted by natural climate variability).

Air quality monitoring is performed by the NSW Department of Planning, Industry and Environment (DPIE) at four air quality monitoring station (AQMS) within a 330 km radius of the Quarry Site. Details of the monitoring performed at these AQMS is presented in **Table C1** and **Figure B1**. As discussed in **Section 4.2** and **Section 4.3**, the year 2014 was selected for assessment based upon an analysis of meteorological and background air quality data.

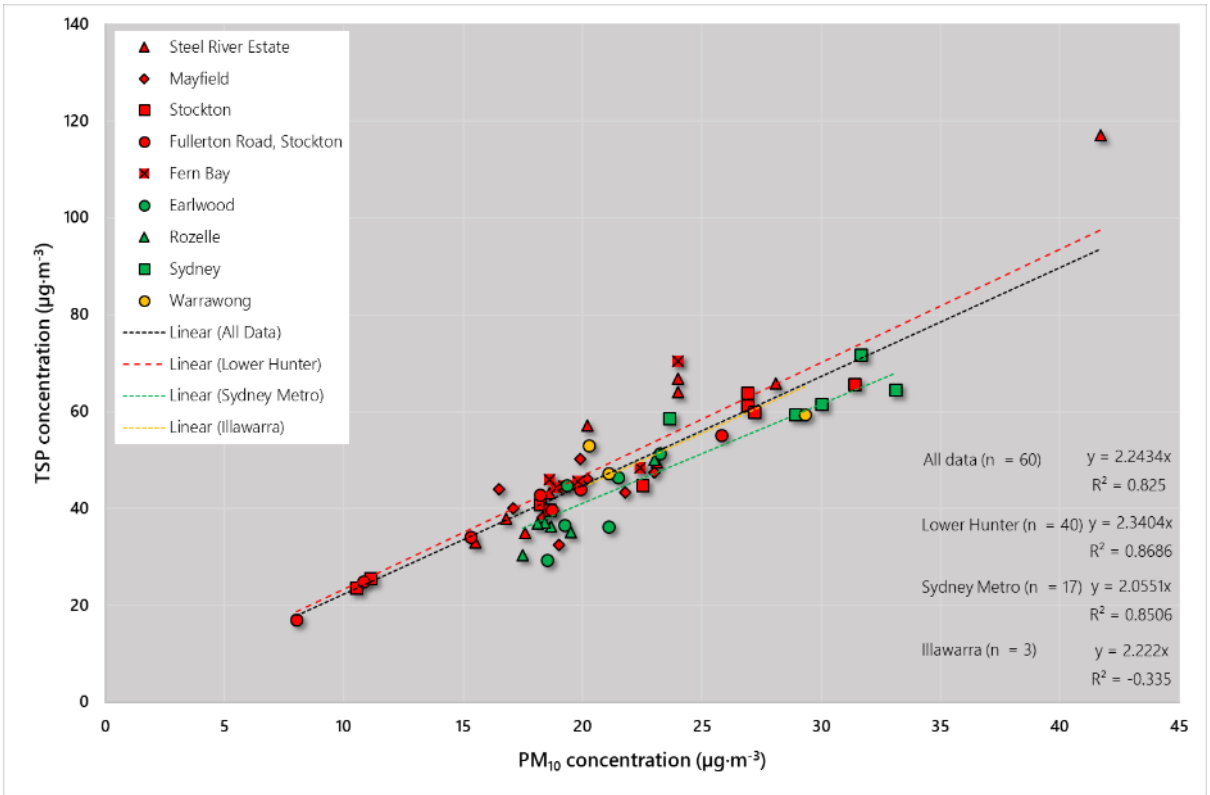
Table C1 Details of closest AQMS surrounding the Quarry

AQMS Location	Approximate distance to Quarry (km)	Screening Parameters			
		2014 Data	Measurements		
			PM_{10}	$PM_{2.5}$	TSP
Wagga Wagga North	186	✓	✓	✓	×
Wagga Wagga	188	×	×	×	×
Albury	264	✓	✓	×	×
Bathurst	327	✓	✓	×	×

Based on the sources of AQMS data available and their proximity to the Quarry, Wagga Wagga North was selected as the source of AQMS data for use in this assessment.

Concentrations of TSP are not measured at any AQMS surrounding the Quarry Site. An analysis of co-located measurements of TSP and PM_{10} in the Lower Hunter (1999 to 2011), Illawarra (2002 to 2004), and Sydney Metropolitan (1999 to 2004) regions is presented in **Figure C1**. The analysis concludes that, on the basis of the measurements collected in all regions between 1999 to 2011, the derivation of a broad TSP:PM_{10} ratio of 2.3404 : 1 (i.e. PM_{10} represents ~43 % of TSP) from the Lower Hunter is appropriate, and the most conservative of all the relationships assessed. In the absence of any more specific information, this ratio has been adopted within this AQIA, resulting in a background annual average TSP concentration of 48.4 $\mu g \cdot m^{-3}$ being adopted.

Figure C1 Co-located TSP and PM10 Measurements, Lower Hunter, Sydney Metro and Illawarra



Similarly, no dust deposition data is available for the area surrounding the Quarry. The incremental impact criterion of 2 $g \cdot m^{-2} \cdot month^{-1}$ as outlined within the Approved Methods has been adopted which effectively provides a background deposition level of 2 $g \cdot m^{-2} \cdot month^{-1}$ (the total allowable deposition being 4 $g \cdot m^{-2} \cdot month^{-1}$).

Graphs presenting the daily varying PM_{10} and $PM_{2.5}$ data recorded at Wagga Wagga North in 2014 are presented in **Figure C2** and **Figure C3**, respectively.

Figure C2 PM10 Measurements, Wagga Wagga North 2014

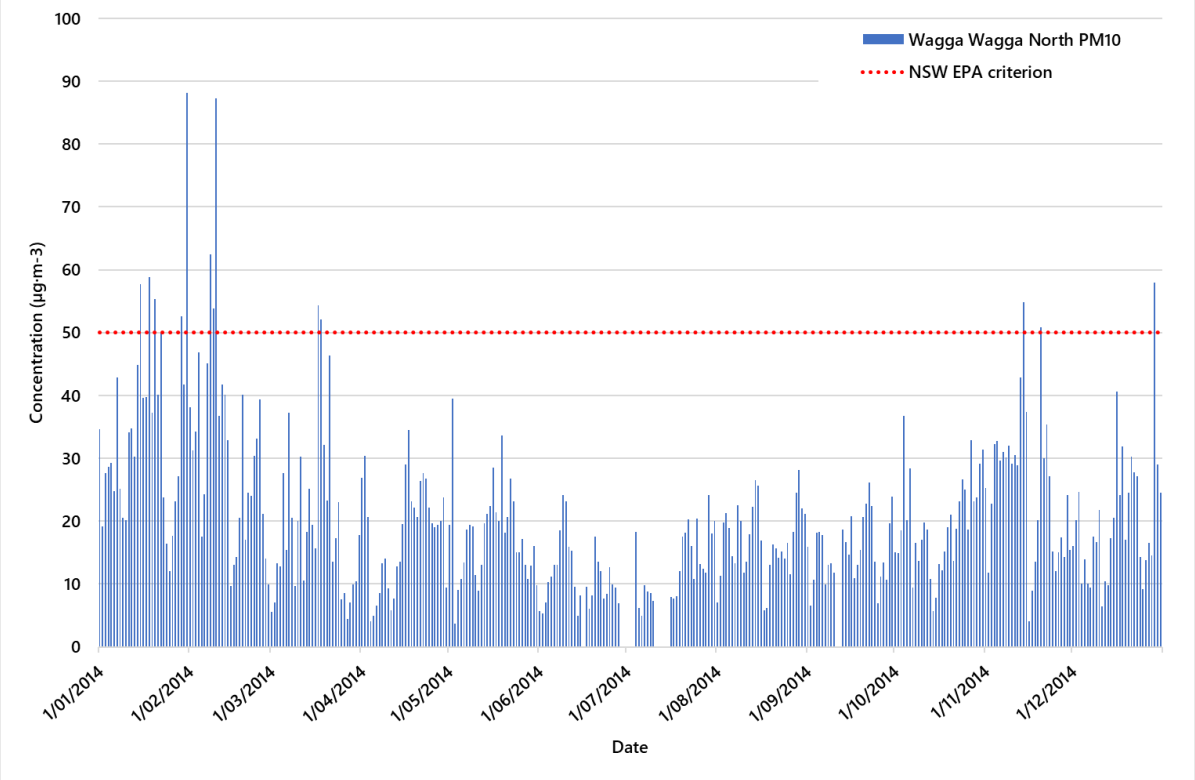
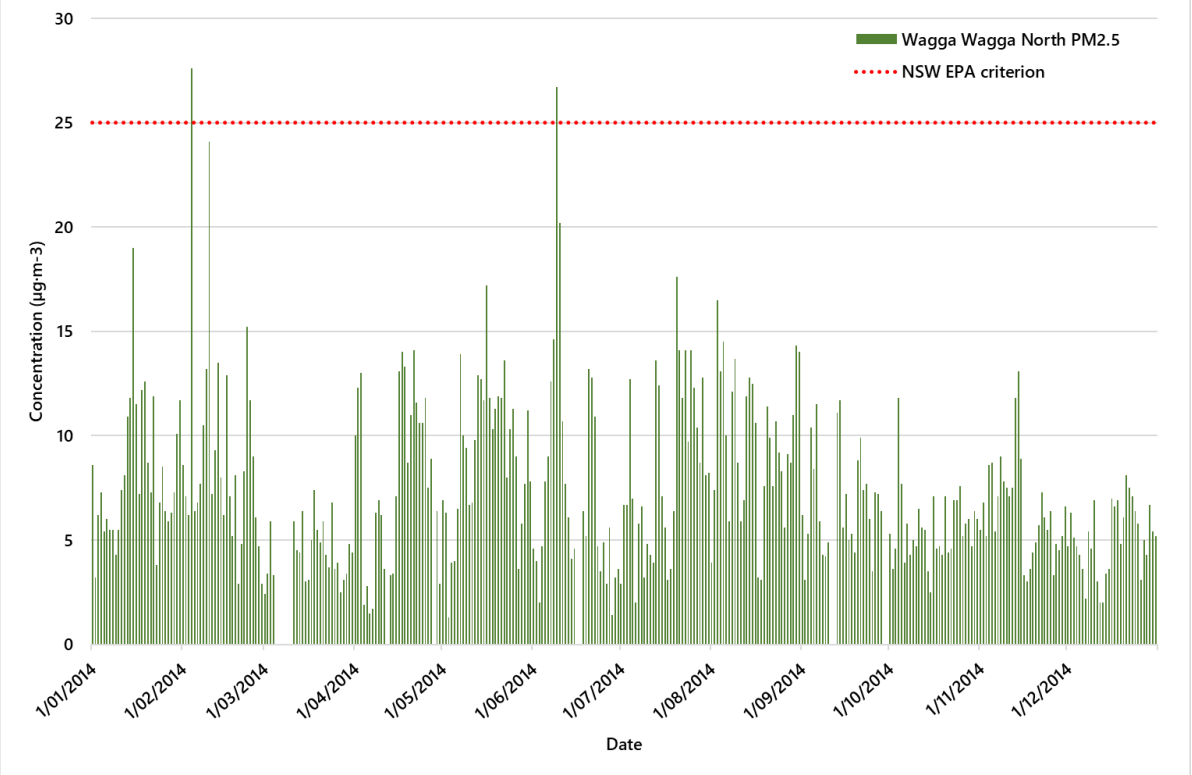


Figure C3 PM2.5 Measurements, Wagga Wagga North 2014



Thirteen exceedances of the NSW EPA maximum 24-hour average PM_{10} criterion and two exceedances of the maximum 24-hour average $PM_{2.5}$ criterion were measured at the Wagga Wagga North AQMS in 2014. The NSW Annual Compliance Report for the National Environment Protection (Ambient Air Quality) Measure for 2014 (NSW OEH, 2016) provides commentary on the likely source of PM_{10} exceedances, reproduced below in **Table C2**. Exceedances of the $PM_{2.5}$ criterion are not discussed in (NSW OEH, 2016) but are included in **Table C2**.

Table C2 Calendar days in 2014 when the 24-hour PM10 and/or PM2.5 criterion was exceeded

Date	PM_{10} concentration ($\mu g \cdot m^{-3}$)	$PM_{2.5}$ concentration ($\mu g \cdot m^{-3}$)	Comments[1] on PM_{10} exceedance (from (NSW OEH, 2016))
15 January	57.7	19.0	24-ha grassfire, 4 km east of Wagga (Tasman Rd)
18 January	58.8	12.2	1-ha grassfire, 1.5 km SE of Wagga AQMS
20 January	55.3	8.7	
29 January	52.6	7.3	0.1 ha grassfire, 7 km NW of Wagga AQMS
31 January	88.2	11.7	
4 February	46.8	27.6	
8 February	62.4	10.5	0.1 ha grassfire, midnight on 7 February at Tumbarumba Road x Eight Mile Road
9 February	53.8	13.2	
10 February	87.3	24.1	Victorian bushfires
17 March	54.4	5.0	
18 March	52.1	7.4	
9 June	24.2	26.7	
14 November	54.8	13.1	Two grass fires and one forest fire (up to 0.4 ha) within a 2 to 3 km radius of Wagga AQMS on 13 November and 14 November
20 November	50.8	4.9	10 ha grassfire 14 km SW of Wagga AQMS (Oxley, Uranquinty)
29 December	58.0	5.2	

Notes 1: Events that can be clearly identified as influencing pollution levels (NSW OEH, 2016)

PM_{10} concentrations show a seasonal trend at the Wagga Wagga North AQMS, with higher concentrations generally experienced in warmer months, and lower concentrations in cooler months. Higher concentrations are often due to bushfire activity (as shown in **Table C2**), but can also be influenced by dust storms, and impacts resulting from broadacre agricultural activity, especially in autumn months (DSEWPC, 2010).

$PM_{2.5}$ concentrations at the Wagga Wagga North AQMS show less seasonal trend, although elevated concentrations are experienced in the cooler months, most likely as a result of the use of wood-fired heaters.

Given the likely source of particulates which influence measurements of particulate matter at the Wagga Wagga North AQMS, it is likely that these sources may be similar in the area surrounding the Quarry Site (i.e. broadacre agriculture, wood-fired heaters). The use of air quality data from Wagga Wagga North to characterise the air quality in the area surrounding Griffith and the Quarry Site is considered to be appropriate.

The AQIA considers all measured particulate concentrations within the background dataset (including exceedances) and provides discussion as to the potential impact of the Quarry on air quality. Impacts are discussed in terms of 'incremental' and 'cumulative' impact, and in relation to the number of 'additional exceedances' which may eventuate with the operation of the Quarry.

APPENDIX D

Emissions Inventory

As outlined in **Section 2.2**, a number of operations to be performed as part of the Quarry operation have the potential to result in emissions of particulate matter. A detailed outline of the emission estimation techniques adopted to derive total emissions from the sources identified are presented below.

A detailed summary and justification of all parameters adopted within the emissions estimation calculations is provided. Emission factors are presented in alphabetical order.

The silt and moisture content of overburden, rock and product has been taken to be 2 % which is considered to represent a conservative assumption.

Blasting

The emissions of particulate matter from blasting operations have been estimated using emission factors presented in Section 11.9-2 of AP-42 (Western Surface Coal Mine) (USEPA, 1998). The emission factors are:

$$EF_{TSP}\ (kg.blast^{-1}) = 0.00022 \times (A)^{1.5}$$

$$EF_{PM_{10}}\ (kg.blast^{-1}) = 0.52 \times (EF_{TSP})$$

$$EF_{PM_{2.5}}\ (kg.blast^{-1}) = 0.03 \times (EF_{TSP})$$

where:

$EF_{(kg \cdot blast^{-1})}$ = emission factor for particulate matter

A = horizontal area (m^2), with blasting depth ≤ 21 m.

The quality rating for this emission factor is rated is rated C for TSP, D for PM_{15}, and D for $PM_{2.5}$.

Bulldozing (Overburden)

The emissions of particulate matter from the bulldozing (overburden [or material other than coal in the NPI]) process have been estimated using emission factors presented in Section 11.9-2 of AP-42 (Western Surface Coal Mining) (USEPA, 1998). The emission factor is:

$$EF_{TSP}\ (kg.hr^{-1}) = \frac{2.6 \times (s)^{1.2}}{(M)^{1.3}}$$

$$EF_{PM_{15}}\ (kg.hr^{-1}) = \frac{0.45 \times (s)^{1.5}}{(M)^{1.4}}$$

$$EF_{PM_{10}}(kg.hr^{-1}) = 0.75\ \times EF_{PM_{15}}$$

$$EF_{PM_{2.5}}\ (kg.hr^{-1}) = 0.105 \times EF_{TSP}$$

where:

$EF_{(kg \cdot hr^{-1})}$ = emission factor for particulate matter

$s_{(\%)}$ = silt content in %, by weight

$M_{(\%)}$ = moisture content of overburden in %, by weight

The quality rating for this emission factor is rated B for TSP, C for PM_{15}, D for PM_{10}, D for $PM_{2.5}$.

Crushing (Primary and Secondary)

Emissions of particulate matter resulting from the processing of materials (primary and secondary crushing) have been estimated using the emission factors presented in Section 11.19.2 of AP-42 (Crushed Stone Processing and Pulverised Mineral Processing) (US EPA, 2004).

The emission factors within table 11.19.2-1 have been adopted for the operations outlined above. No emission factors associated with primary or secondary crushing are available within AP-42 although emission factors for tertiary crushers can be used as an upper limit for primary or secondary crushing (US EPA, 2004). The control efficiency used for tertiary crushing is 77.7 % as calculated in AP-42 (USEPA, 2006c).

$PM_{2.5}$ emission factors are not available for uncontrolled crushing sources in AP-42 although have been taken to be 18% of PM10 as per controlled tertiary crushing in table 11.19.2-1 (USEPA, 2006c).

For uncontrolled tertiary crushing (and uncontrolled primary and secondary crushing):

$$EF_{TSP}\ (kg.tonne^{-1}) = 0.0027$$

$$EF_{PM_{10}}\ (kg.tonne^{-1}) = 0.0012$$

$$EF_{PM_{2.5}}\ (kg.tonne^{-1}) = 0.00012$$

For controlled tertiary crushing (and controlled primary and secondary crushing):

$$EF_{TSP}\ (kg.tonne^{-1}) = 0.0006$$

$$EF_{PM_{10}}\ (kg.tonne^{-1}) = 0.00027$$

$$EF_{PM_{2.5}}\ (kg.tonne^{-1}) = 0.00005$$

The quality rating for these emission factors is: Tertiary Crushing (uncontrolled) = E & C (TSP & PM_{10} respectively), and Tertiary Crushing (controlled) = E, C & E (TSP, PM_{10} & $PM_{2.5}$ respectively). All other crushing emission factors calculated have a quality rating of U (no rating).

Drilling

Emissions of particulate matter resulting from drilling (overburden) operations have been estimated using the emission factors presented in Section 11.9-4 of AP-42 (Western Surface Coal Mining) (USEPA, 1998).

The emission factors within table 11.9-4 have been adopted for the operations outlined above. The emission factor is:

$$EF_{TSP}\ (kg.hole^{-1}) = 0.59$$

where:

EF_{TSP} = emission factor for total suspended particulate matter (kg per hole)

PM_{10} & $PM_{2.5}$ emission factors are not available in AP-42 although have been taken to be 52% of TSP for PM10 and, 3% of TSP for $PM_{2.5}$ as per AP-42 blasting (Table 11.9-2) (USEPA, 1998).

The quality rating for this emission factor is C.

Excavators/Frontend Loaders

Emissions associated with all loading and unloading operations have been characterised using the factor outlined in AP-42 for Batch Drop processes (Section 13.2.4.3) (USEPA, 2006a). This equation is consistent with that associated with the use of excavators, shovels and front end loaders outlined in the NPI EETM for Mining (NPI, 2012):

$$EF\ (kg \cdot tonne^{-1}) = k(0.0016)\ \frac{\left(\frac{U\ (m \cdot s^{-1})}{2.2}\right)^{1.3}}{\left(\frac{M\ (\%)}{2}\right)^{1.4}}$$

where:

$EF_{TSP\ (kg \cdot tonne^{-1})}$ = emission factor for total suspended particles

$EF_{PM_{10}\ (kg \cdot tonne^{-1})}$ = emission factor for total suspended particles

k_{TSP} = 0.74 for particles less than 30 micrometres aerodynamic diameter

$k_{PM_{10}}$ = 0.35 for particles less than 10 micrometres aerodynamic diameter

$k_{PM_{2.5}}$ = 0.053 for particles less than 2.5 micrometres aerodynamic diameter

U = mean wind speed ($m \cdot s^{-1}$)

M = material moisture content (% by weight)

The quality rating for this application is rated U (no rating).

Screening

Emissions of particulate matter resulting from the screening of material have been estimated using the emission factors presented in Section 11.19.2 of AP-42 (Crushed Stone Processing and Pulverised Mineral Processing) (US EPA, 2004).

The emission factors within table 11.19.2-1 have been adopted for the operations outlined above. PM2.5 emission factors are not available for uncontrolled screening sources in AP-42 although have been taken to be 7% of PM10 as per controlled screening activities in table 11.19.2-1 (US EPA, 2004). The control efficiency used for screening is 91.2% as calculated in AP-42 (USEPA, 2006c).

For uncontrolled screening:

$$EF_{TSP}\ (kg.tonne^{-1}) = 0.0125$$

$$EF_{PM_{10}}\ (kg.tonne^{-1}) = 0.0043$$

$$EF_{PM_{2.5}}\ (kg.tonne^{-1}) = 0.00030$$

For controlled screening:

$$EF_{TSP}\ (kg.tonne^{-1}) = 0.0011$$

$$EF_{PM_{10}}\ (kg.tonne^{-1}) = 0.00037$$

$$EF_{PM_{2.5}}\ (kg.tonne^{-1}) = 0.000025$$

The quality rating for these emission factors is: screening (uncontrolled) = E & C (TSP & PM_{10} respectively), and screening (controlled) = E, C & E (TSP, PM_{10} & $PM_{2.5}$ respectively). All other screening emission factors calculated have a quality rating of U (no rating).

Unpaved Roads

Emissions of particulate matter resulting from the movement of materials on unpaved roads have been estimated using the emission factors presented in Section 13.2.2 (Unpaved Roads) of AP-42 (USEPA, 2006c).

The emission factor in section 13.2.2 of (USEPA, 2006c) has been adopted for the operations of vehicles on unpaved roads:

$$EF_{(kg.VKT^{-1})} = 0.2819 \times k \times (\frac{s}{12})^{a} \times (\frac{W \times 0.907185}{3})^{b}$$

where:

$EF_{(kg.VKT^{-1})}$ = emission factor (kg per vehicle kilometre travelled) multiplied by 0.2819 to convert from lb per vehicle mile travelled

k = particle size multiplier (dimensionless)

s = surface material silt content (%)

W = mean vehicle weight (tons) multiplied by 0.907185 to convert from metric tonnes

The particle size multipliers for TSP, PM_{10} and $PM_{2.5}$ (k) are provided in (US EPA, 2006a) as 4.9, 1.5 and 0.15, respectively.

The quality rating for this application is rated B for TSP, B for PM_{10} and B for $PM_{2.5}$.

The silt content of unpaved haul roads at the Quarry Site has been taken to be 8.3 % which is consistent with haul roads at stone quarrying and processing sites (Table 13.2.2-1 of (US EPA, 2006a)).

The mean weight of vehicles used on site has been calculated based on the use of '35 t' dump trucks, such as the Komatsu 35T (or similar) which has a payload of 35 t, tare weight of 25 t and a loaded weight of 60 t (ritchiespecs.com). The average vehicle weight has therefore been calculated to be 42.5 t (metric).

The mean weight of road trucks used on site has been calculated based on the use of '32 t' trucks, which has a payload of 32 t, tare weight of 13.5 t and a loaded weight of 45.5 t. The average vehicle weight has therefore been calculated to be 29.5 t (metric).

Wind Erosion (Exposed Areas)

Emissions of particulate matter resulting from the wind erosion of exposed areas have been estimated using the emission factors presented in Section 11.9-4 of AP-42 (Western Surface Coal Mining) (USEPA, 1998).

The emission factors within table 11.9-4 have been adopted for the operations outlined above. The emission factor applies to the materials: seeded land, stripped overburden and graded overburden. The emission factor is:

$$EF_{TSP}\ (tonne.(hectare.year)^{-1}) = 0.85$$

where:

$EF_{TSP}\ (tonne.(hectare.year)^{-1})$= emission factor for total suspended particulate matter

PM_{10} and $PM_{2.5}$ emission factors are not available in AP-42 although have been taken to be 50 % of TSP for PM_{10} and, 7.5 % of TSP for $PM_{2.5}$ as per AP-42 section (13.2.5) for industrial wind erosion (USEPA, 1998).

The quality rating for this emission factors is C.

Stage 1 - 24-hour maximum

Description	Factor	Emission Rate			Units	Activity Rate	Units	Emission Controls	Controlled Emissions (kg·year^{-1})		
		TSP	PM_{10}	$PM_{2.5}$				(% efficiency)	TSP	PM_{10}	$PM_{2.5}$
Drilling blast holes	AP-42 - Drilling (Overburden) - Table 11.9-4	0.590	0.307	0.018	kg·hole-1	154	holes	Fabric filter (99%)	0.9	0.5	0.0
Blasting	AP-42 - Blasting (Coal or Overburden) - Table 11.9-2	1.760	0.915	0.053	kg·blast-1	1	blasts		1.8	0.9	0.1
Excavator loading blasted material to Dump Truck	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,970	t	Pit retention (50% TSP, 5% PM10, PM2.5)	2.1	1.8	0.3
Unloading of concrete washout at TP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	30	t	Direct load to hopper	0.1	0.0	0.0
Loading hopper of TP (incl concrete washout)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	2,000	t	Water spray (50%)	2.1	1.0	0.1
TP Jaw crusher	AP-42 - Primary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	2,000	tonnes	Water sprays (77.7%)	1.2	0.5	0.1
TP Cone crusher	AP-42 - Secondary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	2,000	tonnes	Water sprays (77.7%)	1.2	0.5	0.1
TP Hawk Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	2,000	tonnes	Water sprays (91.2%)	2.2	0.8	0.1
End of TP stockpile loading - fines	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	200	t		0.4	0.2	0.0
End of TP stockpile loading - rock spalls and ballast	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
End of TP - unloading prior to BP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,800	t		3.8	1.8	0.3
Movement of fines from TP stockpile to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	200	t		0.4	0.2	0.0
Unloading of fines from TP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	200	t		0.4	0.2	0.0
Movement of rock spalls and ballast from TP stockpile to stoc	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Unloading of rock spalls and ballast from TP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Loading of hopper of Bottom Plant (BP)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,800	t		3.8	1.8	0.3
BP VSI	AP-42 - Primary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	1,800	tonnes	Water sprays (77.7%)	1.1	0.5	0.1
BP Hawk Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	1,800	tonnes	Water sprays (91.2%)	2.0	0.7	0.0
BP Global Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	1,800	tonnes	Water sprays (91.2%)	2.0	0.7	0.0
End of BP stockpile loading - fines	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	396	t		0.8	0.4	0.1
End of BP stockpile loading - aggregates	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,404	t		2.9	1.4	0.2
End of BP - unloading remainder	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Movement of fines from BP stockpile to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	396	t		0.8	0.4	0.1
Unloading of fines from BP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	396	t		0.8	0.4	0.1
Movement of aggregates from BP stockpile to stockpile (by F	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	804	t		1.7	0.8	0.1
Unloading of aggregates at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	804	t		1.7	0.8	0.1
Loading of aggregates directly to trucks at BP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Movement of aggregates to precoat plant (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Unloading of aggregates at precoat plant hopper	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading of rock spalls and ballast to trucks	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Loading of fines to trucks	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0

Description	Factor	Emission Rate			Units	Activity Rate	Units	Emission Controls	Controlled Emissions (kg·year^{-1})		
		TSP	PM_{10}	$PM_{2.5}$				(% efficiency)	TSP	PM_{10}	$PM_{2.5}$
Loading of aggregates to trucks at stockpiles	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	750	t		1.6	0.7	0.1
Movement of aggregates and fines to pugmill (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Unloading of roadbase and fines to pugmill hopper	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Operation of pugmill	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading of pugmill stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Movement of roadbase to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Unloading of roadbase at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading of roadbase to trucks at pugmill stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading aggregates to precoat plant	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Operation of precoat plant	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t	Will assume a 'wet' process (100%)	0.0	0.0	0.0
Loading precoat aggregate bins	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading trucks with precoat aggregate	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Bulldozing overburden	AP-42 - Bulldozing (Overburden) - Table 11.9-2	2.4259	0.3617	0.25472	kg·hr-1	-	hr		0.0	0.0	0.0
Haulage of material to TP	AP-42 Unpaved roads - Section 13.2.2	3.676	1.045	0.105	kg·VKT-1	87	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	89.9	25.6	2.6
Transport of concrete washout to Top Plant (TP)	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	1	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	0.7	0.2	0.0
Road trucks off site from stockpiles	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	14	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	12.2	3.5	0.3
Road trucks off site from Precoat plant	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	17	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	14.5	4.1	0.4
Road trucks off site from pugmill	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	17	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	14.5	4.1	0.4
Extraction Area	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	850.00	425.00	63.75	kg·ha-1·yr-1	7	ha	Pit retention	8.6	8.1	1.2
Limit of disturbance (less extraction area) 1	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	850.00	425.00	63.75	kg·ha-1·yr-1	28	ha		64.6	32.3	4.8
								Total	**255.7**	**102.0**	**13.2**

Stage 3 - 24-hour maximum

Description	Factor	Emission Rate			Units	Activity Rate	Units	Emission Controls	Controlled Emissions (kg·year^{-1})		
		TSP	PM_{10}	$PM_{2.5}$				(% efficiency)	TSP	PM_{10}	$PM_{2.5}$
Drilling blast holes	AP-42 - Drilling (Overburden) - Table 11.9-4	0.590	0.307	0.018	kg·hole-1	154	holes	Fabric filter (99%)	0.9	0.5	0.0
Blasting	AP-42 - Blasting (Coal or Overburden) - Table 11.9-2	1.760	0.915	0.053	kg·blast-1	1	blasts		1.8	0.9	0.1
Excavator loading blasted material to Dump Truck	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,970	t	Pit retention (50% TSP, 5% PM10, PM2.5)	2.1	1.8	0.3
Unloading of concrete washout at TP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	30	t	Direct load to hopper	0.1	0.0	0.0
Loading hopper of TP (incl concrete washout)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	2,000	t	Water spray (50%)	2.1	1.0	0.1
TP Jaw crusher	AP-42 - Primary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	2,000	tonnes	Water sprays (77.7%)	1.2	0.5	0.1
TP Cone crusher	AP-42 - Secondary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	2,000	tonnes	Water sprays (77.7%)	1.2	0.5	0.1
TP Hawk Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	2,000	tonnes	Water sprays (91.2%)	2.2	0.8	0.1
End of TP stockpile loading - fines	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	200	t		0.4	0.2	0.0
End of TP stockpile loading - rock spalls and ballast	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
End of TP - unloading prior to BP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,800	t		3.8	1.8	0.3
Movement of fines from TP stockpile to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	200	t		0.4	0.2	0.0
Unloading of fines from TP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	200	t		0.4	0.2	0.0
Movement of rock spalls and ballast from TP stockpile to stoc	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Unloading of rock spalls and ballast from TP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Loading of hopper of Bottom Plant (BP)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,800	t		3.8	1.8	0.3
BP VSI	AP-42 - Primary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	1,800	tonnes	Water sprays (77.7%)	1.1	0.5	0.1
BP Hawk Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	1,800	tonnes	Water sprays (91.2%)	2.0	0.7	0.0
BP Global Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	1,800	tonnes	Water sprays (91.2%)	2.0	0.7	0.0
End of BP stockpile loading - fines	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	396	t		0.8	0.4	0.1
End of BP stockpile loading - aggregates	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,404	t		2.9	1.4	0.2
End of BP - unloading remainder	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Movement of fines from BP stockpile to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	396	t		0.8	0.4	0.1
Unloading of fines from BP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	396	t		0.8	0.4	0.1
Movement of aggregates from BP stockpile to stockpile (by F	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	804	t		1.7	0.8	0.1
Unloading of aggregates at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	804	t		1.7	0.8	0.1
Loading of aggregates directly to trucks at BP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Movement of aggregates to precoat plant (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Unloading of aggregates at precoat plant hopper	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading of rock spalls and ballast to trucks	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0
Loading of fines to trucks	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	-	t		0.0	0.0	0.0

Description	Factor	Emission Rate			Units	Activity Rate	Units	Emission Controls (% efficiency)	Controlled Emissions (kg·year^{-1})		
		TSP	PM_{10}	$PM_{2.5}$					TSP	PM_{10}	$PM_{2.5}$
Loading of aggregates to trucks at stockpiles	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	750	t		1.6	0.7	0.1
Movement of aggregates and fines to pugmill (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Unloading of roadbase and fines to pugmill hopper	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Operation of pugmill	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading of pugmill stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Movement of roadbase to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Unloading of roadbase at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading of roadbase to trucks at pugmill stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading aggregates to precoat plant	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Operation of precoat plant	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t	Will assume a 'wet' process (100%)	0.0	0.0	0.0
Loading precoat aggregate bins	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Loading trucks with precoat aggregate	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	600	t		1.3	0.6	0.1
Bulldozing overburden	AP-42 - Bulldozing (Overburden) - Table 11.9-2	2.4259	0.3617	0.25472	kg·hr-1	-	hr		0.0	0.0	0.0
Haulage of material to TP	AP-42 Unpaved roads - Section 13.2.2	3.676	1.045	0.105	kg·VKT-1	69	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	70.6	20.1	2.0
Transport of concrete washout to Top Plant (TP)	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	2	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	1.5	0.4	0.0
Road trucks off site from stockpiles	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	59	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	51.2	14.6	1.5
Road trucks off site from Precoat plant	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	47	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	41.0	11.6	1.2
Road trucks off site from pugmill	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	47	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	41.0	11.6	1.2
Extraction Area	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	850.00	425.00	63.75	kg·ha-1·yr-1	18	ha	Pit retention	21.2	20.1	3.0
Limit of disturbance (less extraction area) 1	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	850.00	425.00	63.75	kg·ha-1·yr-1	12	ha		29.1	14.5	2.2
								Total	**306.0**	**117.0**	**14.4**

Stage 1 – Annual Average

Description	Factor	Emission Rate			Units	Activity Rate	Units	Emission Controls	Controlled Emissions (kg·year^{-1})		
		TSP	PM_{10}	$PM_{2.5}$				(% efficiency)	TSP	PM_{10}	$PM_{2.5}$
Drilling blast holes	AP-42 - Drilling (Overburden) - Table 11.9-4	0.590	0.307	0.018	kg·hole-1	768	holes	Fabric filter (99%)	4.5	2.4	0.1
Blasting	AP-42 - Blasting (Coal or Overburden) - Table 11.9-2	1.760	0.915	0.053	kg·blast-1	12	blasts		21.1	11.0	0.6
Excavator loading blasted material to Dump Truck	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	250,000	t	Pit retention (50% TSP, 5% PM10, PM2.5)	260.6	234.2	35.5
Unloading of concrete washout at TP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t	Direct load to hopper	3.1	1.5	0.2
Loading hopper of TP (incl concrete washout)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	251,500	t	Water spray (50%)	262.2	124.0	18.8
TP Jaw crusher	AP-42 - Primary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	251,500	tonnes	Water sprays (77.7%)	151.4	67.3	12.1
TP Cone crusher	AP-42 - Secondary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	251,500	tonnes	Water sprays (77.7%)	151.4	67.3	12.1
TP Hawk Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	251,500	tonnes	Water sprays (91.2%)	276.7	95.2	6.7
End of TP stockpile loading - fines	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	25,150	t		52.4	24.8	3.8
End of TP stockpile loading - rock spalls and ballast	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t		3.1	1.5	0.2
End of TP - unloading prior to BP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	224,850	t		468.8	221.7	33.6
Movement of fines from TP stockpile to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	25,150	t		52.4	24.8	3.8
Unloading of fines from TP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	25,150	t		52.4	24.8	3.8
Movement of rock spalls and ballast from TP stockpile to stoc	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t		3.1	1.5	0.2
Unloading of rock spalls and ballast from TP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t		3.1	1.5	0.2
Loading of hopper of Bottom Plant (BP)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	224,850	t		468.8	221.7	33.6
BP VSI	AP-42 - Primary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	224,850	tonnes	Water sprays (77.7%)	135.4	60.2	10.8
BP Hawk Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	224,850	tonnes	Water sprays (91.2%)	247.3	85.1	6.0
BP Global Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	224,850	tonnes	Water sprays (91.2%)	247.3	85.1	6.0
End of BP stockpile loading - fines	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	50,300	t		104.9	49.6	7.5
End of BP stockpile loading - aggregates	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	120,000	t		250.2	118.3	17.9
End of BP - unloading remainder	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	54,550	t		113.7	53.8	8.1
Movement of fines from BP stockpile to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	50,300	t		104.9	49.6	7.5
Unloading of fines from BP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	50,300	t		104.9	49.6	7.5
Movement of aggregates from BP stockpile to stockpile (by F	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	120,000	t		250.2	118.3	17.9
Unloading of aggregates at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	120,000	t		250.2	118.3	17.9
Loading of aggregates directly to trucks at BP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	34,550	t		72.0	34.1	5.2
Movement of aggregates to precoat plant (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Unloading of aggregates at precoat plant hopper	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Loading of rock spalls and ballast to trucks	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t		3.1	1.5	0.2
Loading of fines to trucks	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	73,450	t		153.1	72.4	11.0

Description	Factor	Emission Rate			Units	Activity Rate	Units	Emission Controls (% efficiency)	Controlled Emissions (kg·year^{-1})		
		TSP	PM_{10}	$PM_{2.5}$					TSP	PM_{10}	$PM_{2.5}$
Loading of aggregates to trucks at stockpiles	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	112,000	t		233.5	110.5	16.7
Movement of aggregates and fines to pugmill (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Unloading of roadbase and fines to pugmill hopper	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Operation of pugmill	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Loading of pugmill stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Movement of roadbase to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Unloading of roadbase at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Loading of roadbase to trucks at pugmill stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Loading aggregates to precoat plant	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Operation of precoat plant	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t	Will assume a 'wet' process (100%)	0.0	0.0	0.0
Loading precoat aggregate bins	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Loading trucks with precoat aggregate	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Bulldozing overburden	AP-42 - Bulldozing (Overburden) - Table 11.9-2	2.4259	0.3617	0.25472	kg·hr-1	90	hr		218.3	32.6	22.9
Loading overburden	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	70,000	t		146.0	69.0	10.5
Unloading overburden	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	70,000	t		146.0	69.0	10.5
Haulage of OB	AP-42 Unpaved roads - Section 13.2.2	3.6756	1.0452	0.1045	kg·VKT-1	3,100	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	3190.4	907.2	90.7
Haulage of material to TP	AP-42 Unpaved roads - Section 13.2.2	3.676	1.045	0.105	kg·VKT-1	11,086	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	11409.0	3244.3	324.4
Transport of concrete washout to Top Plant (TP)	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	39	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	34.1	9.7	1.0
Road trucks off site from stockpiles	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	4,139	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	3614.5	1027.8	102.8
Road trucks off site from Precoat plant	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	555	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	484.6	137.8	13.8
Road trucks off site from pugmill	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	278	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	242.3	68.9	6.9
Extraction Area	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	850.00	425.00	63.75	kg·ha-1·yr-1	7	ha	Pit retention	3128.5	2972.1	445.8
Limit of disturbance (less extraction area) 1	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	850.00	425.00	63.75	kg·ha-1·yr-1	28	ha		23587.2	11793.6	1769.0
								Total	**51,061.84**	**22,631.34**	**3,129.14**

Stage 3 – Annual Average

Description	Factor	Emission Rate			Units	Activity Rate	Units	Emission Controls	Controlled Emissions (kg·year^{-1})		
		TSP	PM_{10}	$PM_{2.5}$				(% efficiency)	TSP	PM_{10}	$PM_{2.5}$
Drilling blast holes	AP-42 - Drilling (Overburden) - Table 11.9-4	0.590	0.307	0.018	kg·hole-1	768	holes	Fabric filter (99%)	4.5	2.4	0.1
Blasting	AP-42 - Blasting (Coal or Overburden) - Table 11.9-2	1.760	0.915	0.053	kg·blast-1	12	blasts		21.1	11.0	0.6
Excavator loading blasted material to Dump Truck	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	250,000	t	Pit retention (50% TSP, 5% PM10, PM2.5)	260.6	234.2	35.5
Unloading of concrete washout at TP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t	Direct load to hopper	3.1	1.5	0.2
Loading hopper of TP (incl concrete washout)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	251,500	t	Water spray (50%)	262.2	124.0	18.8
TP Jaw crusher	AP-42 - Primary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	251,500	tonnes	Water sprays (77.7%)	151.4	67.3	12.1
TP Cone crusher	AP-42 - Secondary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	251,500	tonnes	Water sprays (77.7%)	151.4	67.3	12.1
TP Hawk Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	251,500	tonnes	Water sprays (91.2%)	276.7	95.2	6.7
End of TP stockpile loading - fines	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	25,150	t		52.4	24.8	3.8
End of TP stockpile loading - rock spalls and ballast	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t		3.1	1.5	0.2
End of TP - unloading prior to BP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	224,850	t		468.8	221.7	33.6
Movement of fines from TP stockpile to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	25,150	t		52.4	24.8	3.8
Unloading of fines from TP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	25,150	t		52.4	24.8	3.8
Movement of rock spalls and ballast from TP stockpile to stoc	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t		3.1	1.5	0.2
Unloading of rock spalls and ballast from TP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t		3.1	1.5	0.2
Loading of hopper of Bottom Plant (BP)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	224,850	t		468.8	221.7	33.6
BP VSI	AP-42 - Primary crushing - Table 11.19.2.1	0.0027	0.0012	0.00022	kg·t-1	224,850	tonnes	Water sprays (77.7%)	135.4	60.2	10.8
BP Hawk Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	224,850	tonnes	Water sprays (91.2%)	247.3	85.1	6.0
BP Global Screen	AP-42 - Screening - Table 11.19.2.1	0.0125	0.0043	0.00030	kg·t-1	224,850	tonnes	Water sprays (91.2%)	247.3	85.1	6.0
End of BP stockpile loading - fines	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	50,300	t		104.9	49.6	7.5
End of BP stockpile loading - aggregates	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	120,000	t		250.2	118.3	17.9
End of BP - unloading remainder	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	54,550	t		113.7	53.8	8.1
Movement of fines from BP stockpile to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	50,300	t		104.9	49.6	7.5
Unloading of fines from BP at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	50,300	t		104.9	49.6	7.5
Movement of aggregates from BP stockpile to stockpile (by F	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	120,000	t		250.2	118.3	17.9
Unloading of aggregates at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	120,000	t		250.2	118.3	17.9
Loading of aggregates directly to trucks at BP	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	34,550	t		72.0	34.1	5.2
Movement of aggregates to precoat plant (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Unloading of aggregates at precoat plant hopper	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Loading of rock spalls and ballast to trucks	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	1,500	t		3.1	1.5	0.2
Loading of fines to trucks	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	73,450	t		153.1	72.4	11.0

Description	Factor	Emission Rate			Units	Activity Rate	Units	Emission Controls (% efficiency)	Controlled Emissions (kg·year^{-1})		
		TSP	PM_{10}	$PM_{2.5}$					TSP	PM_{10}	$PM_{2.5}$
Loading of aggregates to trucks at stockpiles	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	112,000	t		233.5	110.5	16.7
Movement of aggregates and fines to pugmill (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Unloading of roadbase and fines to pugmill hopper	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Operation of pugmill	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Loading of pugmill stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Movement of roadbase to stockpile (by FEL)	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Unloading of roadbase at stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Loading of roadbase to trucks at pugmill stockpile	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	10,000	t		20.9	9.9	1.5
Loading aggregates to precoat plant	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Operation of precoat plant	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t	Will assume a 'wet' process (100%)	0.0	0.0	0.0
Loading precoat aggregate bins	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Loading trucks with precoat aggregate	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	20,000	t		41.7	19.7	3.0
Bulldozing overburden	AP-42 - Bulldozing (Overburden) - Table 11.9-2	2.4259	0.3617	0.25472	kg·hr-1	90	hr		218.3	32.6	22.9
Loading overburden	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	70,000	t		146.0	69.0	10.5
Unloading overburden	AP-42 - Batch drop - Section 13.2.4.3	0.0021	0.0010	0.00015	kg·t-1	70,000	t		146.0	69.0	10.5
Haulage of OB	AP-42 Unpaved roads - Section 13.2.2	3.6756	1.0452	0.1045	kg·VKT-1	1,948	=	Level 1 watering (50%), Vehicle speed limit (44%)	2004.8	570.1	57.0
Haulage of material to TP	AP-42 Unpaved roads - Section 13.2.2	3.676	1.045	0.105	kg·VKT-1	8,700	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	8953.7	2546.1	254.6
Transport of concrete washout to Top Plant (TP)	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	83	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	72.9	20.7	2.1
Road trucks off site from stockpiles	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	17,319	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	15123.1	4300.5	430.0
Road trucks off site from Precoat plant	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	1,564	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	1365.5	388.3	38.8
Road trucks off site from pugmill	AP-42 Unpaved roads - Section 13.2.2	3.119	0.887	0.089	kg·VKT-1	782	VKT	Level 1 watering (50%), Vehicle speed limit (44%)	682.8	194.2	19.4
Road trucks off site from stockpiles	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	850.00	425.00	63.75	kg·ha-1·yr-1	18	ha	Pit retention	7725.5	7339.2	1100.9
Road trucks off site from Precoat plant	AP-42 - Wind erosion of exposed areas - annual - Table 11.9-4	850.00	425.00	63.75	kg·ha-1·yr-1	12	ha		10618.5	5309.2	796.4
								Total	**51917.9**	**23138.2**	**3074.0**

Appendix 5

Noise and Vibration Impact Assessment

prepared by

Muller Acoustic Consulting Pty Ltd

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Noise and Vibration Impact Assessment

Western Riverina Quarry Extension

Prepared for: RW Corkery & Co. Pty Limited
On Behalf of: Rockwoods Investment Group Pty Ltd
February 2022
MAC191007-04RP1V1

Muller Acoustic Consulting

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Noise and Vibration Impact Assessment

Western Riverina Quarry Extension

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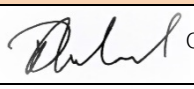
MAC191007-04RP1V1	Final	9 February 2022	Dale Redwood		Oliver Muller	

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CONTENTS

1 INTRODUCTION 5

1.1 BACKGROUND 7

1.2 HOURS OF OPERATION 10

1.3 POTENTIALLY SENSITIVE RECEIVERS 10

1.4 COVERAGE OF SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS 12

2 NOISE AND BLASTING POLICY AND GUIDELINES 13

2.1 INTERIM CONSTRUCTION NOISE GUIDELINE 13

2.1.1 STANDARD HOURS FOR CONSTRUCTION 13

2.1.2 OUT OF HOURS CONSTRUCTION 13

2.1.3 CONSTRUCTION NOISE MANAGEMENT LEVELS 14

2.2 NOISE POLICY FOR INDUSTRY 15

2.2.1 PROJECT NOISE TRIGGER LEVELS 16

2.2.2 PROJECT INTRUSIVENESS NOISE LEVEL (PINL) 16

2.2.3 PROJECT AMENITY NOISE LEVEL (PANL) 16

2.2.4 MAXIMUM NOISE LEVEL ASSESSMENT 19

2.3 ROAD NOISE POLICY 19

2.4 ANZEC BLASTING GUIDELINES 20

3 ASSESSMENT CRITERIA 21

3.1 CONSTRUCTION NOISE MANAGEMENT LEVELS 21

3.2 OPERATIONAL PROJECT NOISE TRIGGER LEVELS 21

3.2.1 PROJECT INTRUSIVENESS NOISE LEVELS 21

3.2.2 PROJECT AMENITY NOISE LEVELS 21

3.2.3 PROJECT NOISE TRIGGER LEVELS 22

3.3 MAXIMUM NOISE ASSESSMENT TRIGGER LEVELS 22

3.4 ROAD TRAFFIC NOISE CRITERIA 22

3.4.1 RELATIVE INCREASE CRITERIA 23

3.5 ANZECC GUIDELINE BLASTING LIMITS 23

4 NOISE ASSESSMENT METHODOLOGY 25

4.1 CONSTRUCTION NOISE MODELLING PARAMETERS 25

4.2 OPERATIONAL NOISE MODELLING PARAMETERS 26

4.2.1 METEOROLOGICAL ANALYSIS 26

4.2.2 OPERATIONAL NOISE MODELLING SCENARIOS 27

4.2.3 SOUND POWER LEVELS - OPERATION 28

4.3 ROAD NOISE ASSESSMENT METHODOLOGY 29

4.4 BLASTING AND VIBRATION ASSESSMENT METHODOLOGY 33

4.4.1 AIR-BLAST OVERPRESSURE 33

4.4.2 GROUND-BORNE VIBRATION 33

5 NOISE MODELLING RESULTS AND DISCUSSION 35

5.1 OPERATIONAL NOISE RESULTS 35

5.2 MAXIMUM NOISE LEVEL ASSESSMENT 36

5.3 TRAFFIC NOISE RESULTS 36

5.4 BLASTING RESULTS 37

5.4.1 EFFECTS OF VIBRATION ON INFRASTRUCTURE FROM BLASTING 37

5.4.2 EFFECTS OF BLASTING ON ANIMALS AND LIVESTOCK 37

6 NOISE MONITORING AND MANAGEMENT 39

6.1 NOISE MANAGEMENT MEASURES 39

6.2 NOISE MONITORING 39

7 CONCLUSION 41

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 RW Corkery & Co Pty Limited (RWC) on behalf of Rockwoods Investment Group Pty Ltd (the 'Applicant') to prepare a Noise and Vibration Impact Assessment (NVIA) for the continued operation and extension of the Western Riverina Quarry (the 'Quarry'), Rankins Springs, NSW.

The Quarry Site is located on rural land within Lot 1 DP821515, approximately 17km northwest of the Rankins Springs township and 61km southeast of Hillston, NSW (see **Figure 1**, RWC, 2021). The Quarry Site covers a total area of 46.5ha of which approximately 40.5ha would be disturbed throughout the life of the Quarry.

The NVIA is provided to accompany the Environmental Impact Statement (EIS) being prepared to assess the proposed extension of the Quarry. 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.**

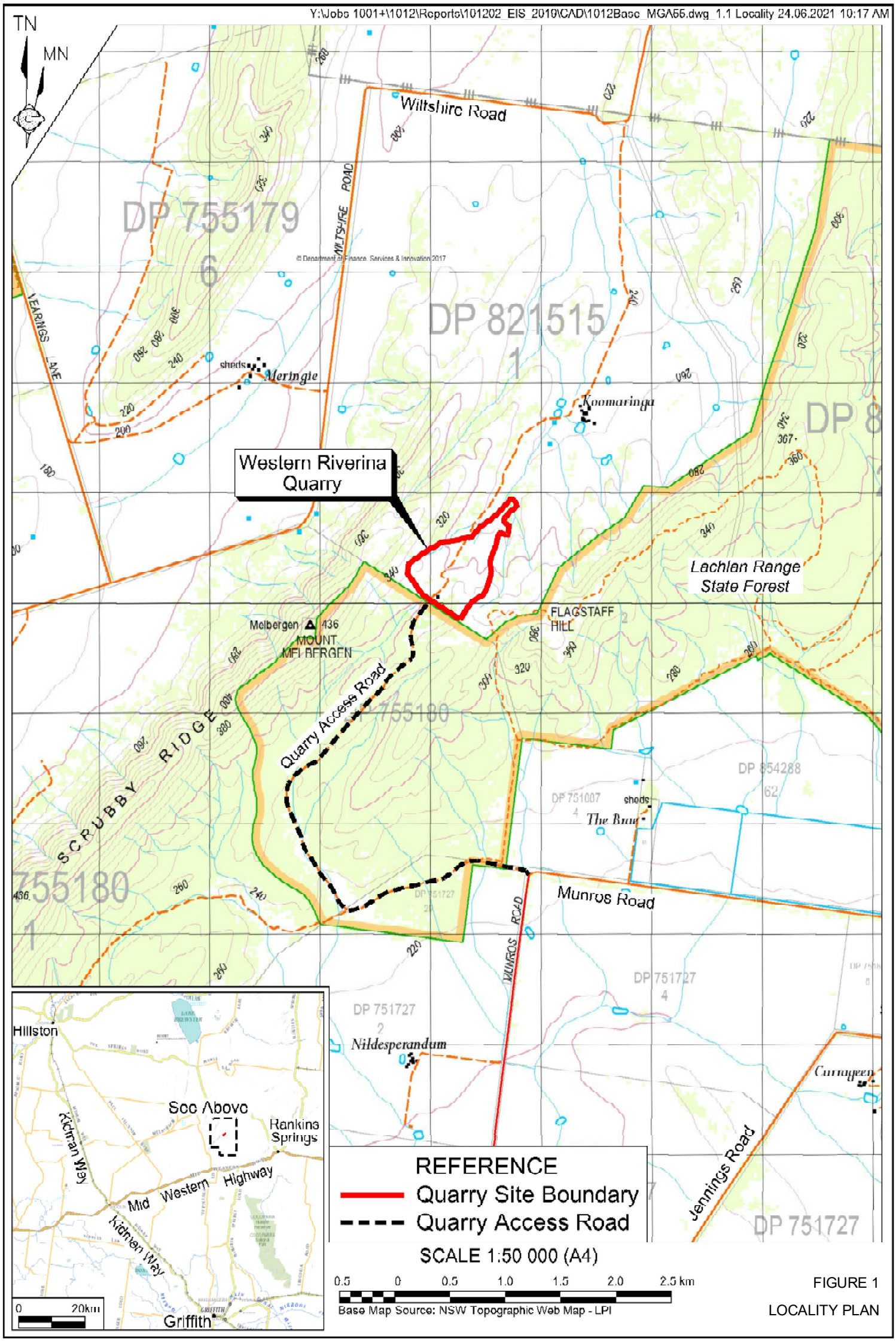


FIGURE 1

LOCALITY PLAN

1.1 Background

MAC understands that operations within the Quarry Site commenced in 1987 under DA1/86, issued by Carrathool Shire Council (25 May 1987). The Quarry currently operates under DA2/91 which was issued by Carrathool Shire Council on 19 July 1991.

The existing Quarry operations has approval to produce up to 5,000m^3 or approximately 13,000 tonnes per annum (tpa) of basalt products through conventional drill and blast, load and haul methods. Quarry products are transported to local and regional markets by truck and dog.

The Applicant has identified a further 4.9 million tonnes of resource adjacent to and beneath the current approved extraction area which would be the target of extraction. The extraction of this material would involve the removal of approximately 800,000m^3 of overburden and interburden. The extension of the extraction area and associated areas of operational disturbance would increase the total area of disturbance to approximately 40.5ha.

To efficiently access and extract the identified resource, it is proposed that a new development consent is sought that would supersede the existing development consent. As part of this application, the Applicant proposes to increase the approved maximum extraction rate to 250,000tpa to allow for existing and future market demands to be met. The proposed Quarry layout is shown in **Figure 2** (RWC, 2021).

The activities for which the Applicant is seeking development consent would involve the following:

- Extraction of basalt and quartzite from within the proposed Extraction Area to produce up to 250,000tpa of Quarry products;
- Importation of up to 1,500tpa of concrete washout and other construction materials for recycling and incorporation in products produced within the Quarry;
- Crushing and screening of fragmented rock and imported materials on site using a fixed processing plant;
- Pre-coating of up to 20,000tpa of Quarry products;
- Ongoing transportation of up to 250,000tpa of Quarry products to end points of use within the Carrathool LGA and the broader Riverina Region; and
- Progressive and final rehabilitation of the Quarry to develop a final landform suitable for grazing and passive biodiversity conservation.

The Applicant would continue to utilise the existing fixed processing plant until the commencement of Stage 3 of the Quarry. The processing plant would be relocated to the Stage 3 product stockpiling area to allow for extraction to progress within the footprint of the existing processing and product stockpiling area.

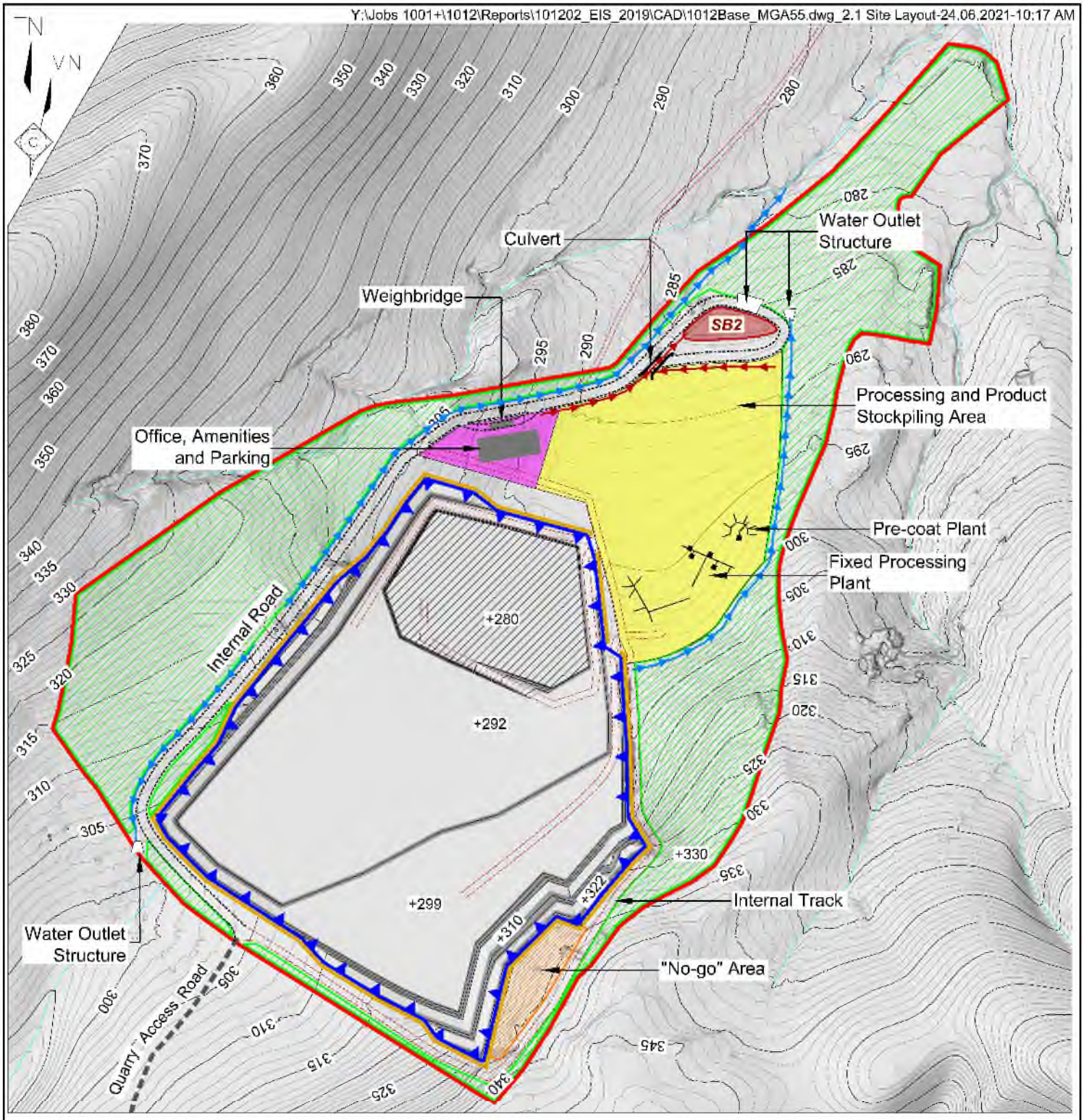
The Quarry products would primarily be despatched from the Quarry Site using the Applicant's fleet of truck and dog trailers with a maximum capacity of 38t with the average load being approximately 32t. Access for all vehicles to the Quarry Site would be retained via the Quarry Access Road which provides vehicular access from Munros Road.

Traffic levels would vary substantially on a daily basis throughout the life of the Proposal based on market demands. It is anticipated that during peak production, transportation of Quarry products would involve a maximum of 60 laden loads per day and a peak of 12 laden loads per hour. Approximately five loads of concrete washout and bricks would be imported to the site per month, however these materials would be backloaded with no additional traffic movements anticipated.

The Applicant proposes to continue to utilise the existing infrastructure, utilities and services at the Quarry where practicable. Prior to the commencement of Stage 3 of the Quarry, the following components would be relocated and/or constructed to the north of the extraction area:

- Top and bottom processing plans, precoat plant and pugmill;
- Quarry Office / Breakroom / Amenities;
- Light-vehicle car park;
- Weighbridge;
- Workshop; and
- Refuelling area.

Construction activities would be undertaken concurrently with extraction operations to enable the progressive development and extension of the Quarry. The construction activities would generally utilise the same equipment as used for extraction operations.



REFERENCE

- Quarry Site Boundary
- Proposed Limit of Extraction
- Quarry Access Road
- Internal Road
- Track
- Creek
- Safety Bund
- No-go Area
- 300 Contours (mAHD)(Interval=1m)
- +280 Spot Height (mAHD)
- Processing and Product Stockpiling Area
- Ancillary Components Area
- Rehabilitation Area
- Overburden / Interburden Emplacement
- Clean Water Diversion Drain
- Dirty Water Collection Drain
- Water Outlet Structure
- Culvert
- SB2 Sediment Basin

SCALE 1:7 000 (A4)

100 0 100 200 300 400m

Base Map Source: RPAS Australia - 27 April 2019

FIGURE 2

PROPOSED QUARRY LAYOUT

1.2 Hours of Operation

Table 1 presents the proposed operating hours for the quarry. The proposed hours and combination of activities for the quarry have formed the basis of the noise modelling scenarios for this assessment.

Table 1 Proposed Hours for Quarry Operation

Activity	Monday to Friday[1]	Saturday	Sunday
Site Establishment and Construction	7am – 7pm	7am – 3pm	Nil
Extraction Operations	7am – 7pm	7am – 3pm	Nil
Blasting	10am – 3pm	N/A	Nil
Processing Operations	7am – 7pm	7am – 3pm	Nil
Product Despatch	7am – 5pm	7am – 3pm	Nil
Maintenance	24 hours/day	24hours/day	Nil

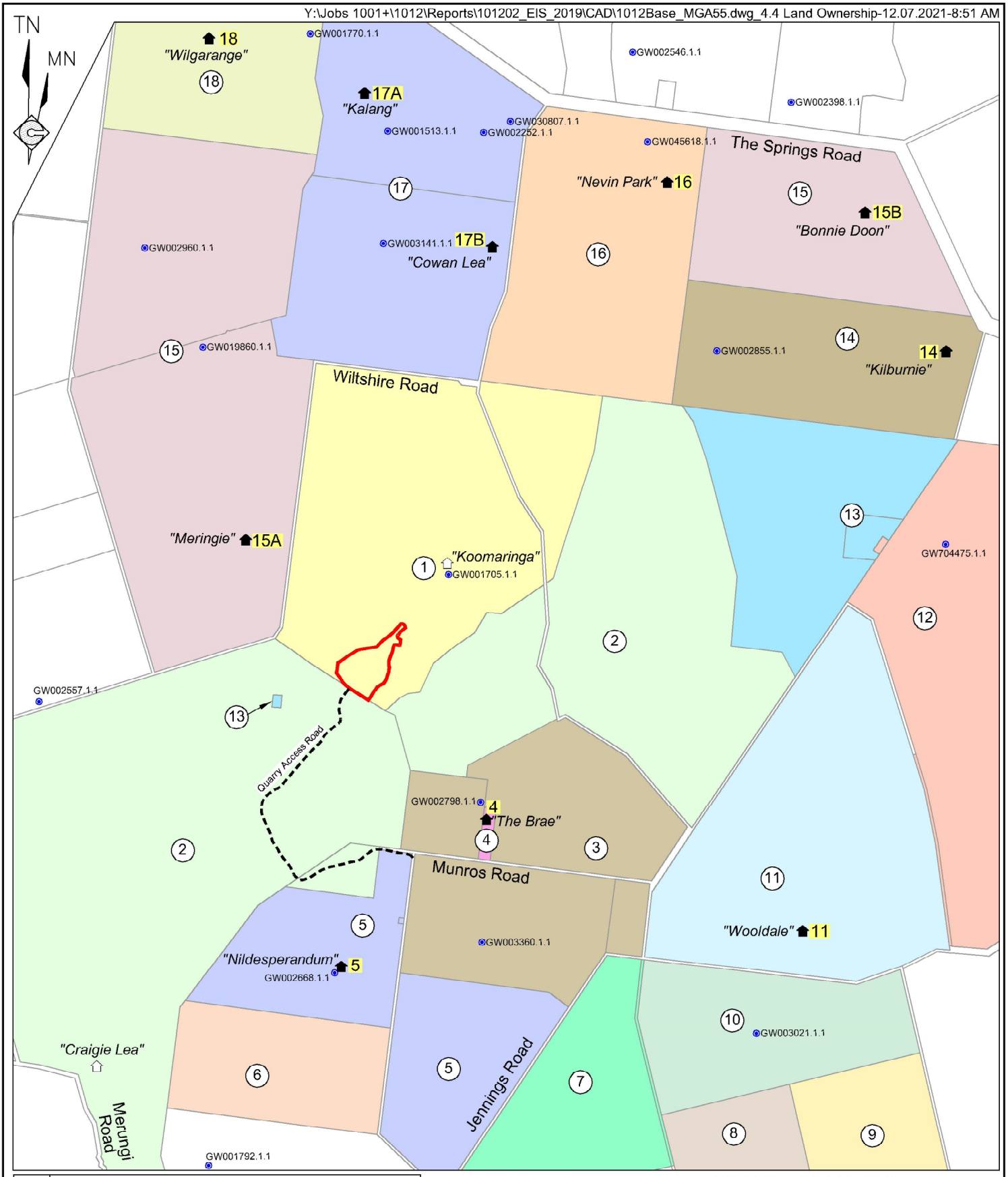
Note 1: Excludes public holidays which would operate as per the proposed hours of operation for Sunday.

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** (RWC 2021).

Table 2 Receiver Locations

Receivers	Address	MGA55 Coordinates	
		Easting	Northing
R4	"The Brae" 979 Munros Road	416918	6258048
R5	"Nildesperandum" 713 Munros Road	414824	6255929
R11	"Wooldale" 606 Jennings Road	421484	6256431
R14	"Kilburnie" The Springs Road	423720	6264939
R15A	"Meringie" 954 Wiltshire Road	413460	6262087
R15B	"Bonnie Doon" The Springs Road	422452	6267233
R16	"Nevin Park" The Springs Road	419524	6267285
R17A	"Kalang" The Springs Road	415147	6268600
R17B	"Cowan Lea" The Springs Road	417011	6266378
R18	"Wilgarange" 2693 The Springs Road	412887	6269355



Ref	Landowner
1	KALRAG PTY LIMITED
2	ESTATE: PERPETUAL LEASE - PA WOODS, BL WOODS
3	IR MUNRO
4	RI MUNRO
5	JW DWYER
6	DG MUNRO
7	BM BLACK, P BLACK
8	KYRIE FARMS PTY. LTD
9	KIARABILLI EQUITIES PTY. LTD
10	BJ VEARING, TJD VEARING, SA VEARING
11	TJD VEARING, SA VEARING
12	RL FINCH
13	STATE OF NSW
14	RB ARGENT- SMITH, SA ARGENT-SMITH
15	DG GROAT
16	IA NEVINSON
17	GS WALKER
18	DG THOMPSON

SCALE 1:90 000 (A4)

1 0 1 2 3 4km

Landowner Source: GlobalX Terrain - February 2020

REFERENCE

- Quarry Site Boundary
- Quarry Access Road
- Cadastral Boundary
- Project-related Residence
- 4 Privately owned Residence & Identifier
- "The Brae" Property Name
- 1 Landowner Identifier
- GW405021 Registered Groundwater Bore

FIGURE 3

RECEIVER MAP

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 5 / 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 / 5.4
▪ 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 5.4
Coverage of Issues Identified by Other Government Agencies	
EPA (12 June 2019):	
▪ The goals of the project should include design, construction, operation and maintenance of the facility in accordance with relevant EPA policy, guidelines and criteria, and in order to minimise potential impacts from noise.	Section 1 / 4
▪ The EPA expects that potential noise sources are assessed in accordance with the Noise Policy for Industry (EPA 2017), and where required mitigation measures are proposed (e.g. appropriate equipment chosen to minimise noise levels).	Section 5
▪ All residential or noise sensitive premises likely to be impacted by the development must be identified and included in the assessment.	Section 1.3
▪ The proposed development may result in an increase in traffic movements. The number of traffic movements associated with the proposal should be quantified and the potential noise impacts associated with these traffic movements need to be assessed in accordance with the NSW Road Noise Policy (DECCW, 2011).	Section 5.3
▪ An assessment of vibration from all activities (including construction and operation) to be undertaken on the premises and this should be assessed using the guidelines contained in the document Assessing Vibration: a technical guideline (DEC 2006).	Section 5.4
▪ An assessment of potential blast impacts should be undertaken and this should be assessed against the guidelines contained in the document Australian and New Zealand Environment Council - Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC, 1990).	Section 5.4

2 Noise and Blasting Policy and Guidelines

The following section summarises relevant policy and guidelines pertinent to undertaking a noise and blasting impact assessment for this type of project.

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 impacts of construction noise on residences and other sensitive land uses.

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.

The proposed construction hours would be from 7am to 7pm Monday to Friday and 7am to 3pm Saturdays. Hence, construction activities may be undertaken during out of hours work periods.

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 Project 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 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 3.5.

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.

3 Assessment Criteria

The following sections summarise the relevant noise and blasting criteria for this type of project.

3.1 Construction Noise Management Levels

Noise Management Levels (NMLs) for standard construction hours and out of hours periods are summarised in **Table 7**.

Table 7 Construction Noise Management Levels

Location	Assessment Period	RBL dBA	NML dB $LA_{eq(15min)}$
All Residential Receivers	Standard Hours	35	45 (RBL+10dBA)
	OOH	30	35 (RBL+5dBA)

Note: See Table 4 for Recommended Construction Hours.

3.2 Operational Project Noise Trigger Levels

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	Day	35	40
	Evening Shoulder	30	35

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening Shoulder – the period from 6pm to 7pm Monday to Saturday.

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 $LA_{eq(15min)}$[4]
Residential	Rural	Day	50	53
		Evening Shoulder	45	48

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening Shoulder – the period from 6pm to 7pm Monday to Saturday.

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[1]	RBL	PINL dB $L_{Aeq(15min)}$	PANL dB $L_{Aeq(15min)}$	PNTL dB $L_{Aeq(15min)}$
Residential	Day	35	40	53	**40**
	Evening Shoulder	30	35	48	**35**

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening Shoulder – the period from 6pm to 7pm Monday to Saturday.

3.3 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 8am.

Note: As per Section 2.5 of the NPI, the highest of the two criteria are adopted as the trigger level.

3.4 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.

3.4.1 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 Munros Road, Jennings Road and the Mid Western 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 $L_{Aeq(15hr)}$ +12dB (external)	Existing traffic $L_{Aeq(9hr)}$ +12dB (external)

3.5 ANZECC Guideline Blasting Limits

The ANZECC blasting limits for air-blast overpressure and ground vibration are presented in **Table 14**.

Table 14 ANZECC 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

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4 Noise Assessment Methodology

A computer model was developed to quantify project noise emissions to neighbouring receivers using DGMR (iNoise, Version 2021.1) noise modelling software. iNoise is an 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. Where relevant, modifying factors in accordance with Fact Sheet C of the NPI have been applied to calculations.

The model calculation method used to predict noise levels was in accordance with ISO 9613:1 and ISO 9613:2 including corrections for meteorological conditions using CONCAWE[1]. The ISO 9613 standards are 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

MAC understands that a range of construction activities would be undertaken concurrently with extraction operations to enable the progressive development and extension of the Quarry. The principal activities include progressive construction of water management infrastructure, internal roads and safety bunds; vegetation clearing and soil removal; and relocation and/or construction of processing plant and Quarry amenities and infrastructure.

Earth moving equipment to be used for the construction activities would generally be consistent with earth moving equipment used on site, with works to be undertaken during periods of reduced production. It is therefore anticipated that the construction activities would not contribute to noise levels above the operational noise emissions. Hence, where operational criteria are satisfied construction management levels would also be satisfied.

[1] Report no. 4/18, "the propagation of noise from petroleum and petrochemical complexes to neighbouring communities", Prepared by C.J. Manning, M.Sc., M.I.O.A. Acoustic Technology Limited (Ref.AT 931), CONCAWE, Den Haag May 1981

4.2 Operational Noise Modelling Parameters

The model incorporated three-dimensional digitised ground contours for the fixed plant and surrounding area, as derived from proposed Project plans superimposed onto the surrounding land base topography. Where relevant, modifying factors in 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 (i.e. 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 November 2018 to November 2020 was obtained from the Bureau of Meteorology's (BOM) Griffith Airport AWS (075041) weather station located approximately 50km south 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 15 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 15 Seasonal Frequency of Occurrence Wind Speed Intervals			
Season	Period	Wind Direction ±(45°)	% Wind Speeds (m/s)
			0.5 to 3 m/s
Summer	Day	SE, WNW	6
	Evening	SE	13
	Night	SE	11
Autumn	Day	S, W	10
	Evening	SSW	18
	Night	WNW	13
Winter	Day	WNW	12
	Evening	SSW, SW	15
	Night	WNW, NW	16
Spring	Day	W, WNW, NW	7
	Evening	SSW	15
	Night	WSW, W, WNW	11

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 16**. The meteorological parameters, including wind speeds for standard and noise-enhancing meteorological conditions are determined in accordance with Table D1 of the NPI.

Table 16 Modelled Site Specific Meteorological Parameters				
Assessment Condition	Temperature	Wind Speed	Relative Humidity	Stability Class
Day - Calm	20°C	0.5m/s	60%	n/a
Evening Shoulder – Inversion	15°C	2m/s	90%	F

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

4.2.2 Operational Noise Modelling Scenarios

Extraction operations would be undertaken in a similar manner to the existing operations, that is, using conventional drill and blast, load and haul methods. Fragmented rock would be hauled from the extraction area and tipped directly into the hopper within the “Top Plant” located adjacent to the jaw crusher to produce spall, ballast and 45mm feed rock for the “Bottom Plant”. A pre-coat plant would also be used on site to produce road pavement products, however, it is anticipated that no more than 20,000tpa would be processed through the pre-coat plant in a typical year.

It is noted that a pugmill will be used on the Quarry Site to process up to 10,000tpa of material. As the pugmill would not operate concurrently with other processing equipment, the pugmill has not been included in the operational noise modelling scenarios.

It is anticipated that the extraction sequence for the Quarry would incorporate three stages. Stage 1 would involve the progressive development of five benches between approximately 322m AHD to 280m AHD. The development of these benches would ultimately extend the footprint of the extraction area to the south and northwest to cover a cumulative area of approximately 7.9ha. During the extension of the extraction area, overburden would be progressively pushed up to the edge of the active extraction area using a bulldozer or excavator to provide access to the targeted resource. Following the removal of overburden, the targeted resource would be extracted using drill and blast method with fragmented rock loaded and hauled to the fixed processing plant.

Stage 2 extraction operations would involve the progressive development of the benches at 310m AHD, 299m AHD, 292m AHD and 280m AHD. The development of these benches would ultimately extend the footprint of the extraction area to the northwest to cover a cumulative area of approximately 13.2ha.

Stage 3 extraction operations would involve the progressive development of the benches at 310m AHD, 299m AHD, 292m AHD and 280m AHD with the Quarry footprint ultimately extending to the southwest to cover a cumulative area of approximately 18.1ha. Extraction would progress within the footprint of the existing processing and product stocking area in Stage 3 which would require the relocation of Quarry-related infrastructure to the north of the extraction area.

Based on the proposed extraction sequence, two (2) modelling scenarios have been adopted to represent Stage 1 and Stage 3 of the Quarry operations. A summary of the assessed operational scenarios is presented in **Figure 4** (RWC 2021). Quarrying and material processing operations would typically occur Monday to Friday 7am to 7pm and Saturdays 7am to 3pm. Despatch operations would typically occur Monday to Friday 7am to 5pm and Saturdays 7am to 3pm. Maintenance activities may occur 24 hours/day where required.

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 17**.

Table 17 Single Octave Equipment Sound Power Levels, dB $LA_{eq(15min)}$ ($re10^{-12}W$)									
Noise Source/Item	Octave Band Centre Frequency, Hz								Total, dBA
	63	125	250	500	1000	2000	4000	8000	
Mobile Equipment									
Bulldozer (D11)	86	92	100	113	110	111	102	88	117
Hydraulic Drill Rig	81	103	104	106	109	108	100	92	114
Excavator (38T)	79	99	100	99	100	96	91	82	106
Excavator (6T)	78	92	91	95	95	94	83	75	101
Dump Truck (35T)	87	99	96	100	104	102	98	89	109
Loader (x2)	79	89	95	100	100	100	92	84	106
Water Truck (15,000L)	81	82	89	91	95	97	89	81	101
Road Trucks	89	95	90	89	93	97	92	85	102
Processing Plant									
Top Plant[1]	95	104	106	113	116	114	109	103	120
Bottom Plant[2]	92	101	103	110	113	111	106	100	117
Pre-coat Plant	84	94	89	94	92	88	77	71	99
Sleep Disturbance Assessment (LA_{max})									
Maintenance Activities	82	92	98	102	103	103	95	87	108

Note: Source - MAC database.

Note 1: Top plant comprising jaw crusher, two cone crushers, and twin deck hawks screen.

Note 2: Bottom plant comprising hawks screen (triple deck), vertical shaft impactor and global screen (triple deck).

4.3 Road Noise Assessment Methodology

The United States (US) Environment Protection Agency's road traffic calculation method (US FHWA Report 550/9-74-004) is used to predict the LA_{eq} noise levels from project related trucks travelling past receivers adjacent to the haul routes. This method is an internationally accepted theoretical noise prediction model and is ideal for calculating road traffic noise where small traffic flows are encountered.

MAC understands that extracted material would typically be transported from the Quarry Site using the Applicant's fleet of truck and dog trailers with a maximum capacity of 38t. During operation of the Quarry the average number of laden truck movements would be 26 trips per day, with a maximum of 12 laden truck trips per hour and up to 60 laden truck trips per day.

Upon departing the Quarry Site, all laden trucks would turn right from the Quarry Access Road and travel along Munros Road until they reach the Mid Western Highway. At the Mid Western Highway, laden trucks would typically turn right and travel westwards towards Goolgowi. However, depending on market demands, laden trucks may turn left and travel in an easterly direction towards Rankins Springs (see **Figure 5**, RWC 2021). This assessment has therefore considered a daily rate of 100% of traffic travelling either direction on the Mid Western Highway.

The closest offset distances to receivers along the haulage route are provided in **Table 18**.

Table 18 Closest Offset Distances – Road Traffic Assessment

Travel Route	Address	Offset Distance (m)
Munros Road	713 Munros Road, Rankins Springs	830
Mid Western Highway (West)	6 Zara Street, Goolgowi	35
Mid Western Highway (East)	9131 Mid Western Highway, Rankins Springs	45

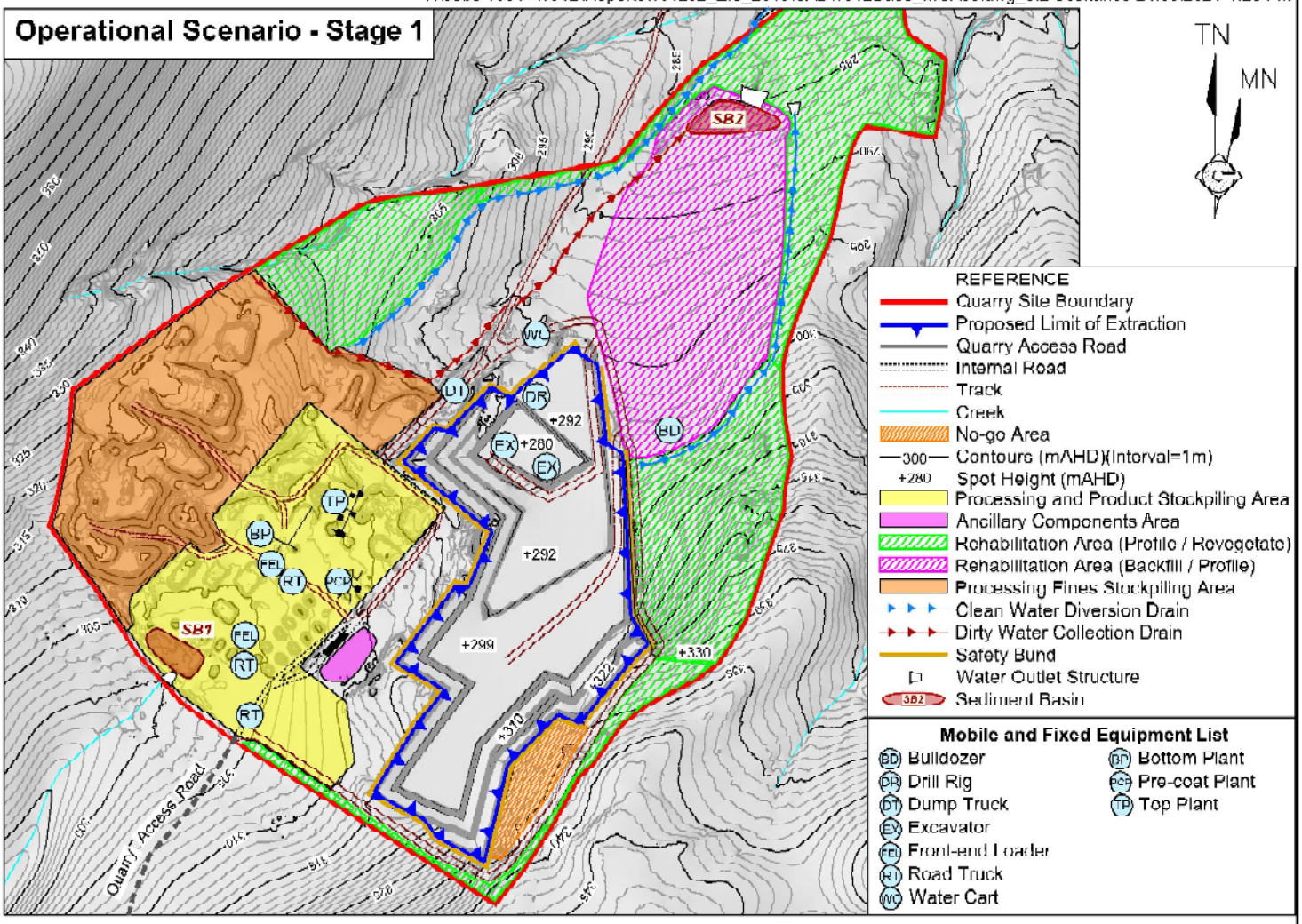
To quantify existing traffic conditions in the vicinity of the Quarry, automatic tube counters were used to collect traffic data on:

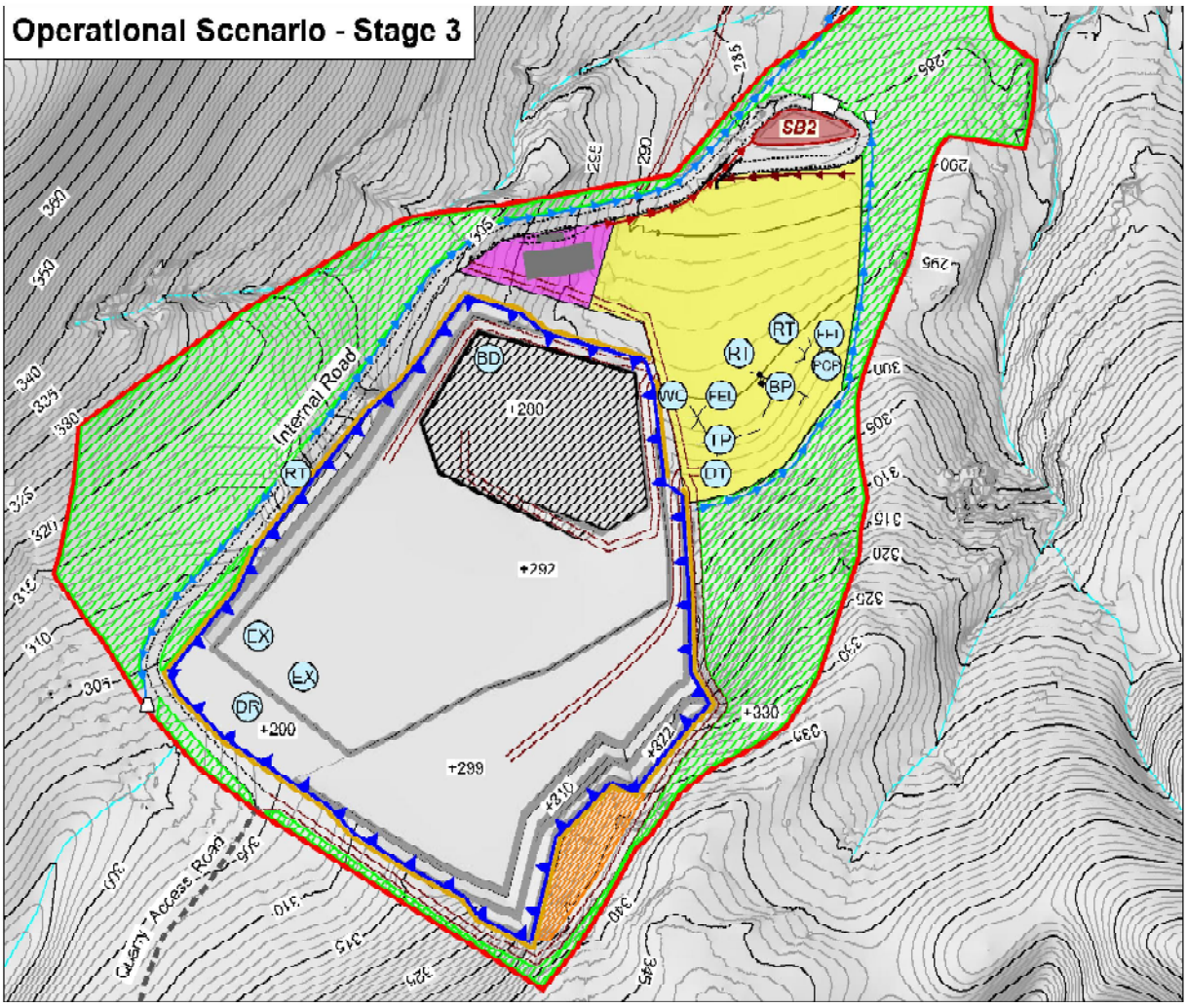
- Munros Road south of the Quarry Access Road; and
- Mid Western Highway, east of Munros Road.

The surveys were undertaken by TTPP Transport Planning over one weeks from Sunday 16 February 2020 to Saturday 22 February 2020 inclusive. The daily average traffic volumes are provided in **Table 19**.

Table 19 Existing Traffic Volumes – Day Period (7am to 10pm) Monday to Saturday

	Daily Average Traffic Volume			% Heavy Vehicles
	Light Vehicles	Heavy Vehicles	Total Vehicles	
Munros Road	19	14	33	42%
Mid Western Highway	90	192	282	68%





SCALE 1:8 500 (A4)

100 0 100 200 300 400 m

Base Map Source: RPAS Australia - 27 April 2019

FIGURE 4

OPERATIONAL SCENARIOS

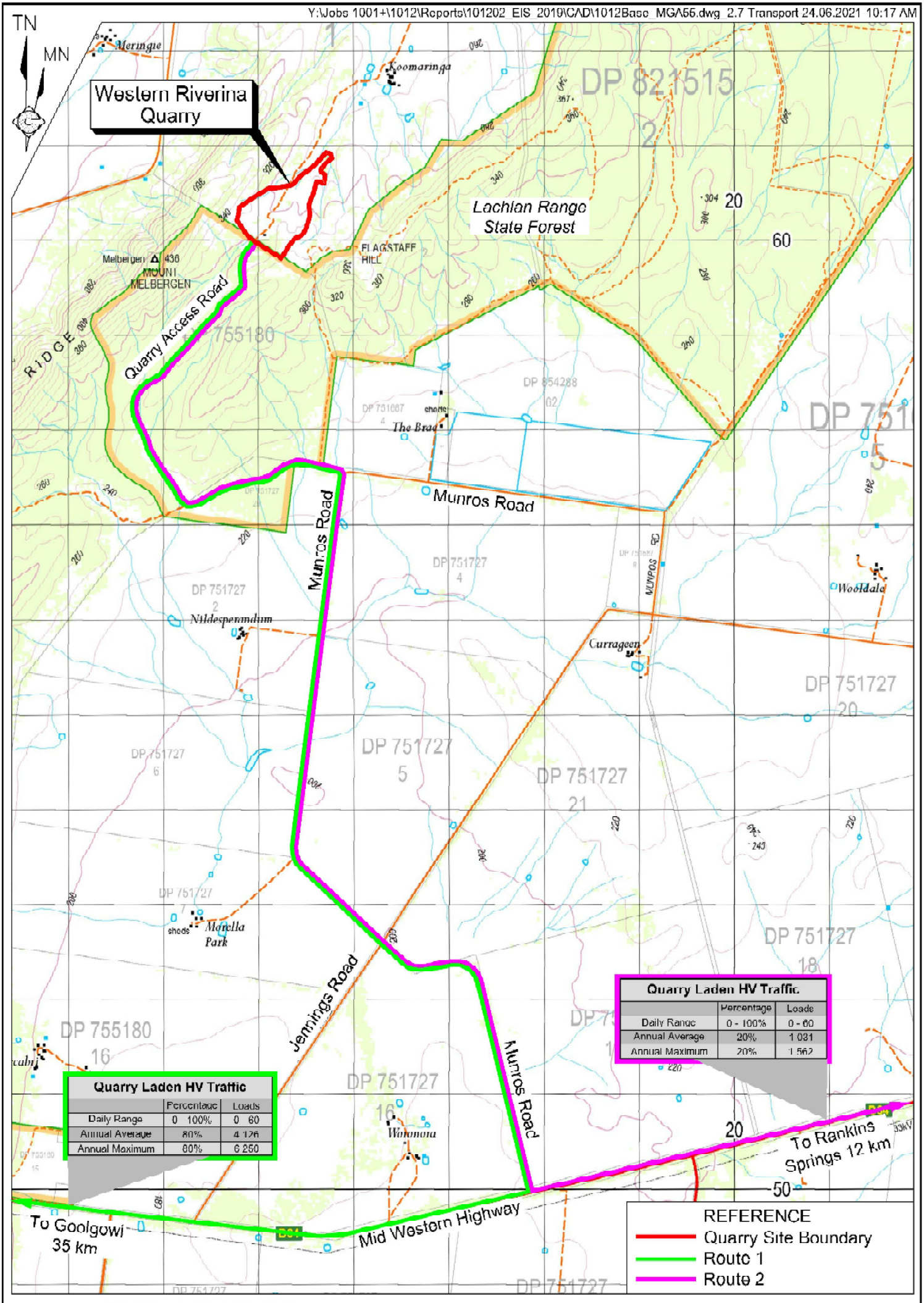


FIGURE 5

TRANSPORT ROUTES

4.4 Blasting and Vibration Assessment Methodology

4.4.1 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:

$$\mathrm{SPL} = 10\ x \log\left(\frac{P}{P_0}\right)^2$$

4.4.2 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 Operational Noise Results

Quarry operations for noise prediction included extraction, processing, product loading and transportation. The predicted noise levels at each receiver during calm meteorological conditions during the day period and noise-enhancing meteorological conditions during the night period are provided in **Table 20**. The noise contour maps for Scenario 2 (Stage 3) of the quarry operations, which is considered to be the worst case scenario, 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 (day period) and adverse meteorological scenarios during the evening shoulder period.

Table 20 Predicted Operational Noise Levels, dB $L_{Aeq(15min)}$

Receiver	Period	Scenario		PNTL	Compliant
		Scenario 1 (Stage 1)	Scenario 2 (Stage 3)		
R4	Day	31	31	40	✓
	Evening Shoulder	30	30	35	✓
R5	Day	<30	30	40	✓
	Evening Shoulder	<30	<30	35	✓
R11	Day	<30	<30	40	✓
	Evening Shoulder	<30	<30	35	✓
R14	Day	<30	<30	40	✓
	Evening Shoulder	<30	<30	35	✓
R15A	Day	30	31	40	✓
	Evening Shoulder	30	32	35	✓
R15B	Day	<30	<30	40	✓
	Evening Shoulder	<30	<30	35	✓
R16	Day	<30	<30	40	✓
	Evening Shoulder	<30	<30	35	✓
R17A	Day	<30	<30	40	✓
	Evening Shoulder	<30	<30	35	✓
R17B	Day	<30	<30	40	✓
	Evening Shoulder	<30	<30	35	✓
R18	Day	<30	<30	40	✓
	Evening Shoulder	<30	<30	35	✓

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

5.2 Maximum Noise Level Assessment

In assessing sleep disturbance, a typical L_{Amax} noise source of 108dB was used to represent transient events such as impact noise from night maintenance activities to the nearest residential receivers, under F Class stability conditions (ie worst case).

The results of the analysis identify that maximum noise trigger level 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 21**.

Table 21 Predicted Maximum Noise Levels

Receiver	Period	Noise Predictions dB L_{Amax}	Sleep Disturbance Trigger Level, dB L_{Amax}
R4	Morning Shoulder	<30	52
R5		<30	52
R11		<30	52
R14		<30	52
R15A		<30	52
R15B		<30	52
R16		<30	52
R17A		<30	52
R17B		<30	52
R18		<30	52

Monday to Saturday; Night 10pm to 7am. On Sundays and Public Holidays; Night 10pm to 8pm.

5.3 Traffic Noise Results

The results of the traffic noise calculations for typical operational road traffic are presented in **Table 22** for the closest residential receivers to Munros Road and the Mid Western Highway. The traffic noise contribution from the Quarry is predicted to remain below the relevant day period assessment criteria for all dwellings along the travel routes and is demonstrated to satisfy the RNPs relative increase criteria.

Table 22 Operational Road Traffic Noise Levels – Residential Receivers

Offset Distance (m)	Assessment Criteria[1]	Traffic Noise dB $L_{Aeq(period)}$		
		Existing Traffic Noise	Future Traffic Noise	Total Change
Munros Road				
830	Day 60 dB $L_{Aeq(15hr)}$	negligible	negligible	N/A
Mid Western Highway Goolgowi				
35	Day 60 dB $L_{Aeq(15hr)}$	45.1	46.3	+1.2
Mid Western Highway Rankins Springs				
45	Day 60 dB $L_{Aeq(15hr)}$	42.4	43.6	+1.2

Note 1: Day 7am to 10pm

5.4 Blasting Results

Blast overpressure and vibration have been calculated to each assessed receiver for the Quarry adopting an MIC of up to 152kg for a typical 50,000t blast. Calculated levels for overpressure and vibration have been compared to the relevant ANZEC criteria and are presented in **Table 23**.

Results identify blasts of MICs up to 152kgs would satisfy relevant ANZEC overpressure and vibration criteria. Notwithstanding, the proposed MIC blast patterns should be designed specifically to meet the relevant ANZEC guidelines at receivers and be completed in conjunction with an appropriate blast monitoring program.

Table 23 Blasting Emissions

Receiver ID	Distance to Charge[1]	Airblast Overpressure	Ground Vibration
	km	dBZ Peak	mm/s
R4	2.8	103.0	0.19
R5	4.4	97.3	0.09
R11	7.3	90.9	0.04
R14	9.6	87.5	0.03
R15A	2.5	104.3	0.23
R15B	9.9	87.0	0.03
R16	8.2	89.6	0.03
R17A	8.3	89.4	0.03
R17B	6.3	92.8	0.05
R18	9.3	87.9	0.03

Note 1: Denotes distance from drill rig to receiver location, as per operational scenario.

5.4.1 Effects of Vibration on Infrastructure from Blasting

There is no significant infrastructure in the locality of the Quarry Site. The nearest public road is Wiltshire Road approximately 1.4km to the west of the Quarry Site, where ground vibration levels of up to 0.53mm/s are predicted to be experienced.

5.4.2 Effects of Blasting on Animals and Livestock

Blast effects resulting from the Quarry are predicted at the nearest sensitive receivers to be, at worst for overpressure up to 104dBZ, and for vibration up to 0.19mm/s. These 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)

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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 residual noise impacts, operational noise management measures the Applicant would assemble a comprehensive Environmental Management Plan (the 'Plan') for the ongoing management of the relevant environmental issues at the Quarry. The Plan would incorporate an overall Environmental Management Strategy and include a separate section relating to Noise Management. Feasible and reasonable best management practices included in the Plan may include:

- Strictly adhering to the proposed hours of operation;
- 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; and
- Running staff-education programs and regular tool box talks on the effects of noise and the use of quiet work practices.

The Plan may also address the use of best available technology including alternatives to tonal reversing alarms and efficient muffler design.

6.2 Noise Monitoring

It is recommended that the Plan 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.

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 completed a NVIA to quantify potential impacts associated with the continued operation and extension of the Western Riverina Quarry northwest of Rankins Springs in the NSW Riverina. The assessment has quantified potential operational noise emissions pertaining to extraction, processing and dispatch of Quarry products via road trucks, as well as blasting noise and vibration emissions.

The results of the NVIA demonstrate that operational noise levels (including minor construction activities) comply with the relevant NPI criteria for all assessment periods at the most affected sensitive receiver locations.

Results of the maximum noise level assessment are identified to remain below the sleep disturbance trigger level at all residential receivers. Therefore, sleep disturbance due to maintenance activities within the Quarry are unlikely to cause awakening reactions to adjacent receivers.

Additionally, the NVIA demonstrates that the road noise criteria as specified in the RNP will be satisfied at the nearest potentially affected receivers for worst case operational road traffic.

Airblast overpressure and vibration levels are also predicted to meet the criteria at all assessed receivers for blasts up to 152kg MIC.

Based on the NVIA results, there are no noise or vibration related issues which would prevent the approval of the extension of the Quarry. 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 relevant EPA and DECCW policies, without additional ameliorative measures being required.

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Appendix A – Glossary of Terms

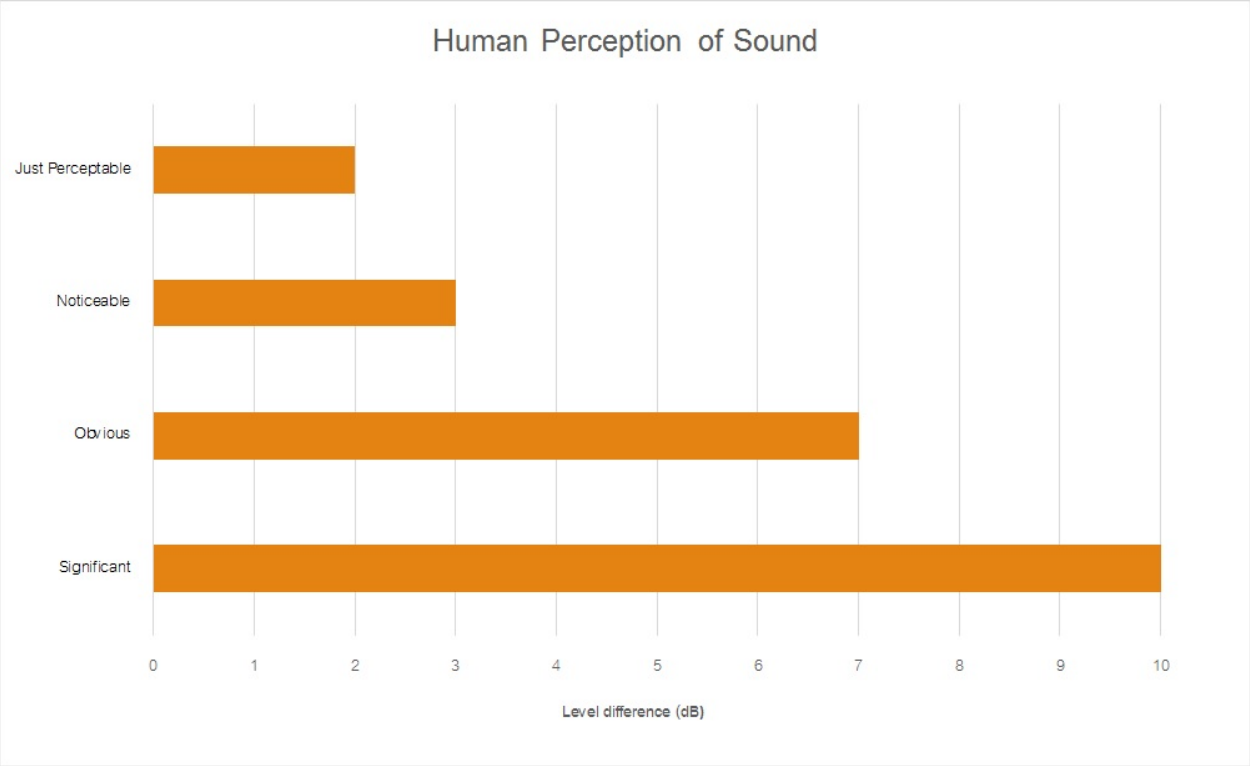
Table A1 provides a number of technical terms have been used in this report.

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, Griffith Airport AWS NSW					
Direction ± 45°	Season	Day Percentage Occurrence %	Direction	Season	Day Percentage Occurrence %
0	Summer	4	180	Summer	5
0	Autumn	6	180	Autumn	8
0	Winter	8	180	Winter	8
0	Spring	4	180	Spring	5
22.5	Summer	4	202.5	Summer	5
22.5	Autumn	7	202.5	Autumn	7
22.5	Winter	8	202.5	Winter	9
22.5	Spring	4	202.5	Spring	5
45	Summer	4	225	Summer	5
45	Autumn	6	225	Autumn	8
45	Winter	7	225	Winter	9
45	Spring	4	225	Spring	6
67.5	Summer	5	247.5	Summer	5
67.5	Autumn	8	247.5	Autumn	9
67.5	Winter	9	247.5	Winter	9
67.5	Spring	4	247.5	Spring	7
90	Summer	5	270	Summer	5
90	Autumn	9	270	Autumn	10
90	Winter	9	270	Winter	11
90	Spring	5	270	Spring	7
112.5	Summer	5	292.5	Summer	6
112.5	Autumn	10	292.5	Autumn	9
112.5	Winter	9	292.5	Winter	12
112.5	Spring	5	292.5	Spring	7
135	Summer	6	315	Summer	5
135	Autumn	9	315	Autumn	9
135	Winter	10	315	Winter	11
135	Spring	5	315	Spring	7
157.5	Summer	3	337.5	Summer	5
157.5	Autumn	6	337.5	Autumn	7
157.5	Winter	6	337.5	Winter	11
157.5	Spring	3	337.5	Spring	6

Table B2 NEWA Analysed Evening Meteorological Conditions, Griffith Airport AWS NSW					
Direction ± 45°	Season	Night Percentage Occurrence %	Direction	Season	Night Percentage Occurrence %
0	Summer	5	180	Summer	13
0	Autumn	7	180	Autumn	17
0	Winter	9	180	Winter	14
0	Spring	6	180	Spring	13
22.5	Summer	5	202.5	Summer	12
22.5	Autumn	7	202.5	Autumn	18
22.5	Winter	8	202.5	Winter	15
22.5	Spring	6	202.5	Spring	15
45	Summer	5	225	Summer	12
45	Autumn	9	225	Autumn	16
45	Winter	8	225	Winter	15
45	Spring	6	225	Spring	14
67.5	Summer	5	247.5	Summer	7
67.5	Autumn	11	247.5	Autumn	14
67.5	Winter	10	247.5	Winter	11
67.5	Spring	6	247.5	Spring	12
90	Summer	8	270	Summer	6
90	Autumn	12	270	Autumn	10
90	Winter	9	270	Winter	10
90	Spring	6	270	Spring	9
112.5	Summer	8	292.5	Summer	6
112.5	Autumn	14	292.5	Autumn	8
112.5	Winter	9	292.5	Winter	11
112.5	Spring	8	292.5	Spring	8
135	Summer	13	315	Summer	6
135	Autumn	15	315	Autumn	8
135	Winter	12	315	Winter	11
135	Spring	12	315	Spring	6
157.5	Summer	10	337.5	Summer	6
157.5	Autumn	9	337.5	Autumn	7
157.5	Winter	9	337.5	Winter	10
157.5	Spring	9	337.5	Spring	6

Table B3 NEWA Analysed Night time Meteorological Conditions, Griffith Airport AWS NSW					
Direction ± 45°	Season	Night Percentage Occurrence %	Direction	Season	Night Percentage Occurrence %
0	Summer	6	180	Summer	9
0	Autumn	7	180	Autumn	7
0	Winter	9	180	Winter	6
0	Spring	6	180	Spring	7
22.5	Summer	6	202.5	Summer	10
22.5	Autumn	6	202.5	Autumn	7
22.5	Winter	6	202.5	Winter	6
22.5	Spring	5	202.5	Spring	8
45	Summer	7	225	Summer	9
45	Autumn	7	225	Autumn	9
45	Winter	6	225	Winter	9
45	Spring	7	225	Spring	10
67.5	Summer	8	247.5	Summer	7
67.5	Autumn	11	247.5	Autumn	10
67.5	Winter	11	247.5	Winter	11
67.5	Spring	8	247.5	Spring	11
90	Summer	7	270	Summer	7
90	Autumn	11	270	Autumn	12
90	Winter	10	270	Winter	13
90	Spring	8	270	Spring	11
112.5	Summer	9	292.5	Summer	8
112.5	Autumn	11	292.5	Autumn	13
112.5	Winter	11	292.5	Winter	16
112.5	Spring	8	292.5	Spring	11
135	Summer	11	315	Summer	9
135	Autumn	13	315	Autumn	12
135	Winter	12	315	Winter	16
135	Spring	8	315	Spring	10
157.5	Summer	6	337.5	Summer	7
157.5	Autumn	8	337.5	Autumn	11
157.5	Winter	6	337.5	Winter	13
157.5	Spring	5	337.5	Spring	8

Appendix C – Noise Model Contours

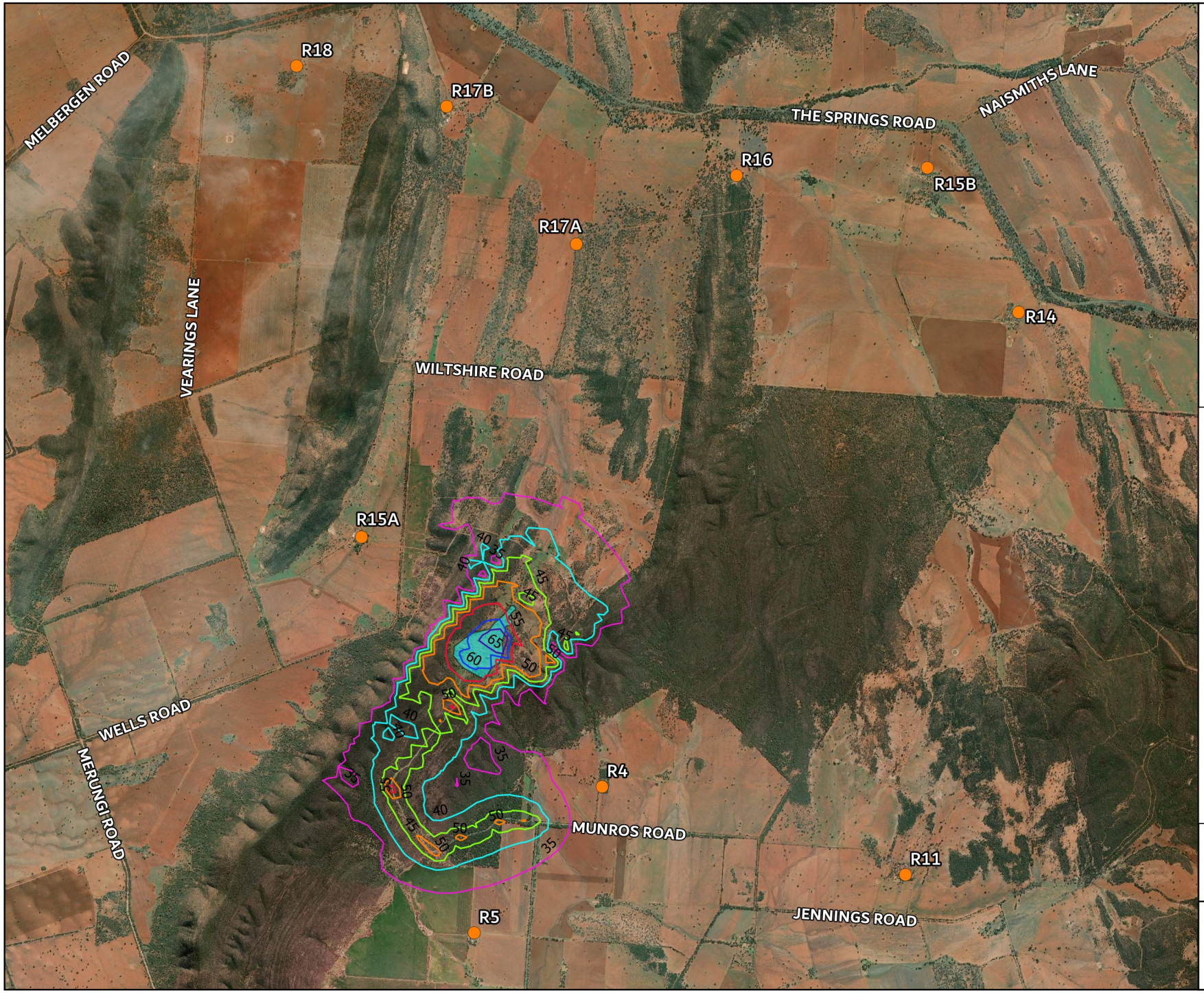

FIGURE C1

LAeq,15min Noise Contours

Scenario 2 - Stage 3

Day Period

MAC191007-04

Western Riverina Quarry

KEY

- Project Site
- Receivers

LAeq,15min Contours

- 35 dB
- 40 dB
- 45 dB
- 50 dB
- 55 dB
- 60 dB
- 65 dB

0 600 1200 1800 2400 3000 m

N

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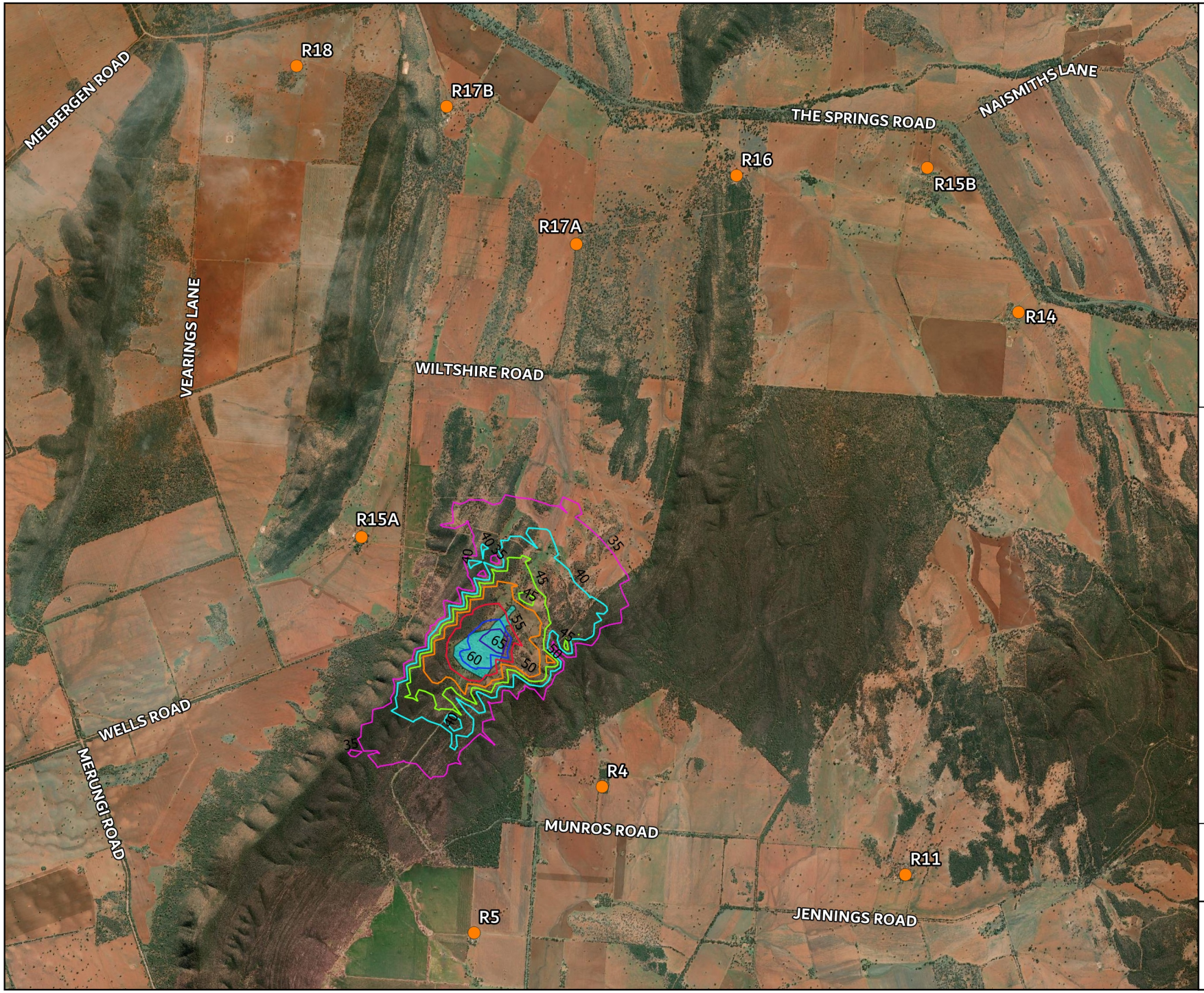

FIGURE C2

LAeq,15min Noise Contours

Scenario 2 - Stage 3

Evening Period

MAC191007-04

Western Riverina Quarry

KEY

- Project Site
- Receivers

LAeq,15min Contours

- 35 dB
- 40 dB
- 45 dB
- 50 dB
- 55 dB
- 60 dB
- 65 dB

0 600 1200 1800 2400 3000 m

N

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Appendix 6

Sediment Basin Storage Requirement Calculations

prepared by

R.W. Corkery & Co. Pty Limited

(Total No. of pages including blank pages = 16)

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1. SEDIMENT BASIN CALCULATIONS

1.1 BASIN TYPE

Based on the sediment type generated in the disturbed catchment, the sediment basin should be designed as a Type D/F (Water Retention) Basin. These are also referred to as 'fill and spill' structures as they are designed to retain all in-flows to allow for settlement of sediment before the water is discharged after the total suspended solids of the water is reduced to criteria level (50mg/L).

1.2 CATCHMENT SIZE

The existing Quarry is managed with four catchment areas (see **Figure A**). The Northern Catchment principally conveys clean runoff to areas beyond the boundary of the Quarry Site. A further three catchments (i.e. the Extraction Area Catchment, Southern Catchment, and Western Catchment) carry dirty water from disturbed areas. The Southern Catchment collects water in an existing sediment basin (SB1) and discharges towards the south. The Extraction Area Catchment collects water locally in a quarry sump and does not discharge to the surrounding environment.

During Stage 1 of the Proposal, historical extraction areas (see **Figure A** and **Figure B**) will be backfilled and profiled for rehabilitation. That rehabilitation will modify the existing catchment areas and convert from four catchments to five catchments. A major dirty water catchment will be created (i.e. the Central Catchment) due to the development of the relocated Processing and Product Stockpiling Area which will require the development of a separate sediment basin i.e. Sediment Basin 2 (SB2) (see **Figure B** to **D**).

1.3 RAINFALL DATA

Volume 2E of the Blue Book identifies that the design rainfall event to be used to figure out the sediment storage and water settlement zones as either:

- 5-day 90th percentile event for standard receiving environments; or
- 5-day 95th percentile for sensitive receiving environments.

A 'sensitive' receiving environment is defined by Volume 2E of the Blue Book as "*one that has a high conservation value, or supports human uses of water that are particularly sensitive to degraded water quality*". At this stage it is assumed that the receiving environment does not fit this definition. Therefore, the design rainfall event to be used to determine storage and settlement criteria is the **5-day 90th percentile event**.

Rainfall data was extracted for the site from SILO (scientific data for landowners) database. The calculated 5-day 90th percentile event from SILO data is **26.3mm**. Similarly, the Blue Book Table 6.3a gives the rainfall depth of a 5-day 90th percentile event for the nearest large town (i.e. Griffith) as **25.4mm**.

1.4 EROSION DATA

1.4.1 RAINFALL EROSIVITY (R-FACTOR)

The rainfall erosivity (R-factor) of a location influences the soil loss (erosion). The Quarry Site has a low R-Factor of 960 which was calculated using the following formula (Landcom, 2004) where S is the 2-year ARI, 6-hour ARI rainfall event (mm) i.e. 5.73mm.

$$R = 164.74(1.1177)^{S} S^{0.6444}$$

1.4.2 ERODIBILITY (K) FACTOR

A conservative K-factor of **0.05** is adopted in line with the recommendations of Volume 2E of the Blue Book.

1.4.3 LENGTH / GRADIENT (LS) FACTOR

The local topography within disturbed area is gentle (~5%), with the length of slopes within each catchment generally between 60m and 80m. There is no need to bench these slopes to change the LS Factor. The slope length, gradients and LS Factors have been calculated for the catchment is as follows:

- Catchment gradient = 5%, length = 80m, LS Factor = 2.05

1.5 SOIL HYDROLOGIC GROUP AND RUNOFF COEFFICIENTS

For cleared catchments, i.e. those without significant vegetation or other cover likely to slow the flow of water and reduce runoff, the runoff coefficient is largely a factor of the permeability and saturation of the soil or surface. *Appendix F* of Landcom (2004) shows four Soil Hydrologic Groups, derived by USDA (1993) through consideration of infiltration and permeability characteristics.

- Group A: very low runoff potential. Water moves into and through these soil materials relatively quickly, when thoroughly wetted. Usually, they consist of deep (>1.0m), well-drained sandy loams, sands, or gravels. They shed runoff only in extreme storm events.
- Group B: low to moderate runoff potential. Water moves into and through these soil materials at a moderate rate when thoroughly wetted. Usually, they consist of moderately deep (>0.5m), well-drained soils with medium, loamy textures or clay loams with moderate structure. They shed runoff only infrequently.
- Group C: moderate to high runoff potential. Water moves into and through these soil materials at slow to moderate rates when thoroughly wetted. Usually, they consist of soils that have:
  - moderately fine (clay loam) to fine (clay) texture;
  - weak to moderate structure; and/or
  - a layer near the surface that impedes free downward movement of water.

  They regularly shed runoff from moderate rainfall events.

- Group D: very high runoff potential. Water moves into and through these soils very slowly when thoroughly wetted. Usually, they consist of soils:
  - that are fine-textured (clay), poorly structured, surface-sealed or have high shrink/swell properties; and/or
  - with a permanent high water table; and/or
  - with a layer near the surface that is impervious.

  They shed runoff from most rainfall events.

Considering the catchments for which sediment basins are needed, the catchments are considered most likely representative of Soil Hydrologic Group B. That is also supported by the data mapped by the Office of Environment and Heritage (OEH) and provided on the SEED portal (The Central Resource for Sharing and Enabling Environmental Data in NSW).

With reference to *Table F2* of the Blue Book, the volumetric runoff coefficient (C_v) for the 5-day 90th percentile rainfall event for the catchments will be 0.25 (~25% of rainfall accumulates as runoff).

1.6 SETTLEMENT AND STORAGE VOLUME REQUIREMENTS

Table A provides the minimum water settlement and sediment storage zone requirements for the sediment basins based on the likely volume of runoff and sediment load under a 5-day 90th percentile rainfall event during different operational stages. The minimum design requirements for the sediment basins will vary throughout the life of the Proposal due to changes in the size of the catchments.

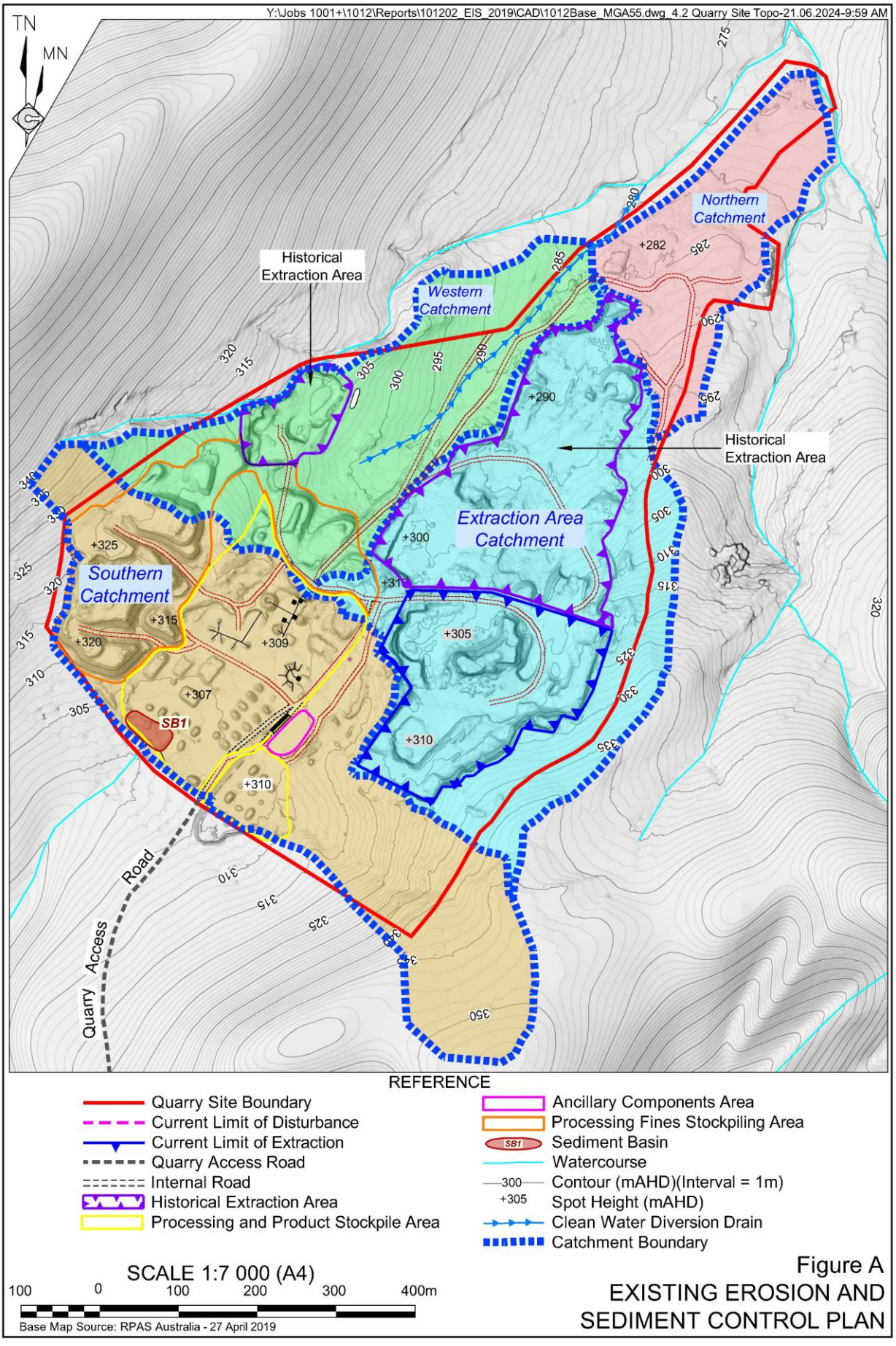
The volumetric requirement of SB1 will be reduced gradually during the life of the Proposal principally reflecting the development of the Extraction Area and the reduction of the disturbance footprint within the Southern Catchment. In Stage 3, SB1 will not be required due to the relocation of the Processing and Product Stockpiling Area and the rehabilitation of disturbed areas within the catchment. After rehabilitation, clean water from the Southern Catchment will diverted towards the existing drainage feature to the south. The volumetric requirement of SB1 will vary between ~723m^3 and ~1408m^3 throughout the life of the Proposal before rehabilitation (**Table A**).

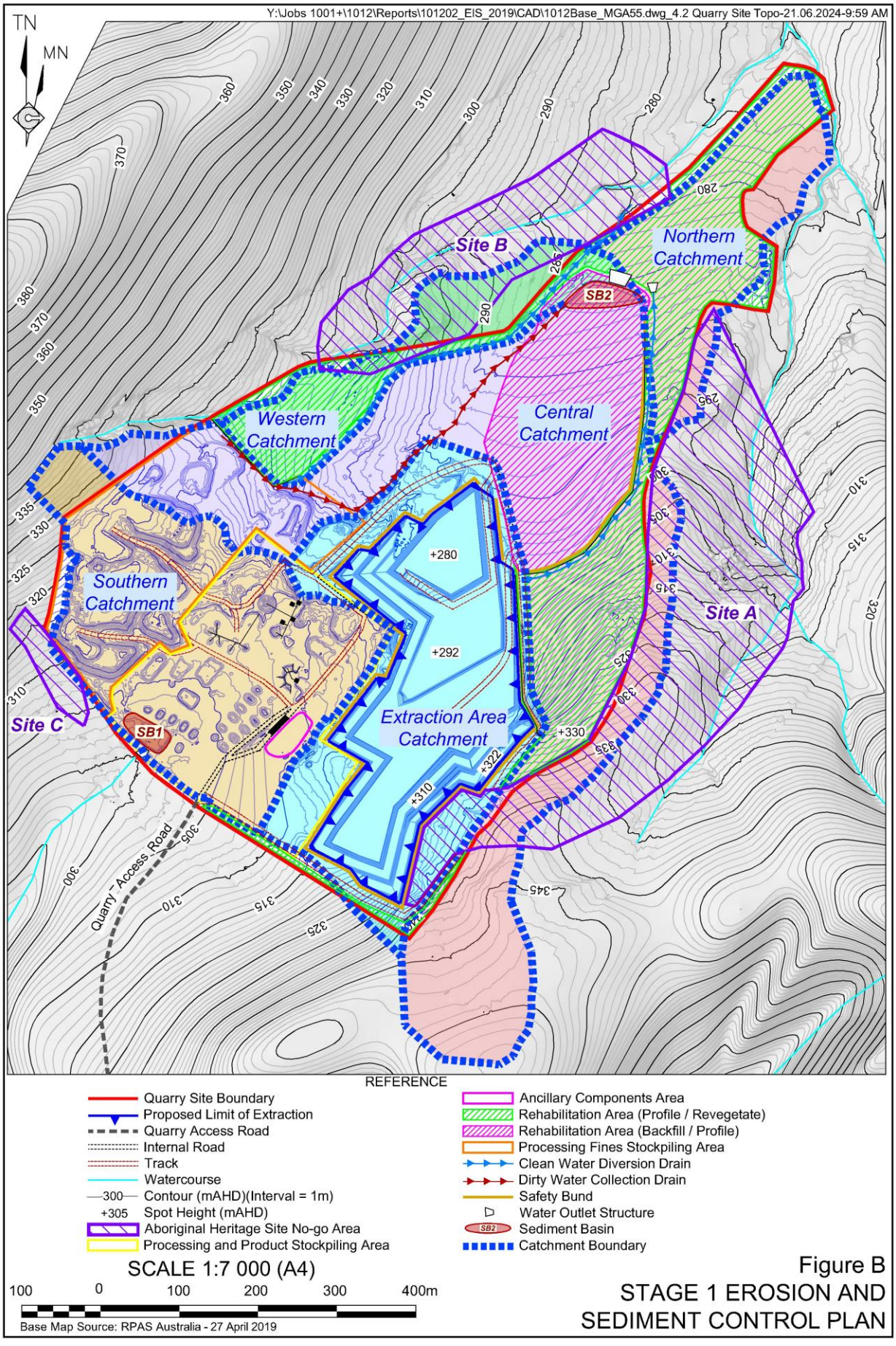
SB2 will be constructed to cater for the dirty water diverted from the Central Catchment prior to the progression of disturbance in this area (**Figures A** to **D**).

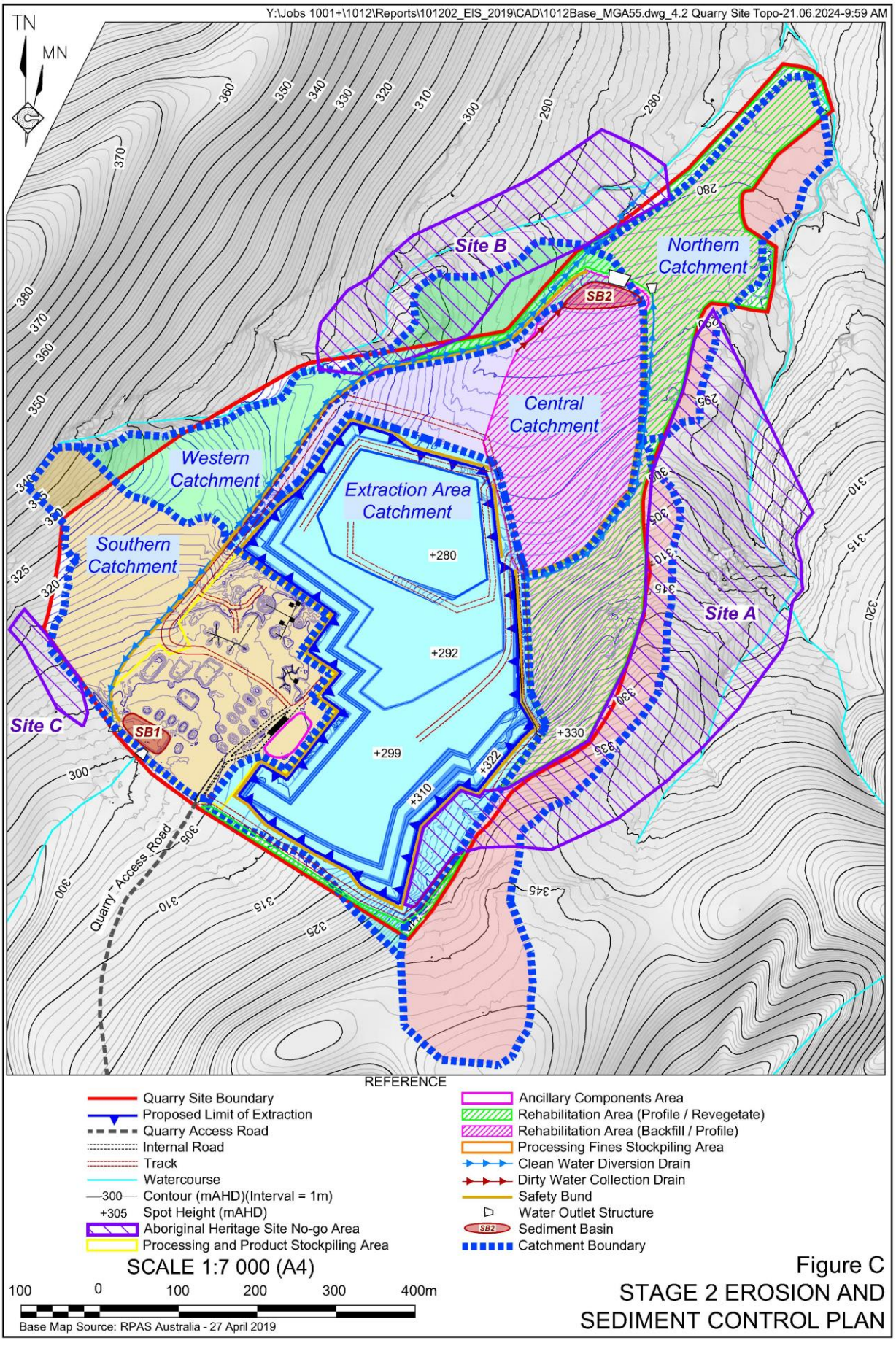
Table A
Settlement and Storage Volume Requirements

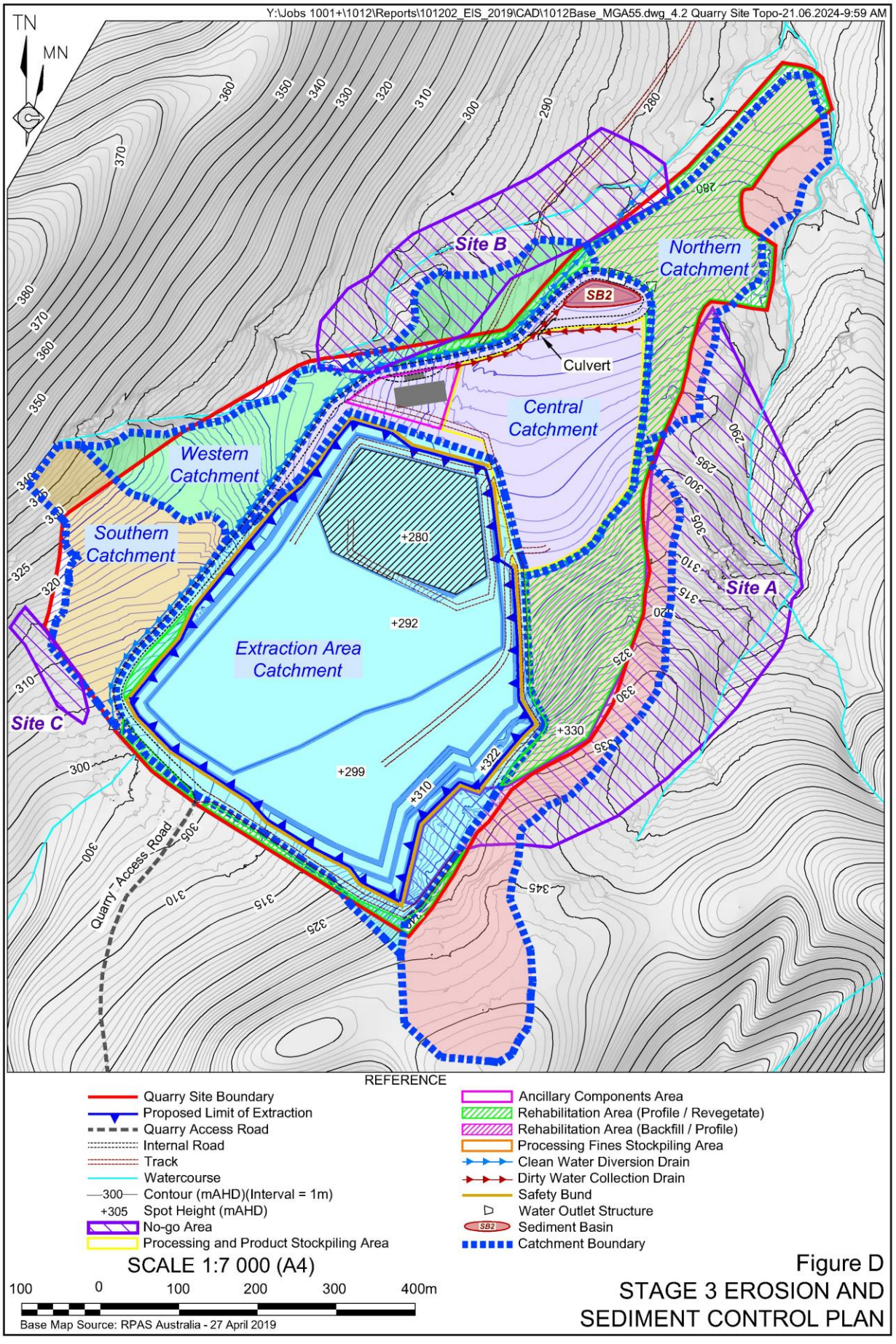
Basin	Sediment Basin 1			Sediment Basin 2		
	Water Settlement Zone (m^3)	Sediment Storage Zone (m^3)	Total (m^3)	Water Settlement Zone (m^3)	Sediment Storage Zone (m^3)	Total (m^3)
Sediment Basins – Existing	1230	178	1408	-	-	-
Sediment Basins – Stage 1	750	108	858	700	84	784
Sediment Basins – Stage 2	632	91	723	498	60	558
Sediment Basins – Stage 3				498	72	570

The worksheet used estimate these minimum capacities is provided as **Attachment 1**.


Y:\Jobs 1001+\1012\Reports\101202_EIS_2019\CAD\1012Base_MGA55.dwg_4.2 Quarry Site Topo-21.06.2024-9:59 AM
TN
MN
Historical Extraction Area
Western Catchment
Northern Catchment
Historical Extraction Area
Extraction Area Catchment
Southern Catchment
SB1
Road
Access
Quarry
REFERENCE
Quarry Site Boundary
Current Limit of Disturbance
Current Limit of Extraction
Quarry Access Road
Internal Road
Historical Extraction Area
Processing and Product Stockpile Area
Ancillary Components Area
Processing Fines Stockpiling Area
Sediment Basin
Watercourse
Contour (mAHD)(Interval = 1m)
Spot Height (mAHD)
Clean Water Diversion Drain
Catchment Boundary
SCALE 1:7 000 (A4)
100 0 100 200 300 400m
Base Map Source: RPAS Australia - 27 April 2019
Figure A
EXISTING EROSION AND SEDIMENT CONTROL PLAN


Y:\Jobs 1001+\1012\Reports\101202_EIS_2019\CAD\1012Base_MGA55.dwg_4.2 Quarry Site Topo-21.06.2024-9:59 AM
TN
MN
Site B
Northern Catchment
SB2
Western Catchment
Central Catchment
Southern Catchment
Site A
Site C
SB1
Extraction Area Catchment
+280
+292
+330
+322
+310
Quarry Access Road
REFERENCE
Quarry Site Boundary
Proposed Limit of Extraction
Quarry Access Road
Internal Road
Track
Watercourse
300 Contour (mAHD)(Interval = 1m)
+305 Spot Height (mAHD)
Aboriginal Heritage Site No-go Area
Processing and Product Stockpiling Area
Ancillary Components Area
Rehabilitation Area (Profile / Revegetate)
Rehabilitation Area (Backfill / Profile)
Processing Fines Stockpiling Area
Clean Water Diversion Drain
Dirty Water Collection Drain
Safety Bund
Water Outlet Structure
SB2 Sediment Basin
Catchment Boundary
SCALE 1:7 000 (A4)
100 0 100 200 300 400m
Base Map Source: RPAS Australia - 27 April 2019
Figure B
STAGE 1 EROSION AND SEDIMENT CONTROL PLAN


Y:\Jobs 1001+\1012\Reports\101202_EIS_2019\CAD\1012Base_MGA55.dwg_4.2 Quarry Site Topo-21.06.2024-9:59 AM
TN
MN
Site B
Northern Catchment
SB2
Central Catchment
Western Catchment
Extraction Area Catchment
Southern Catchment
Site A
Site C
SB1
+280
+292
+299
+310
+322
+330
Quarry Access Road
REFERENCE
Quarry Site Boundary
Proposed Limit of Extraction
Quarry Access Road
Internal Road
Track
Watercourse
300 Contour (mAHD)(Interval = 1m)
+305 Spot Height (mAHD)
Aboriginal Heritage Site No-go Area
Processing and Product Stockpiling Area
Ancillary Components Area
Rehabilitation Area (Profile / Revegetate)
Rehabilitation Area (Backfill / Profile)
Processing Fines Stockpiling Area
Clean Water Diversion Drain
Dirty Water Collection Drain
Safety Bund
Water Outlet Structure
SB2 Sediment Basin
Catchment Boundary
SCALE 1:7 000 (A4)
100 0 100 200 300 400m
Base Map Source: RPAS Australia - 27 April 2019
Figure C
STAGE 2 EROSION AND SEDIMENT CONTROL PLAN


Y:\Jobs 1001+\1012\Reports\101202_EIS_2019\CAD\1012Base_MGA55.dwg_4.2 Quarry Site Topo-21.06.2024-9:59 AM
TN
MN
Site B
Northern Catchment
SB2
Culvert
Central Catchment
Western Catchment
Southern Catchment
Extraction Area Catchment
Site A
Site C
Quarry Access Road
+280
+292
+299
+310
+322
+330
REFERENCE
Quarry Site Boundary
Proposed Limit of Extraction
Quarry Access Road
Internal Road
Track
Watercourse
300 Contour (mAHD)(Interval = 1m)
+305 Spot Height (mAHD)
No-go Area
Processing and Product Stockpiling Area
Ancillary Components Area
Rehabilitation Area (Profile / Revegetate)
Rehabilitation Area (Backfill / Profile)
Processing Fines Stockpiling Area
Clean Water Diversion Drain
Dirty Water Collection Drain
Safety Bund
Water Outlet Structure
SB2 Sediment Basin
Catchment Boundary
SCALE 1:7 000 (A4)
100 0 100 200 300 400m
Base Map Source: RPAS Australia - 27 April 2019
Figure D
STAGE 3 EROSION AND SEDIMENT CONTROL PLAN

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Attachment 1

Erosion Hazard and Sediment Basin Calculations

(Total No. of pages including blank pages = 8)

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1. Erosion Hazard and Sediment Basins

Site Name: Western Riverina Quarry

Site Location:

Precinct/Stage: Existing

Other Details:

Site area	Sub-catchment or Name of Structure						Notes
	SB1						
Total catchment area (ha)	18.71						
Disturbed catchment area (ha)	18.71						

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	F	F					From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	F	F					Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5						See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	90						
x-day, y-percentile rainfall event (mm)	26.3						
Rainfall R-factor (if known)							Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	5.73						

RUSLE Factors

Rainfall erosivity (*R*-factor)	960						Auto-filled from above
Soil erodibility (*K*-factor)	0.05						
Slope length (m)	80						
Slope gradient (%)	5						RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS*-factor)	1.19						
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2						Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.25						See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	74						
Soil Loss Class	1						See Table 4.2, page 4-13
Soil loss (m^3/ha/yr)	57						Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)	178						See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)	1230						See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)	1408						

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

1. Erosion Hazard and Sediment Basins

Site Name: Western Riverina Quarry

Site Location:

Precinct/Stage: Stage 1

Other Details:

Site area	Sub-catchment or Name of Structure						Notes
	SB1	SB2					
Total catchment area (ha)	11.41	10.65					
Disturbed catchment area (ha)	11.41	10.65					

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	F	F					From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	F	F					Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5	5					See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	90	90					
x-day, y-percentile rainfall event (mm)	26.3	26.3					
Rainfall R-factor (if known)							Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	5.73	5.73					

RUSLE Factors

Rainfall erosivity (*R*-factor)	960	960					Auto-filled from above
Soil erodibility (*K*-factor)	0.05	0.05					
Slope length (m)	80	80					
Slope gradient (%)	5	4.27					RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS*-factor)	1.19	0.99					
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2	2					Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.25	0.25					See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	74	62					
Soil Loss Class	1	1					See Table 4.2, page 4-13
Soil loss (m^3/ha/yr)	57	47					Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)	108	84					See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)	750	700					See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)	858	784					

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

1. Erosion Hazard and Sediment Basins

Site Name: Western Riverina Quarry

Site Location:

Precinct/Stage: Stage 2

Other Details:

Site area	Sub-catchment or Name of Structure						Notes
	SB1	SB2					
Total catchment area (ha)	9.605	7.578					
Disturbed catchment area (ha)	9.605	7.578					

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	F	F					From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	F	F					Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5	5					See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	90	90					
x-day, y-percentile rainfall event (mm)	26.3	26.3					
Rainfall R-factor (if known)							Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	5.73	5.73					

RUSLE Factors

Rainfall erosivity (*R*-factor)	960	960					Auto-filled from above
Soil erodibility (*K*-factor)	0.05	0.05					RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	80	80					
Slope gradient (%)	5	4.27					
Length/gradient (*LS*-factor)	1.19	0.99					
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2	2					Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.25	0.25					See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	74	62					
Soil Loss Class	1	1					See Table 4.2, page 4-13
Soil loss (m^3/ha/yr)	57	47					Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)	91	60					See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)	632	498					See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)	723	558					

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

1. Erosion Hazard and Sediment Basins

Site Name: Western Riverina Quarry

Site Location:

Precinct/Stage: Stage 3

Other Details:

Site area	Sub-catchment or Name of Structure						Notes
	SB2						
Total catchment area (ha)	7.571						
Disturbed catchment area (ha)	7.571						

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	F						From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	F						Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5						See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	90						
x-day, y-percentile rainfall event (mm)	26.3						
Rainfall R-factor (if known)							Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	5.73						

RUSLE Factors

Rainfall erosivity (*R*-factor)	960						Auto-filled from above
Soil erodibility (*K*-factor)	0.05						
Slope length (m)	80						
Slope gradient (%)	5						RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS*-factor)	1.19						
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2						Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.25						See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	74						
Soil Loss Class	1						See Table 4.2, page 4-13
Soil loss (m^3/ha/yr)	57						Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)	72						See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)	498						See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)	570						

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

Appendix 7

Biodiversity Development Assessment Report

prepared by

OzArk Environment and Heritage Management Pty Ltd

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View of the subject land.

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Western Riverina Quarry

CARRATHOOL SHIRE COUNCIL LOCAL GOVERNMENT AREA

June 2024

Report prepared by

OzArk Environment & Heritage

for R.W. Corkery & Co Pty Limited

on behalf of Rockwoods Investment Group Pty Ltd.

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Acknowledgement

OzArk acknowledge Traditional Owners of the area to which this report applies 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.

Document Control

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Client	R. W. Corkery & Co Pty Limited		
Purchase order number			
Document description	Biodiversity Development Assessment Report (BDAR)		
	Name	Signed	Date
Clients reviewing officer			
Clients representative managing this document	OzArk representatives managing this document		
Caiden O'Connor (CO)	Dr Crystal Graham (CG)		
Location	OzArk job number		
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Enquiries would be addressed to OzArk Environment & Heritage.

CERTIFICATION

I certify that I have prepared the contents of this BDAR and, to the best of my knowledge, it is in accordance with the *NSW Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method 2020 (BAM). The information it contains is neither false nor misleading. It addresses, to the fullest extent possible, all matters affecting or likely to affect biodiversity as a result of the proposed activity. This BDAR has been reviewed and advised by a BAM Accredited Assessor.

BDAR prepared by	**Madeline Walsh**
Signed	
Date	12/12/2021
Organisation	OzArk Environment & Heritage
Position	Ecologist
Qualification	Bachelor of Environmental Biology (Hons)
Accreditation number	BAAS21010

I certify that I have reviewed and updated the contents of this BDAR and, to the best of my knowledge, it is in accordance with the *NSW Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method 2020 (BAM 2020). The information it contains is neither false nor misleading. It addresses, to the fullest extent possible, all matters affecting or likely to affect biodiversity as a result of the proposed activity. This BDAR has been reviewed and advised by a BAM Accredited Assessor.

BDAR reviewed and updated by	**Dr David Orchard**	**Dr Crystal Graham**
Signed		
Date	20/06/2024	20/06/2024
Organisation	OzArk Environment & Heritage	OzArk Environment & Heritage
Position	Ecologist	Senior Ecologist
Qualification	PhD (Biology)	PhD (Biology)
Accreditation number	BAAS21028	BAAS22024

Executive Summary

Rockwoods Investment Group Pty Ltd. (the proponent) proposes to extend an existing quarry within Lot 1 DP 821515, approximately 55.5 kilometres (km) north of Griffith, and 17 km northwest of Rankins Springs, within the Carrathool Local Government Area. OzArk Environment & Heritage (OzArk) was engaged by R. W Corkery & Co Pty Ltd. (RWC), on behalf of the proponent, to prepare the biodiversity assessment for the proposal.

The proposal will clear up to 4.23 ha of native vegetation to extend quarry operations, which includes an extraction area, processing and product stockpiling area, ancillary components area and operational disturbance area.

As the proposal will clear more than 1 ha of native vegetation, a Biodiversity Development Assessment Report (BDAR) is required to assess the impacts of the proposal on biodiversity and the proponent's offset obligations under the NSW Biodiversity Offsets Scheme (BOS).

The native vegetation consists of four Plant Community Types (PCTs):

- PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt.
- PCT 72 - White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion.
- PCT 185 - Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion.
- PCT 186 - Dwyer's Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion.

PCT 186 is associated with the following Threatened Ecological Community (TEC):

- *Biodiversity Conservation Act* 2016 (BC Act)-listed, Endangered Ecological Community (EEC), Mallee and Mallee-Broombush dominated woodland and shrubland, lacking *Triodia*, in the NSW South Western Slopes Bioregion.

Based on the results of the field survey, the occurrence of this PCT within the subject land did not meet the composition criteria to be considered an example of this TEC. Therefore, no TECs occur within the subject land.

In total, 29 Ecosystem Credit Species were generated by the Biodiversity Assessment Method Calculator (BAM-C). Three species were removed from the list due to habitat constraints, two species was detected on site, and 24 further species are assumed present on the subject land, generating a total of 62 Ecosystem Credits. In addition, 17 Species Credit Species were generated by the BAM-C. Of these, six species were removed due to habitat constraints. The remaining species were surveyed for following relevant and approved BAM survey methodologies; these species were not detected on the subject land. However, three candidate flora species were not able to be fully surveyed across the entire subject land as a small area (0.12 ha) of PCT 70_poor had already been disturbed prior to targeted surveys being conducted.

As such, presence has been assumed for these three flora species in this area generating a total of six Species Credits.

Offsetting is required for 62 Ecosystem Credits and six (6) Species Credits. The proponent intends to satisfy their Ecosystem and Species Credit obligations by buying and retiring the necessary credits from the open market or by paying directly into the Biodiversity Conservation Fund.

The significance of the proposed impact to *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act)-listed entities predicted to occur within a 10 km search area was assessed. No significant impact to a wetland, TEC, threatened, migratory, or marine species is expected as a result of this proposal. The residual ecological impacts of the proposal would be adequately mitigated using the management actions recommended. Therefore, a referral of the proposal to the Federal Department of Climate Change, Energy the Environment and Water for these matters is not required.

This assessment covers the current form of the proposal, any change to the scope of work may require re-assessment.

Table of Contents

Executive Summary ..... **iv**

Table of Contents ..... **vi**

List of Tables ..... **ix**

1 Introduction **11**

1.1 Background 11

1.2 Proposed development 12

1.3 Relevant Terms 16

1.4 Site Identification 16

1.5 Regulatory Context 16

1.6 Purpose 20

2 Legislation **21**

2.1 International Legislation 21

2.2 Commonwealth Legislation 21

2.3 NSW Legislation 21

2.3.1 Environmental Planning and Assessment Act 1979 (EP&A Act) 21

2.3.2 Biodiversity Conservation Act 2016 (BC Act) 21

2.3.3 Biodiversity Conservation Regulation 2017 (BCR) 21

2.3.4 Biosecurity Act 2015 21

2.3.5 Fisheries Management Act 1994 (FM Act) 22

2.3.6 Water Management Act 2000 (WM Act) 22

2.3.7 State Environmental Planning Policy (Biodiversity and Conservation) 2021 23

3 Methodology **24**

3.1 Personnel 24

3.2 Desktop Review 26

3.3 Field survey 27

3.3.1 BAM Survey Methodology 27

3.3.2 Incidental Fauna Sightings 28

3.3.3 Targeted Surveys for Threatened Species Credit Species 29
3.3.4 Survey Limitations 35
4 Landscape Features 36
4.1 Bioregions and NSW Landscapes 36
4.2 Watercourses and Key Fish Habitat 37
4.3 Wetlands 37
4.4 Groundwater Dependent Ecosystems 38
4.5 Karst, Caves, Crevices, Cliffs and Areas of Geological Significance 40
4.6 Areas of Outstanding Biodiversity Value 40
4.7 State Environmental Planning Policy (SEPP) - Koala Habitat Protection 40
4.8 Native Vegetation Cover 40
4.9 Landscape Connectivity 40
4.10 Climate 41
5 Native vegetation 43
5.1 Plant Community Types 43
5.2 Vegetation Zones, Patch Size and Vegetation Integrity 52
5.3 Threatened Ecological Communities 57
5.4 Weeds 57
6 Threatened species 58
6.1 Ecosystem Credit Species 58
6.2 Species Credit Species 60
6.2.1 Species Credit Species Targeted Survey Results 62
7 Impact Summary 64
7.1 Offset Scheme Threshold 64
7.2 Avoidance, Minimisation and Mitigation 64
7.3 Impacts to Wetlands, Watercourses and Aquatic habitat 67
7.4 Impacts to Native Vegetation 67
7.5 Serious and Irreversible Impacts 67
7.6 Prescribed Impacts 67

7.7 Indirect Impacts 71
7.8 Matters of National Environmental Significance 73
8 Biodiversity Credit and Offset Report 74
8.1 Management Zones 74
8.2 Vegetation Integrity Assessment 74
8.3 Ecosystem Credit Summary 75
8.4 Species Credit Summary 77
8.5 Offset Requirement 77
9 Summary and conclusions 78
10 References 80
Appendix A: Database Search Results 85
Appendix B: Vegetation Plot Locations and Photographs 109
Appendix C: Field Survey Results 122
Appendix D: BAM Calculator Credit Report 151
Appendix E: Habitat Suitability Assessment 155
Appendix F: EPBC Act Habitat Assessment and Matters of National Environmental Significance 178
Appendix G: EPBC Act Tests of Significance 194
Appendix H: Terms and Abbreviations 203
Appendix I: State Vegetation Type Map C1.1.M1.1 207
Appendix J: Coverage of SEARs and Other Government Agency Requirements Relevant to this BDAR 208

List of Tables

Table 1-1. Clearing thresholds for entry into the Biodiversity Offsets Scheme (BOS) 17

Table 3-1. Summary of OzArk personnel qualifications. 25

Table 3-2. Minimum number of plots and transects required per zone area (NSW Department of Planning, Industry and Environment, 2020). 28

Table 3-3. Prescribed and actual survey timing for threatened species. 29

Table 3-4. Summary of targeted survey effort for threatened fauna species. 32

Table 4-1. Description of the Lachlan Plains Subregion (NSW National Parks and Wildlife Service, 2003). 36

Table 4-2. NSW Landscapes of the study area (Mitchell, 2002). 36

Table 4-3. Native vegetation cover estimate in the study area. 40

Table 5-1. Determination of Plant Community Types Present on the Subject Land. 45

Table 5-2. Extent of native vegetation on the subject land. 52

Table 5-3. Vegetation Zones and Patch Size of Native Vegetation on the Subject Land. 54

Table 6-1. Ecosystem credit species predicted to occur and their nature of presence within the subject land. 59

Table 6-2. Species credit species predicted to occur and their nature of presence within the subject land. 61

Table 7-1. Area clearing thresholds for entry into the Biodiversity Offset Scheme. 64

Table 7-2. Recommended environmental safeguards. 66

Table 7-3. Potential prescribed impacts of the proposal. 68

Table 7-4. Potential indirect impacts of the proposal 72

Table 7-5. Impacts to Matters of National Environmental Significance. 73

Table 8-1. Vegetation Integrity (VI) assessment. 75

Table 8-2. Ecosystem Credits Required to be retired – like for like. 76

Table 8-3. Species credits required to be retired – like for like. 77

List of Figures

Figure 1-1. Map showing the location of the proposal. 12

Figure 1-2. Proposed final site layout. 15

Figure 1-3. Site Map of the Proposal and Subject Land. 18

Figure 1-4. Location Map of the Subject Land Within the Study Area. 19

Figure 3-1. Location of large hollows (>20 cm diameter) within 100 m of subject land. 33

Figure 3-2. Targeted Survey Effort for Candidate Species. 34

Figure 4-1. Groundwater Dependent Ecosystems and Watercourses within the Study Area. ... 39

Figure 4-2. Rainfall data for nearby Weethalle, NSW showing mean monthly rainfall over the past 91 years, and total monthly rainfall in 2019 (Bureau of Meteorology, 2021). 42

Figure 4-3. Temperature data for nearby Griffith, showing mean minimum and maximum monthly temperatures over the past 51 years (Bureau of Meteorology, 2021). 42

Figure 5-1. Vegetation Zones on the Subject Land and Locations of BAM Plots. 44

Figure 5-2. Original subject land boundary and vegetation mapping prior to footprint reduction. 55

Figure 5-3. Intact Native Vegetation Patch. 56

Figure 6-1. Species polygon for all species assumed present. 63

Figure 7-1. Prescribed impacts from the proposal. 70

1 Introduction

1.1 Background

OzArk Environment & Heritage (OzArk) has been engaged by R.W. Corkery (the client), on behalf of Rockwoods Investment Group Pty Ltd. (the proponent) to complete a Biodiversity Development Assessment Report (BDAR) for the proposed extension of operations at the Western Riverina Quarry (WRQ, the proposal). The proposal is located on Lot 1 DP821515 near Wiltshire Road, approximately 55.5 kilometres (km) north of Griffith, and 17 km northwest of Rankins Springs, within the Carrathool Local Government Area (LGA; **Figure 1-1**). The development footprint (subject land) abuts the Lachlan Range State Forest at its southwestern limit and is c. 14.7 km from Jimberoo National Park, the nearest conservation reserve (**Figure 1-1**).

The minimum lot size associated with the proposal is 40 ha, therefore the clearing threshold for this proposal is 1 ha. Since the proposal will require the clearing of 4.23 ha of native vegetation it triggers entry into the NSW Biodiversity Offsets Scheme (BOS), therefore, a BDAR is required under the NSW *Biodiversity Conservation Act* 2016 (BC Act). This report documents the assessment, which has been completed in accordance with the Biodiversity Assessment Method 2020 (BAM) and details the proponent's biodiversity offset requirement (number of ecosystem and species credits).

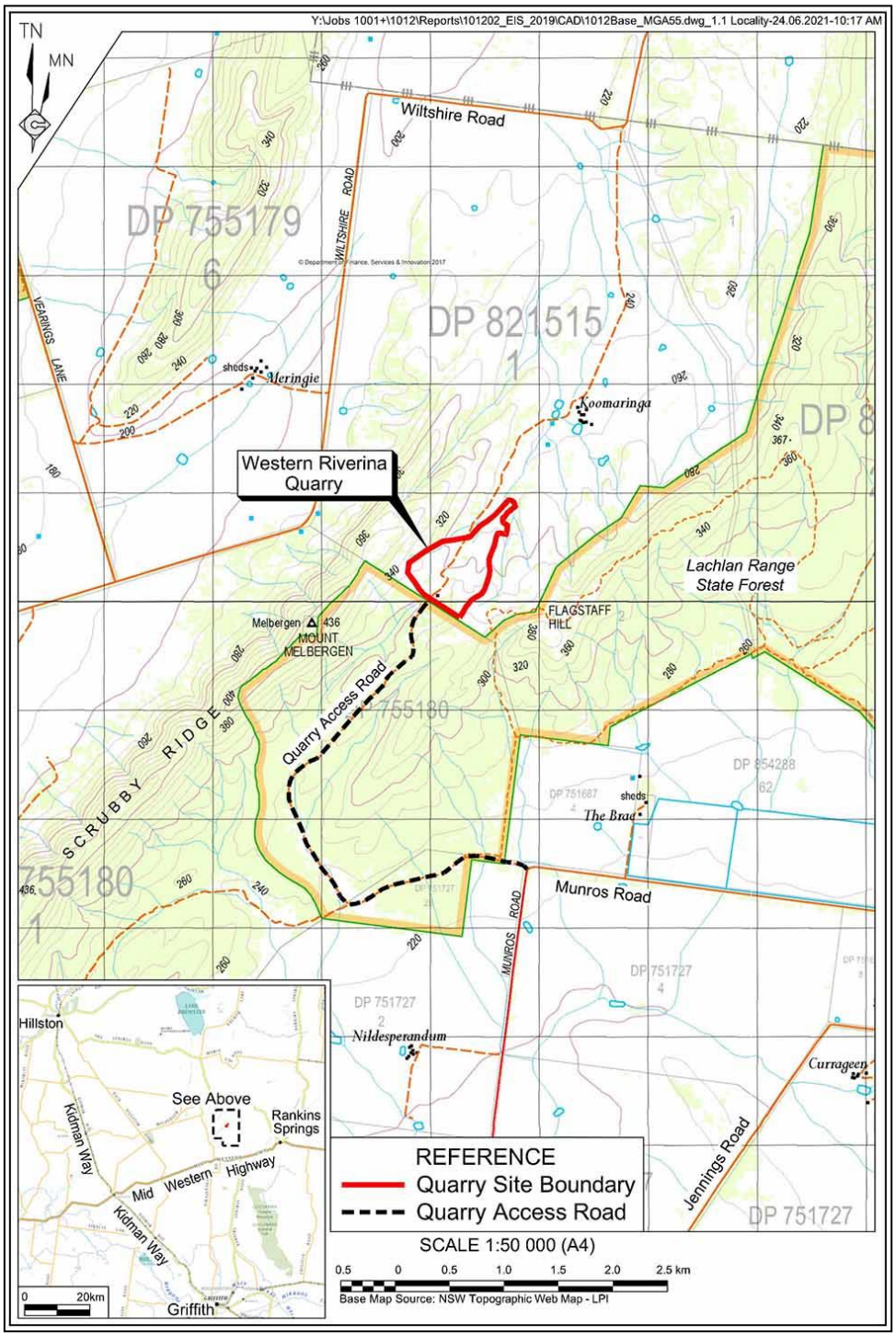

Figure 1-1. Map showing the location of the proposal.

1.2 Proposed development

WRQ currently has consent to extract 5,000 metres cubed (m^3), approximately 13,000 tonnes (t) of basalt per year although it is noted that annual production has exceeded this limit in recent years. Basalt material is extracted from the extraction area using drill and blast techniques with approximately six blasts undertaken per year. The fragmented basalt is loaded and hauled to a fixed crushing and screening plant for processing prior to stockpiling

and product despatch. It is noted that some aggregates are pre-coated within the processing area prior to despatch.

Rockwoods Investment Group Pty Ltd. has identified a further 4.9 million tonnes of resource adjacent to and beneath the current approved extraction area which they propose to extract (the proposal). The activities for which the proponent is seeking development consent would involve the following:

- Extraction of basalt and quartzite from within the proposed extraction area to produce up to 250,000 tpa of Quarry products.
- Importation of up to 1,500 tpa of concrete washout and other construction materials for recycling and incorporation in products produced within the Quarry.
- Crushing and screening of fragmented rock and imported materials on site using a fixed processing plant.
- Pre-coating of up to 20,000 tpa of aggregates.
- Transportation of up to 250,000 tpa Quarry products to end points of use within the Carrathool LGA and the broader Riverina Region.
- Ongoing employment of local personnel.
- Progressive and final rehabilitation of the Quarry to develop a final landform suitable for grazing and passive biodiversity conservation.

Figure 1-2 shows the proposed work and impact footprint, which includes the following existing and proposed components within WRQ:

- Extraction Area: the extraction area would be centred on the targeted hard rock resource
- Processing and Product Stockpiling Area: this area would include the fixed processing and screening plant, pre-coat plant, pugmill and dedicated areas for stockpiling Quarry products and imported material.
- Ancillary Components Area: this area would be located to the west of the processing and product stockpiling area and would comprise the Quarry office, amenities, light vehicle parking, weighbridge, and workshop.
- “No-go” Area: Designated “no-go” areas would be retained within the northern and southeastern extents of the Quarry Site to preserve Aboriginal heritage sites. The areas would be clearly marked to prevent inadvertent access.
- Rehabilitation Areas: designated areas would be progressively rehabilitated throughout the life of the proposal
- Operational Disturbance Area (35.52 ha – inclusive of all Quarry components and associated areas of disturbance): areas would be cleared of vegetation around the extraction area and other Quarry components to allow for the construction of safety bunds, internal roads / tracks and erosion and sediment control infrastructure.

- Quarry Access Road (5.2 km): the existing Quarry Access Road, which extends from Munros Road to the Quarry Site, would be retained to provide ongoing access to the Quarry Site for both heavy and light vehicles.

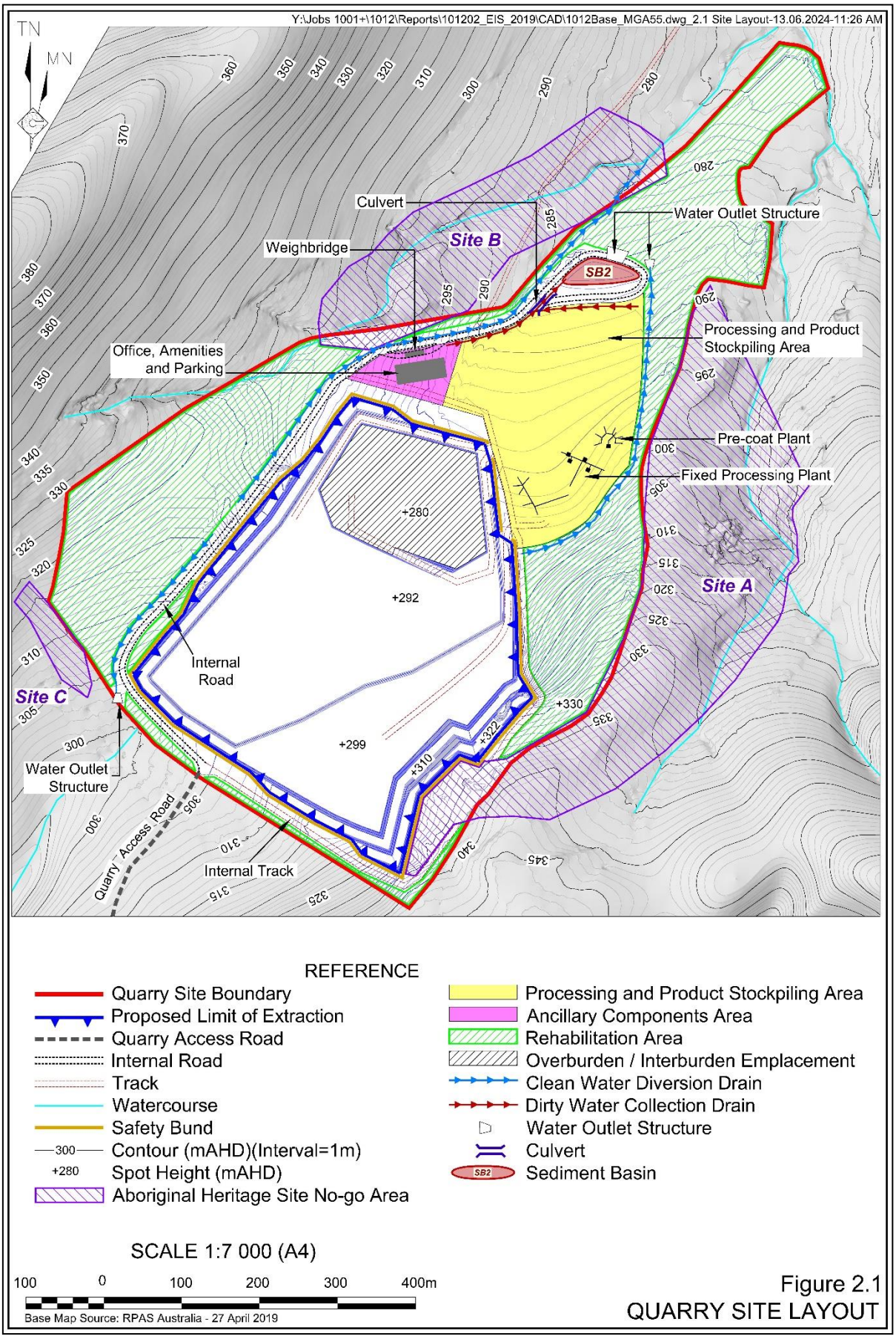

Figure 1-2. Proposed final site layout.

1.3 Relevant Terms

Three terms are used within the report to contextualise the proposal's location:

Subject land – The subject land includes the area directly affected by the proposal. The subject land is shown on **Figure 1-1** to **Figure 1-3**.

Study area (1500 m buffer) – To contextualise the landscape of the subject land, a 1500 m buffer has been applied to the subject land. Referred to as the study area throughout this report, it has been used to determine aspects of the site such as habitat connectivity and the predicted Plant Community Types (PCTs). The study area is shown on **Figure 1-4**.

10 km search area – The area within 10 km of the subject land. The 10 km search area has been used to carry out database searches to determine known records of threatened species or those predicted to occur within the study area and development site.

1.4 Site Identification

The site is identified under the Carrathool Shire Council Local Environment Plan 2013 (Carrathool Shire Council LEP) and on the NSW Planning Portal as follows.

- **Lot/Section/Plan No:** Lot 1/-/DP821515
- **Land Zoning:** RU1 Primary Production
- **Minimum Lot Size:** 40 ha
- **Terrestrial Biodiversity:** Biodiversity Value (Carrathool Shire Council LEP)

The location of the proposal is shown on the site map (**Figure 1-3**) and the location map (**Figure 1-4**).

1.5 Regulatory Context

The Proposal does not constitute a State Significant Development (SSD) and consequently entry into the BOS is not automatic. It has been determined that the BOS applies to this proposal as the clearing of 4.23 ha of native vegetation would exceed the clearing threshold for the relevant lot (**Table 1-1**).

The subject land was identified as occurring on bushfire prone land, according to mapping provided by the NSW Rural Fire Service, and as such, under Section 4.15 of the EP&A Act, the proponent will be required to address the relevant bushfire protection requirements of the Rural Fire Service Document *Planning for Bush Fire Protection*. It is assumed that all required asset protection zones are included in the assessed impact footprint.

Table 1-1. Clearing thresholds for entry into the Biodiversity Offsets Scheme (BOS)

Minimum lot size associated with the property	Clearing threshold, beyond which the BAM applies
<1 ha	0.25 ha or more
1 ha to <40 ha	0.50 ha or more
40 ha to <1000 ha	**1.00 ha or more**
1000 ha or more	2.00 ha or more

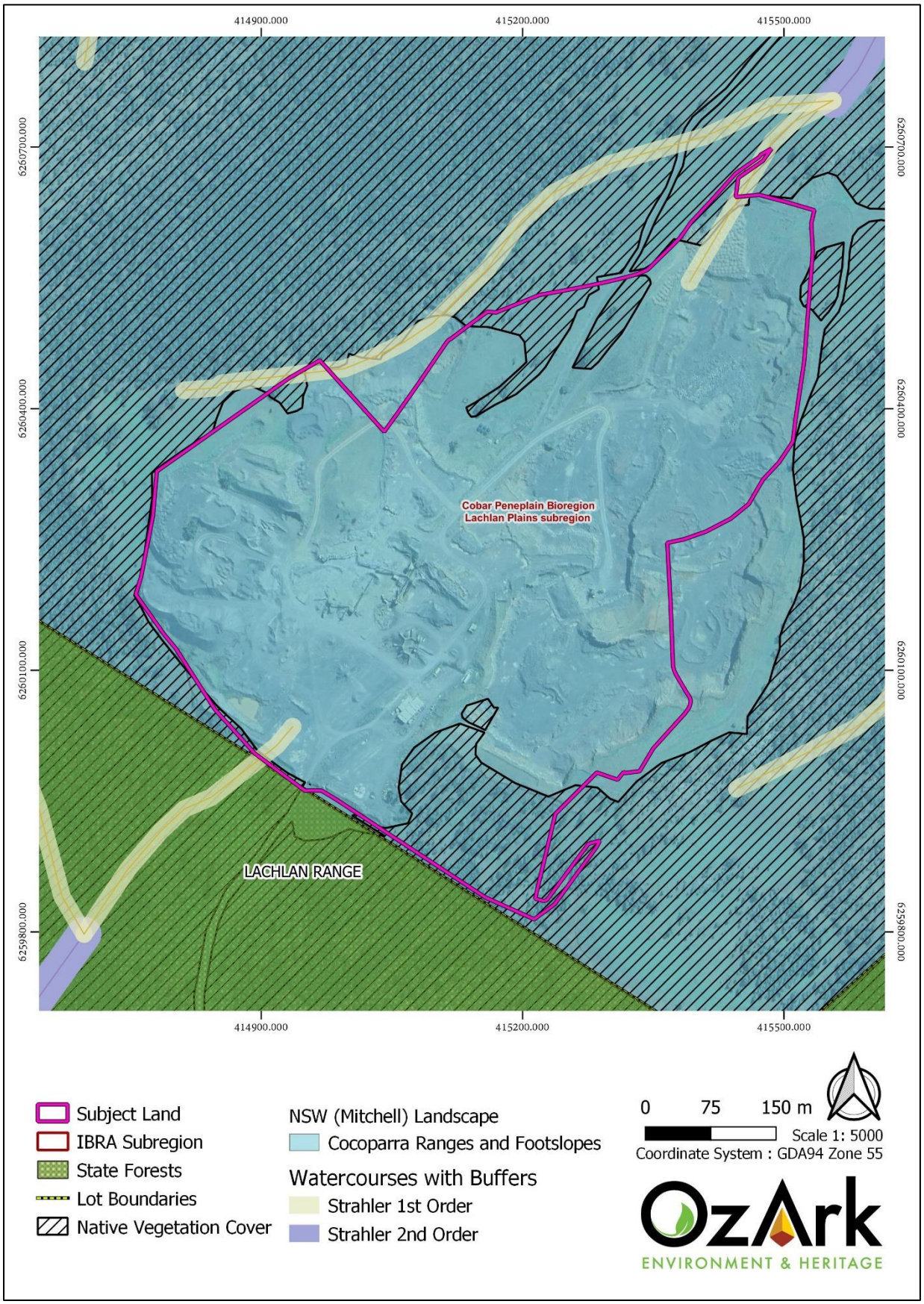

Figure 1-3. Site Map of the Proposal and Subject Land.

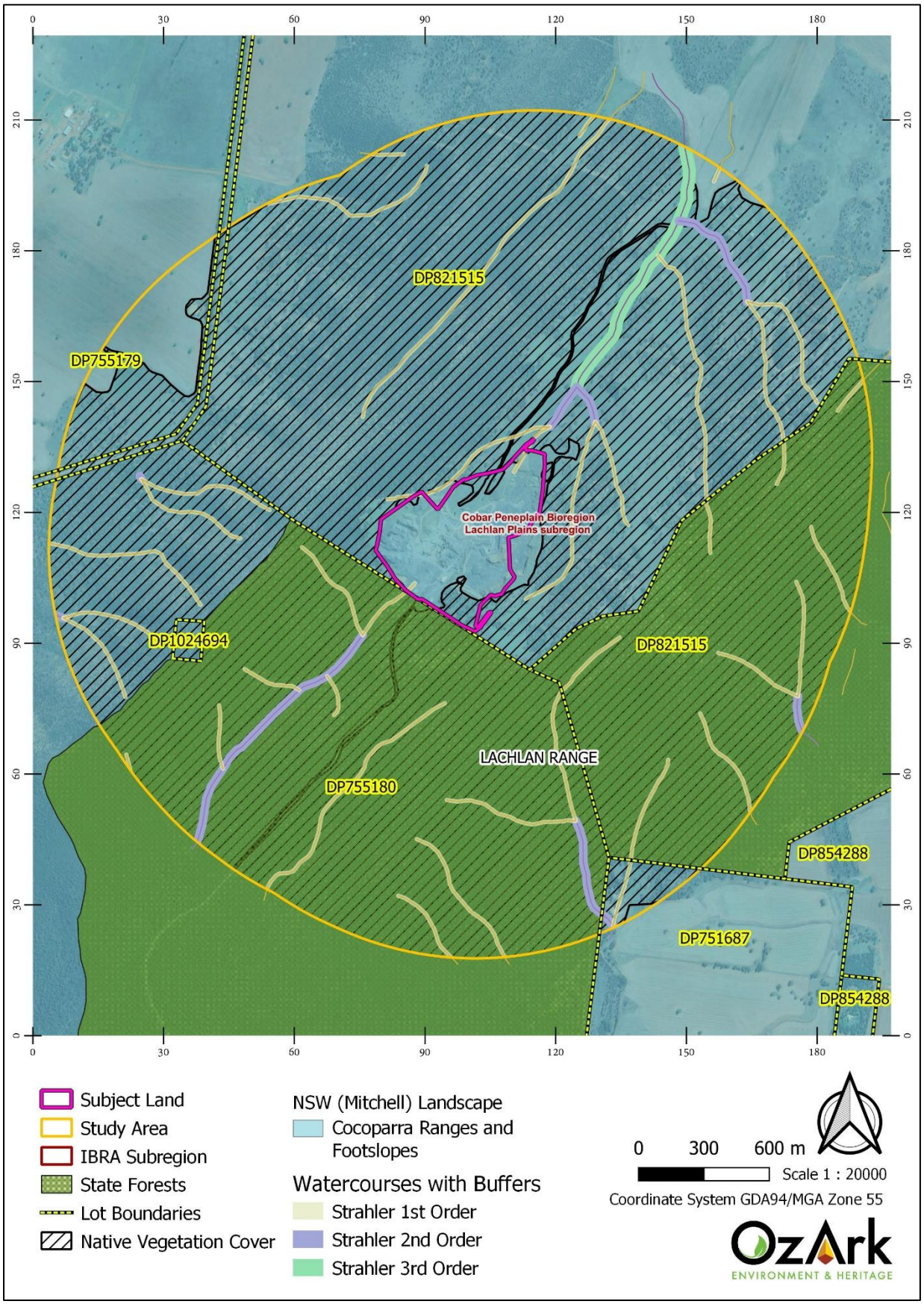

Figure 1-4. Location Map of the Subject Land Within the Study Area.

1.6 Purpose

The purpose of the BDAR is to determine the biodiversity assets, including flora, fauna, threatened species, threatened communities and habitat values, of the subject land. The BDAR calculates the credits required to be offset under the BC Act as mitigation for the biodiversity values that will be impacted after avoidance and minimisation measures have been incorporated into the development design. The BDAR also identifies any constraints on the proposal according to relevant federal and NSW environmental legislation and includes the calculation of Biodiversity Credits requiring offset.

2 Legislation

2.1 International Legislation

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
- Ramsar Convention on Wetlands (Ramsar).

2.2 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), including EPBC Act Environmental Offsets Policy and Significant Impact Guidelines Version 1.1, 2013.

2.3 NSW Legislation

2.3.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act provides the legal framework for the assessment and approval of the proposed activities. Part 4 of the EP&A Act requires the proponent to examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.

2.3.2 Biodiversity Conservation Act 2016 (BC Act)

Under the BC Act, the proponent has an obligation to consider impacts to all threatened species, populations and ecological communities listed in NSW, as well as ensuring the proposal does not exacerbate a Key Threatening Process (KTP). Entry to the BOS is triggered if the proposal constitutes a State Significant Development (SSD), if a significant impact to a threatened entity is expected, if the proposal takes place on land mapped on the Biodiversity Values Map, or if the proposal exceeds the allowable clearing threshold (see **Section 1.5**).

2.3.3 Biodiversity Conservation Regulation 2017 (BCR)

The BCR defines the triggers and entry thresholds for the BOS. It also provides the rules for meeting offset obligations, triggers for authorities to refuse development applications and compliance provisions.

2.3.4 Biosecurity Act 2015

From 1 July 2017, the *Biosecurity Act 2015* and its subordinate legislation has commenced. The *Noxious Weeds Act 1993* and part of the *Local Land Services Act 2013* (Part 10 Pests), among other acts, have been repealed under the new *Biosecurity Act 2015*. Schedule 1 of the

Biosecurity Act 2015 contains the special provisions relating to weeds and duty to control weeds which pose a biosecurity risk.

The Department of Primary Industries (DPI) maintains a list of 'Priority Weeds' (previously referred to as noxious weeds) in NSW for the state and each region which imply an obligation on landholders to prevent, eliminate or minimise, so far as is reasonably practicable, any biosecurity risk they may pose. In addition, Local Government Areas may include their own priority weeds.

2.3.5 Fisheries Management Act 1994 (FM Act)

The objects of the FM Act are to:

- Conserve fish stocks and key fish habitats.
- Conserve threatened species, populations and ecological communities of fish and marine vegetation.
- Promote ecologically sustainable development, including the conservation of biological diversity.

Section 201 of the FM Act states that a person other than a government authority must seek a permit from NSW DPI – Fisheries for dredging or reclamation in a waterway. Dredging work means any work that involves excavating water land. Reclamation work means any work that involves depositing any material on water land. Matters relevant to the FM Act are explored in **Section 4.2** and **4.3**.

2.3.6 Water Management Act 2000 (WM Act)

The WM Act aims to provide for the 'sustainable and integrated management of the water sources of the state for the benefit of both present and future generations.'

The WM Act provides for the granting of various licenses and approvals, including for the use of water and water supply work. Additionally, the WM Act identifies provisions relating to 'controlled activities' which includes (among other definitions):

- The erection of a building or the carrying out of a work (within the meaning of the EPA Act)
- The removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise.
- It includes laying pipes and cables.

Approval (via a 'controlled activity' approval) is required from the Minister for Primary Industries under the WM Act if it is on 'waterfront land'. '*Waterfront land*' means the bed of any river, lake or estuary, and the land within 40 m of the riverbanks, lake shore or estuary mean high water

mark. There is no waterfront land within the subject land, or within 40 m, therefore a controlled activity approval will not be required for this proposal.

2.3.7 *State Environmental Planning Policy (Biodiversity and Conservation)* 2021

The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (*Biodiversity and Conservation SEPP*) consolidates, transfers and repeals provisions of 11 SEPPs, the following of which are relevant to the current assessment:

- Former SEPP (Koala Habitat Protection) 2020
- Former SEPP (Koala Habitat Protection) 2021

These individual SEPPs are no longer current; however, their provisions are incorporated into the *Biodiversity and Conservation SEPP.* Through the principles contained in these amalgamated SEPPs, the *Biodiversity and Conservation SEPP* aims to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline'.

While the subject land is zoned RU1, the Carrathool Shire LGA is not listed under Schedule 1. For this reason, the proposal is not assessed under the *Biodiversity and Conservation SEPP*.

A separate assessment of impacts to the Koala under the EPBC Act guidelines has also been conducted (**Appendix F, G**).

3 Methodology

This BDAR has been prepared in accordance with the NSW Biodiversity Assessment Method 2020 (BAM) (NSW Department of Planning, Industry and Environment, 2020).

The ecological assessment was carried out in three stages:

1. Desktop searches and review of ecological databases and information to identify threatened species, populations or ecological communities listed in the BC Act, FM Act or the EPBC Act that have the potential to occur in the study area.
2. Field survey of the subject land to conduct BAM plots and collate species lists for the purposes of identifying the vegetation communities present and target predicted threatened species and ecological communities. Where a threatened species or community or habitat feature is identified, document the nature and extent of the protected matter and describe its 'viable local population' or occurrence through targeted surveys.
3. Preparation of a BDAR that describes the impacts of the proposed activity on native vegetation and threatened species, populations and ecological communities, and provides recommendations to avoid, minimise and mitigate these impacts. The BDAR also includes a biodiversity credit summary that identifies the number of ecosystem credits and species credits required to offset the development.

3.1 Personnel

OzArk operates under NSW Scientific Research License 101908, and NSW Department of Primary Industries (DPI) Accreditation of a corporation as an animal research establishment Ref No. AW2017/012. The role and key details of personnel involved in the proposal are provided in **Table 3-1**.

The primary field survey and BAM plots were completed by Senior Ecologist and Accredited Assessor Jesse Carpenter on 28th August 2019. Accredited Assessor Dr Emma Gray conducted targeted flora surveys on 20th September 2019. Accredited Assessor Dr Emma Gray and Ecologist Coral Pearce conducted targeted fauna surveys on 31st October 2019 and 1st November 2019. Accredited Assessor Dr Crystal Graham visited the subject land on 20 May 2022 to confirm Plant Community Type (PCTs), map hollow-bearing trees, conduct additional bird surveys, and record incidental fauna sightings. Accredited Assessor Dr David Orchard conducted targeted flora surveys in January 2023 and October 2023. The BDAR was originally written by Accredited Assessor Madeline Walsh and reviewed and updated by Accredited Assessors Dr Crystal Graham and Dr David Orchard.

Table 3-1. Summary of OzArk personnel qualifications.

Name	Position	Role	CV Details
Jesse Carpenter	Senior Ecologist	BAM Plots, PCT determination	• Accredited BAM assessor – Accreditation #BAAS18122 • Bachelor of Applied Science – Environmental Management – University of South Australia • 4WD Training • WH&S Induction Training for Construction Work
Dr Emma Gray	Ecologist	Targeted Surveys, GIS, initial BAM-C calculations	• Accredited BAM assessor – Accreditation #BAAS19069 • Doctor of Philosophy – Ecology – Queensland University of Technology • Bachelor of Applied Science – Ecology – Queensland University of Technology • WH&S Induction Training for Construction Work
Madeline Walsh	Ecologist	Subsequent BAM-C calculations, initial BDAR preparation	• Accredited BAM assessor – Accreditation # #BAAS21010 • Bachelor of Environmental Biology – University of Technology, Sydney • Honours in Ecology – UNSW, Sydney • WH&S Induction Training for Construction Work
Coral Pearce	Ecologist	Targeted surveys	• Master of Science – Ecology – Queensland University of Technology • Bachelor of Applied Science – Ecology – Queensland University of Technology • 4WD Training • WH&S Induction Training for Construction Work
Dr Crystal Graham	Senior Ecologist	Technical review and update of BDAR, revised PCT mapping, habitat tree survey	• Accredited BAM assessor – Accreditation # BAAS22024 • Doctor of Philosophy – Biology – University of Sydney • Honours 1 – Biology – University of Sydney • Bachelor of Advanced Science – University of Sydney • 4WD Training • WH&S Induction Training for Construction Work
Dr David Orchard	Ecologist	GIS, technical review, revised PCT determination, final BAM-C calculations, and BDAR update, targeted flora surveys	• Accredited BAM assessor – Accreditation # BAAS21028 • Doctor of Philosophy – Charles Sturt University • Graduate Diploma in Science (Botany) – University of New England • Bachelor of Arts – Australian National University • First aid training • WH&S Induction Training for Construction Work

3.2 Desktop Review

Existing information sources were reviewed to contextualise the study area, identify entities for targeted surveys, predict possible constraints, refine field survey methodology and assist with assessing the impacts of the proposal. Information sources consulted included:

- Aerial photographs and drone photographs
- Literature reviews to determine vegetation and species habitat(s) within the proposed study area
- NSW Government Web Map Service (WMS) layers for NSW Imagery (compiled imagery, NSW Property, NSW Base Map and NSW Topographic Map) (https://www.spatial.nsw.gov.au/products_and_services/aerial_and_historical_imagery).
- EPBC Protected Matters Search Tool (https://pmst.awe.gov.au/).
- State Vegetation Type Map: Central West/Lachlan Region Version v1.4 - VIS_ID 4468 (DPIE 2015).
- NSW DPI threatened fish indicative distribution maps (www.dpi.nsw.gov.au/fishing/species-protection/threatened-species-distributions-in-nsw/freshwater-threatened-species-distribution-maps).
- NSW BioNet Vegetation Classification Database (https://www.environment.nsw.gov.au/research/Visclassification.htm) .
- NSW BioNet Threatened Biodiversity Data Collection (www.bionet.nsw.gov.au/) .
- NSW BioNet Atlas (www.bionet.nsw.gov.au/).
- Register of Declared Areas of Outstanding Biodiversity Value (www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/critical-habitats).
- PlantNET, NSW Flora Online (www.plantnet.rbgsyd.nsw.gov.au/).
- Department of Environment and Planning *Biodiversity Values Map* (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap).
- Mapping of Vulnerable Lands – Steep and Highly Erodible (NSW Office of Environment and Heritage, 2011)
- Acid Sulphate Soils Risk mapping (NSW Office of Environment and Heritage, 1998)
- Directory of Important Wetlands of Australia (DIWA) (https://www.dcceew.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands).
- NSW wetlands mapping (NSW Office of Environment and Heritage, 2010)
- Important area mapping for Regent Honeyeater and Swift Parrot available from the Biodiversity Offsets and Agreement Management System (BOAMs).

All databases were searched in September 2021, December 2021, October 2023, and, where necessary, June 2024. Results of the database searches are provided in **Appendix A**.

3.3 Field survey

3.3.1 BAM Survey Methodology

Vegetation communities are identified in accordance with the online NSW Master Plant Community Type Classification (NSW Department of Planning, Industry and Environment, 2021b), which is the current state-wide vegetation classification system for Plant Community Types (PCTs). This classification system is used for vegetation mapping, development assessment and site planning purposes. It describes over 1,500 PCTs across the state, and groups the vegetation communities into vegetation Class and Formation / Sub-formation as per Keith (2004).

In this study, PCTs were identified on the basis of the following inputs:

- Regional Scale State Vegetation Map*:* Central West/Lachlan Region Version v1.4 - VIS_ID 4468 (DPIE, 2015) and State Vegetation Type Map C1.1.M1.1 (DPE, 2022), which provide predictive mapping of PCTs in and around the subject land. This mapping is indicative only. It is not necessarily accurate at a fine scale for the purposes of the current study.
- Professional ecological knowledge about locally occurring vegetation types and landscape, soil and topographic patterns, including transitions from one community to another and potential for intergrades between plant communities.
- Field survey results to confirm the flora species present, vegetation structure, landscape position and soil type at the subject land and the extent and condition of native vegetation.
- The BioNet Vegetation Classification database, this being used to identify the candidate vegetation communities likely to be present based on the site conditions (flora species present, vegetation structure, bioregion, and landscape position and soil type) and the relevant published PCT descriptions.

If any of the PCTs were identified as having potential to be part of a Threatened Ecological Community (TEC), the relevant identification guidelines (NSW Scientific Committee listing criteria and Commonwealth identification guides) were consulted to determine the status of the vegetation community present. These guidelines provide the identification criteria used to determine whether the community is part of a TEC. The criteria include location, species present, overstory species, weed cover, number and type of native species including whether certain ‘important’ native species are present.

Plant identification followed nomenclature in the Royal Botanic Gardens PlantNET online database (Royal Botanic Gardens and Domain Trust, 2024).

Vegetation Integrity was surveyed according to the BAM as follows:

- The survey plots consisted of nested 20m x 50m and 20m x 20m plots
- Species composition and structure (species and percent cover) data collected from within 20m x 20m plot
- Vegetation function data (size and number of trees, presence of hollow-bearing trees and woody debris) collected from within 20m x 50m plot
- Percent of litter cover data collected within five 1m x 1m squares positioned at 5m, 15m, 25m, 35m and 45m points of the 50m transect
- The plots were positioned within the subject land and their GPS locations were recorded (GDA 94 / MGA Zone 55).

The plot locations were randomly selected whilst ensuring adequate survey effort within each vegetation zone (**Table 3-2**). Thirteen BAM plots (WRQ01-WRQ13) were conducted in the initial field survey by Jesse Carpenter in August 2019. Two BAM Plots (WQ08 and WQ09) were not used in the assessment as the vegetation zone associated with the plots was not present within the final subject land. The location of all BAM plots is depicted in **Figure 5-1** and **Figure 5-2**. All plot data is provided in **Appendix C**.

Table 3-2. Minimum number of plots and transects required per zone area (NSW Department of Planning, Industry and Environment, 2020).

Vegetation zone area (ha)	Minimum number of plots/transects
<2	1 plot/transect
>2 – 5	**2 plots/transects**
>5 – 20	3 plots/transects
>20 – 50	4 plots/transects
>50 – 100	5 plots/transects
>100 – 250	6 plots/transects
>250 – 1000	7 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone
>1000	8 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone

3.3.2 Incidental Fauna Sightings

Incidental fauna sightings were recorded while undertaking the BAM plots and searching the subject land for hollow-bearing trees and other potential habitat features. Potential habitat such as rock outcrops, loose bark and course woody debris was recorded and examined for signs of cryptic species. Tracks and other areas of suitable substrate were searched for animal

tracks. Other evidence of fauna presence on the subject land, such as scats, feathers and sloughed skins were also recorded.

3.3.3 Targeted Surveys for Threatened Species Credit Species

Targeted surveys were carried out to confirm the presence/absence of a number of threatened species credit species identified by the BAM calculator ([BAM-C], see **Section 6**). Targeted surveys were conducted prior to the finalisation of the impact footprint. Therefore, flora and fauna targeted surveys were completed outside the subject land in addition to inside the subject land (**Figure 3-2**). Targeted surveys were conducted on the 28th August 2019, 20th of September 2019, 31st of October 2019, 1st of November 2019, 20th of May 2022, 30th of January 2023, and 5th of October 2023. Survey periods prescribed by the BAM are given in **Table 3-3**, along with the dates of the actual surveys and the associated vegetation zones for each species. Candidate species credit species were surveyed following the methodology outlined in the appropriate survey guidelines (see below).

Table 3-3. Prescribed and actual survey timing for threatened species.

Common Name	Scientific Name	BAM Survey Period	Field Survey Timing	Associated Vegetation Zones
Curly-bark Wattle	*Acacia curranii*	All year	September 20, 2019 and January 30, 2023	72_Poor
A speargrass	*Austrostipa metatoris*	October-November	October 5, 2023	70_Poor, 72_Poor
Pine Donkey Orchid	*Diuris tricolor*	September-October	September 20, 2019 and October 5, 2023	70_Poor, 72_Poor
Holly-leaf Grevillea	*Grevillea ilicifolia* subsp. *ilicifolia*	All year	September 20, 2019	186_Poor
Silky Swainson-pea	*Swainsona sericea*	September-November	September 20, 2019 and October 5, 2023	70_Poor, 72_Poor
Bush Stone-curlew	*Burhinus grallarius*	All year	August 28, 2019, October 31, 2019-November 1, 2019, May 20, 2022	72_Poor
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	January-September*	August 28, 2019, October 31, 2019-November 1, 2019 and May 20, 2022.	72_Poor, 185_Poor, 186_Mod
White-browed Treecreeper – endangered population	*Climacteris affinis*	All year	August 28, 2019, October 31, 2019-November 1, 2019, May 20, 2022	72_Poor

Common Name	Scientific Name	BAM Survey Period	Field Survey Timing	Associated Vegetation Zones
Little Eagle (Breeding)	*Hieraaetus morphnoides*	August-October	August 28, 2019, October 31, 2019-November 1, 2019	70_Poor, 72_Poor, 185_Poor, 186_Moderate
Major Mitchell's Cockatoo (Breeding)	*Lophochroa leadbeateri*	September-December	October 31, 2019-November 1, 2019	70_Poor, 72_Poor, 185_Poor, 186_Moderate
Square-tailed Kite (Breeding)	*Lophoictinia isura*	September-January	October 31, 2019-November 1, 2019	70_Poor, 72_Poor

*At the time of the initial survey, the Riverina population of this species could be surveyed at any time of the year. This population has now been merged with the listing for the species generally and the survey window altered.

Threatened flora

The BAM-C returned five threatened flora species credit species that could not be excluded due to habitat constraints. Targeted surveys were undertaken for all five flora species and consisted of parallel transects, at approximately 10 m separation widths, undertaken on 20th of September 2019, 30th of January 2023, and 5th of October 2023 (**Figure 3-2**). This area was classified as open vegetation, so the survey methodology was adequate, according to the methods outlined in *Surveying threatened plants and their habitats* (DPIE 2020). However, three candidate flora species were not able to be fully surveyed across the entire subject land as a small area (0.12 ha) of PCT 70_poor had already been disturbed prior to targeted surveys being conducted. As such, presence has been assumed for these three flora species in this area (see **Section 6.2**).

Threatened fauna

No large hollows were recorded within the subject land, and only one large hollow was recorded within 100 m (**Figure 3-1**) of the subject land boundary, however, this was not located within 100 m of an appropriate PCT for any species dependent on large hollows. Therefore, fauna species dependent on large hollows were excluded from survey requirements.

Six threatened fauna species credit species generated by the BAM-C could not be excluded due to habitat constraints:

- Bush Stone-curlew (*Burhinus grallarius*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
- White-browed Treecreeper (*Climacteris affinis*)
- Little Eagle (*Hieraatus morphnoides*)

- Major Mitchell's Cockatoo (*Lophochroa leadbeateri*)
- Square-tailed Kite (*Lophoictinia isura*)

Incidental bird surveys were undertaken during the initial BAM vegetation survey in August 2019 (07:00-17:00) and follow up survey in May 2022 (11:30-13:50). Targeted fauna surveys were conducted over a two-day period between the 31st of October and the 1st of November 2019. Diurnal and nocturnal survey effort was required, including:

- Diurnal bird surveys were conducted at the site by repeating three 20-minute point-surveys over two days, detecting birds by call and sight. Birds were surveyed within the full extent of the associated PCTs. A Song Meter (SM4 model) was also deployed in PCT 70 on 31st of October 2019 (**Figure 3-2**) for 21 days to ensure woodland birds were sampled. The song meter was programmed to record the dawn (05:30-07:30) and dusk (19:30-21:30) chorus. Habitat searches were undertaken to detect evidence of breeding activity and flushes were also carried out to detect any Bush Stone-curlews that may have been utilising the groundcover as habitat.
- Nocturnal bird surveys were conducted by performing call playbacks (31 October 2019) to determine whether the Bush Stone Curlew (*Burhinus grallarius*) was present. Spotlighting between call playbacks was also undertaken for the Bush Stone-curlew. A Song Meter programmed to capture nocturnal bird calls (23:30-01:30 h) was deployed for 21 days to determine whether the species makes any use of the subject land.

Survey conditions during targeted fauna surveys in October-November were hot and fine (**Section 4.10**). Surveys followed the TBDC, Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (working draft) (NSW Department of Planning, Industry and Environment, 2004) and the Survey Guidelines for Australia's Threatened Birds (Department of the Environment Water, Heritage and the Arts 2010). A summary of the methods employed to target each species, and the effort accumulated, is presented in **Table 3-4**.

Table 3-4. Summary of targeted survey effort for threatened fauna species.

Common Name	Scientific Name	Diurnal searches for physical presence, auditory or physical signs	Spotlighting	Call playback	SM4 Recorder
Bush Stone-curlew	*Burhinus grallarius*	✓	✓	✓	✓
South-eastern Glossy Black-Cockatoo	*Calyptorhynchus lathami*	✓			✓
White-browed Treecreeper	*Climacteris affinis*	✓			✓
Little Eagle (Breeding)	*Hieraaetus morphnoides*	✓			✓
Major Mitchell's Cockatoo (Breeding)	*Lophochroa leadbeateri*	✓			✓
Square-tailed Kite (Breeding)	*Lophoictinia isura*	✓			✓
PERSON HOURS		22.5 hrs (over 4 days)	1 hr (1 night)	4 hrs (1 night)	126 hrs of call recording (over 21 days)

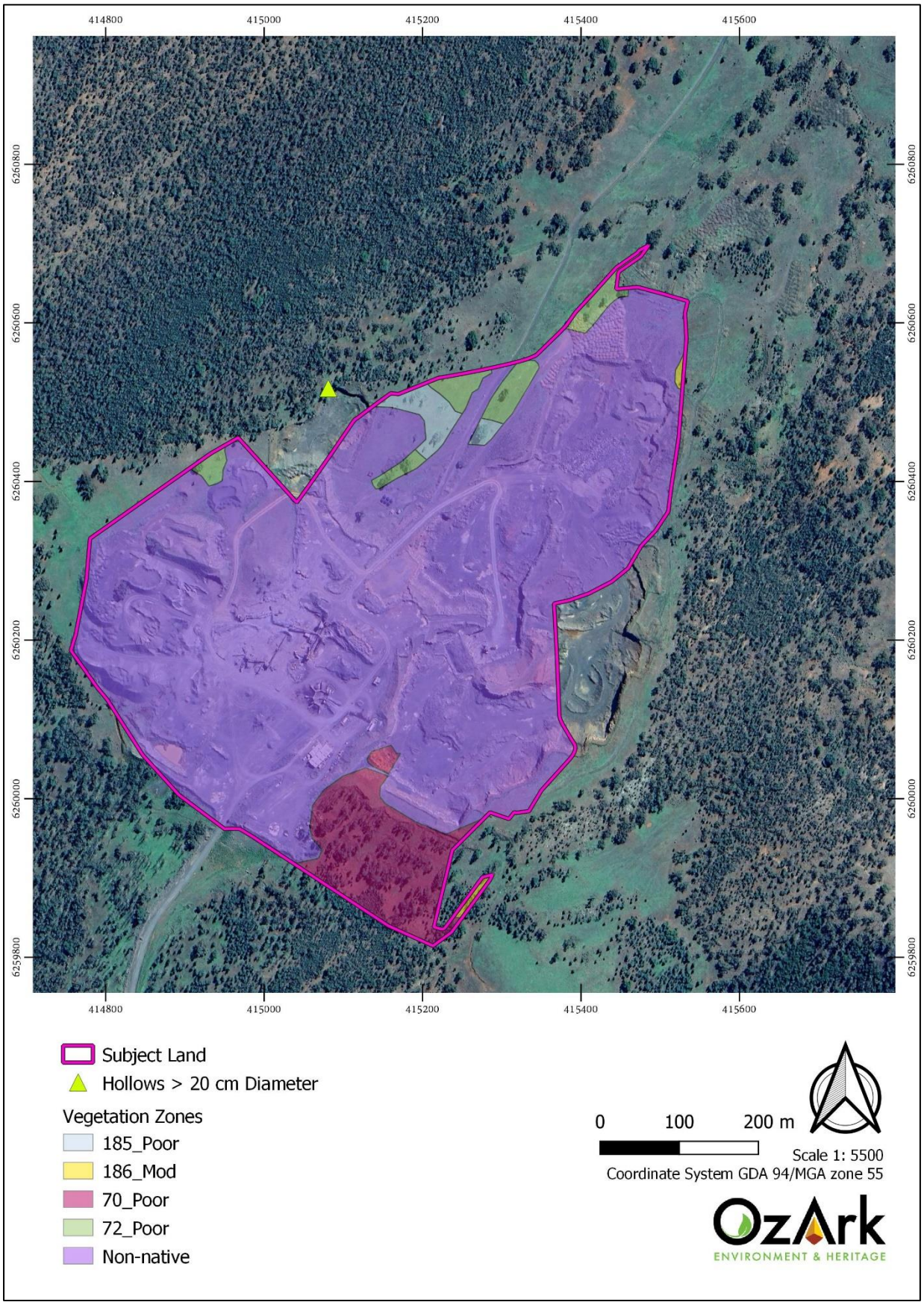

Figure 3-1. Location of large hollows (>20 cm diameter) within 100 m of subject land.

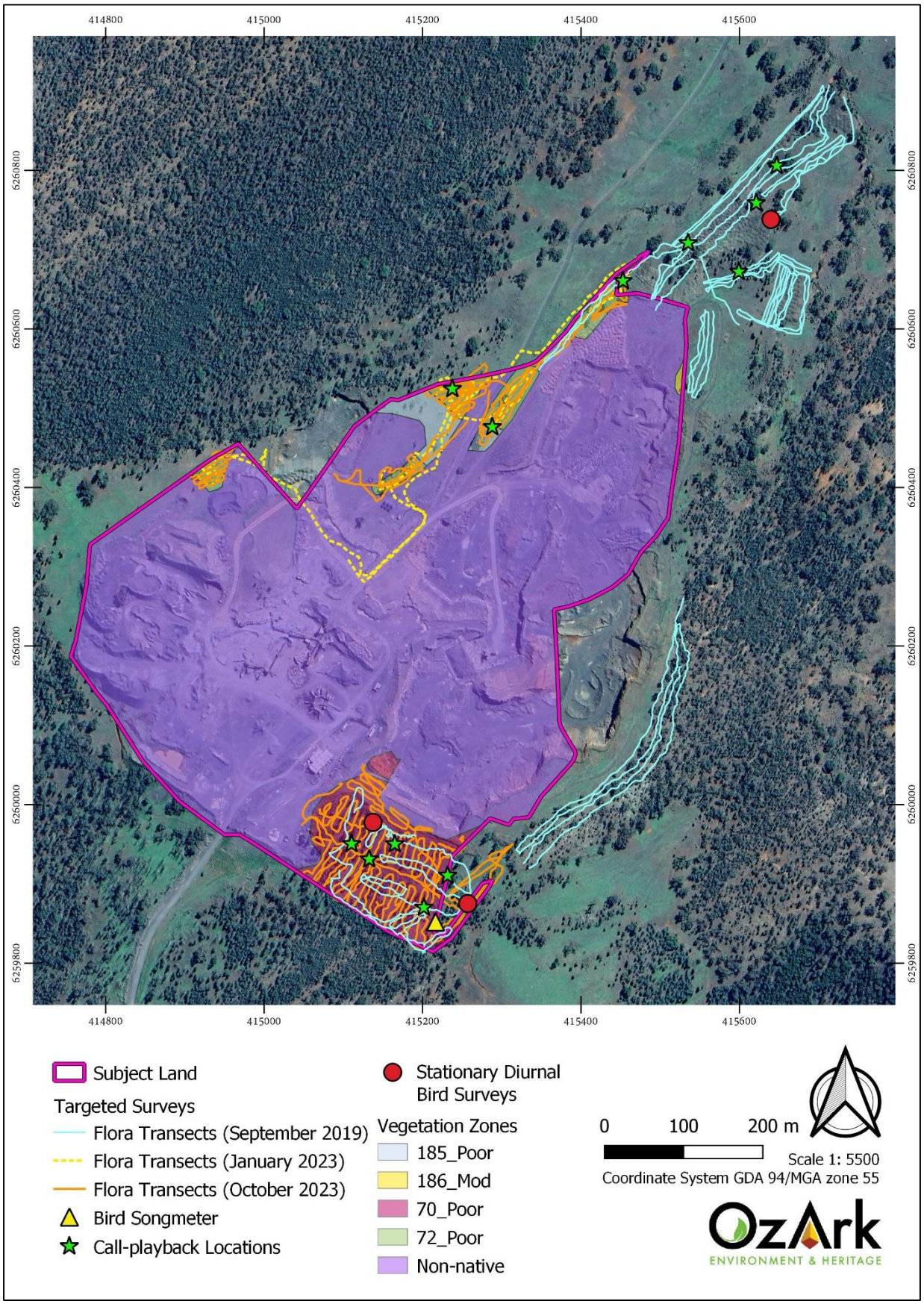

Figure 3-2. Targeted Survey Effort for Candidate Species.

3.3.4 Survey Limitations

This study is based upon the species data available at the time of the field investigation, and the environmental conditions, season, and time constraints imposed by the proposal for the field survey. Specific limitations on this study include the following:

- The BAM vegetation field survey was mostly completed over a single day in August 2019, as such, the diversity of plant species observed in the BAM plots may not have been wholly representative.
- Prevailing climatic conditions at the time of the BAM vegetation field survey were extremely dry, which undoubtedly caused some species to be temporarily absent or difficult to detect (**Section 4.10**). This may affect calculations of vegetation integrity.
- A small area (0.12 ha) of PCT70 was disturbed prior to completion of targeted flora surveys. In these areas, species have been assumed present.

To overcome some of these limitations, a 'precautionary approach' for species presence has been adopted where required. For example, if suitable habitat for a particular threatened species is present on the site and the conditions for targeted survey are not able to be met (due to footprint changes or habitat disturbance) then the species is assumed to be present.

The above-mentioned constraints were also considered when preparing the recommendations of avoiding, minimising and mitigating potential impacts.

4 Landscape Features

4.1 Bioregions and NSW Landscapes

The subject land is situated in the Lachlan Plains subregion, within the Cobar Peneplain Bioregion, as per the Interim Biogeographic Regionalisation of Australia (IBRA) (Thackway & Cresswell, 1995). The Lachlan Plains subregion is characterised by geology, landforms, soil types and vegetation as described in **Table 4-1**.

Table 4-1. Description of the Lachlan Plains Subregion (NSW National Parks and Wildlife Service, 2003).

Cobar Peneplain Bioregion				
Subregion	**Geology**	**Landform**	**Soils**	**Vegetation**
Lachlan Plains	Devonian quartz sandstone and conglomerate, small areas of granite, and Quaternary colluvial slope mantles and alluvium.	Strike ridges of resistant rocks often following fold patterns. Low rounded hills of granite with sparse outcrop. Wide short valleys connecting to Lachlan floodplains.	Shallow stony or gritty red earths on crests and slopes, thickening downslope as rubbly mantles often with a texture contrast. Deep sandy alluvial soils in valleys with small areas of grey clay in swamps.	Dense currawang, Dwyer's mallee gum and white cypress pine on rocky crests. Same with red ironbark, mallee broombush, hill tea-tree and poplar box on slopes. Poplar box, white cypress pine, mallee, kurrajong, yarran and wilga in valleys. Poplar box and black box in minor swamps.

In 2002, landscapes within NSW were mapped to provide a framework for reporting reserve establishment and for determining over-cleared landscapes. These landscapes broadly describe areas of similar topography, geology, soils and vegetation and are termed NSW (Mitchell) Landscapes.

The Cocoparra Ranges and Footslopes landscape occurs within the study area (**Figure 1-3**, **Figure 1-4**). The characteristics of this landscape are described in **Table 4-2**.

Table 4-2. NSW Landscapes of the study area (Mitchell, 2002).

Mitchell Landscape	Geology and soils	Landform	Vegetation
Cocoparra Ranges and Footslopes	Footslopes of Quaternary colluvium with outcrops of upper Devonian sandstone, conglomerate and siltstones. Extensive rock outcrop, shallow sandy lithosols, acid, neutral and calcareous	Steep crested ranges, ridges, hills and associated footslopes. Cliff faces to 30 m, bouldery hill slopes with overall relief to 260 m.	On ranges; scattered white cypress pine (*Callitris glaucophylla*), currawang (*Acacia doratoxylon),* Dwyer's mallee gum (*Eucalyptus dwyeri*), and red ironbark (*Eucalyptus sideroxylon*); locally dense broombush (*Melaleuca uncinata*), hill tea-tree (*Leptospermum divaricatum),* urn

	red earths on slopes and deep sandy alluvium in creek lines.	heath (*Melichrus urceolatus*), wedge-leaf hopbush (*Dodonaea viscosa*), punty bush (*Senna eremophila*), cough bush (*Cassinia laevis*), sugarwood (*Myoporum platycarpum*), grey box (*Eucalyptus microcarpa*), wilga (*Geijera parviflora*), and Deane's wattle (*Acacia deanei*); rock fern (*Cheilanthes sieberi*), wire grass (*Aristida* sp.), mulga grass (*Thyridolepis mitchelliana*), short grasses and forbs. On lower slopes bimble box (*Eucalyptus populnea),* white cypress pine, mallees, yarran (*Acacia homalophylla*), wilga, emu bush (*Eremophila longifolia*) and various acacias with grasses and forbs.

4.2 Watercourses and Key Fish Habitat

Forty-five watercourses are present within the Study area. Three Strahler 1st order, unnamed, minor, non-perennial watercourses occur within the subject land. The study area contains the following watercourses (**Figure 4-1**):

- Thirty-six 1st order, unnamed, minor, non-perennial watercourses
- Eight 2nd order, unnamed, minor, non-perennial watercourses
- One 3rd order, unnamed, minor, non-perennial watercourse

There are no waterways mapped as Key Fish Habitat (KFH) by the Department of Primary Industries - Fisheries (DPI Fisheries) within the subject land, nor is there any Protected Riparian Land mapped by the Department of Planning and Environment (DPE). Therefore, no permits will be required under the FM Act.

Sediment runoff (caused by ground disturbance/vegetation removal by the proposal) may flow into watercourses within the study area and impact steams. However, if standard mitigation measures are implemented, the likelihood of this occurring is low.

4.3 Wetlands

The directory of Important Wetlands of Australia indicates that there are no nationally important wetlands in or in close proximity downstream of the study area. The closest nationally important wetland is Lake Brewster, over 30 km to the north (Department of the Environment, 2010). Additionally, the closest Ramsar wetland is Fivebough and Tuckerbil Swamp over 80 km to the south.

4.4 Groundwater Dependent Ecosystems

Groundwater plays an important ecological role in directly and indirectly supporting terrestrial and aquatic ecosystems. Groundwater sustains terrestrial and aquatic ecosystems by supporting vegetation and providing discharge to channels, lacustrine and palustrine wetlands, and both the estuarine and marine environment.

The degree of groundwater dependence of ecosystems in terms of three broad categories:

- Non-dependent ecosystems that occur mostly in recharge areas and have no connection with groundwater
- Facultative GDEs that require groundwater in some locations but not in others, particularly where an alternative source of water can be accessed to maintain ecological function. Minor changes to the groundwater regime in facultative GDEs with proportional or opportunistic groundwater dependence may not have any adverse impacts but these ecosystems can be damaged or destroyed if a lack of access to groundwater is prolonged
- Obligate GDEs that are restricted to locations of groundwater discharge and ecosystems located within aquifers (e.g. subterranean cave and stygofauna communities (Kuginis *et al*. 2012). Aquifer ecosystems are inherently groundwater dependent (Queensland Government, 2017).

The Bureau of Meteorology Atlas of Groundwater Dependent Ecosystems (GDEs) identified areas of low potential terrestrial GDEs within the subject land and areas of moderate potential terrestrial GDEs within the surrounding study area (**Figure 4-1;** Bureau of Meteorology, 2017). No Aquatic GDEs were identified within the study area.

The proposal does not include the extraction of groundwater; however, contamination from construction operations, could impact on the quality of groundwater if adequate mitigation measures are not taken. See **Section 7.2** for recommended mitigation measures regarding GDEs.

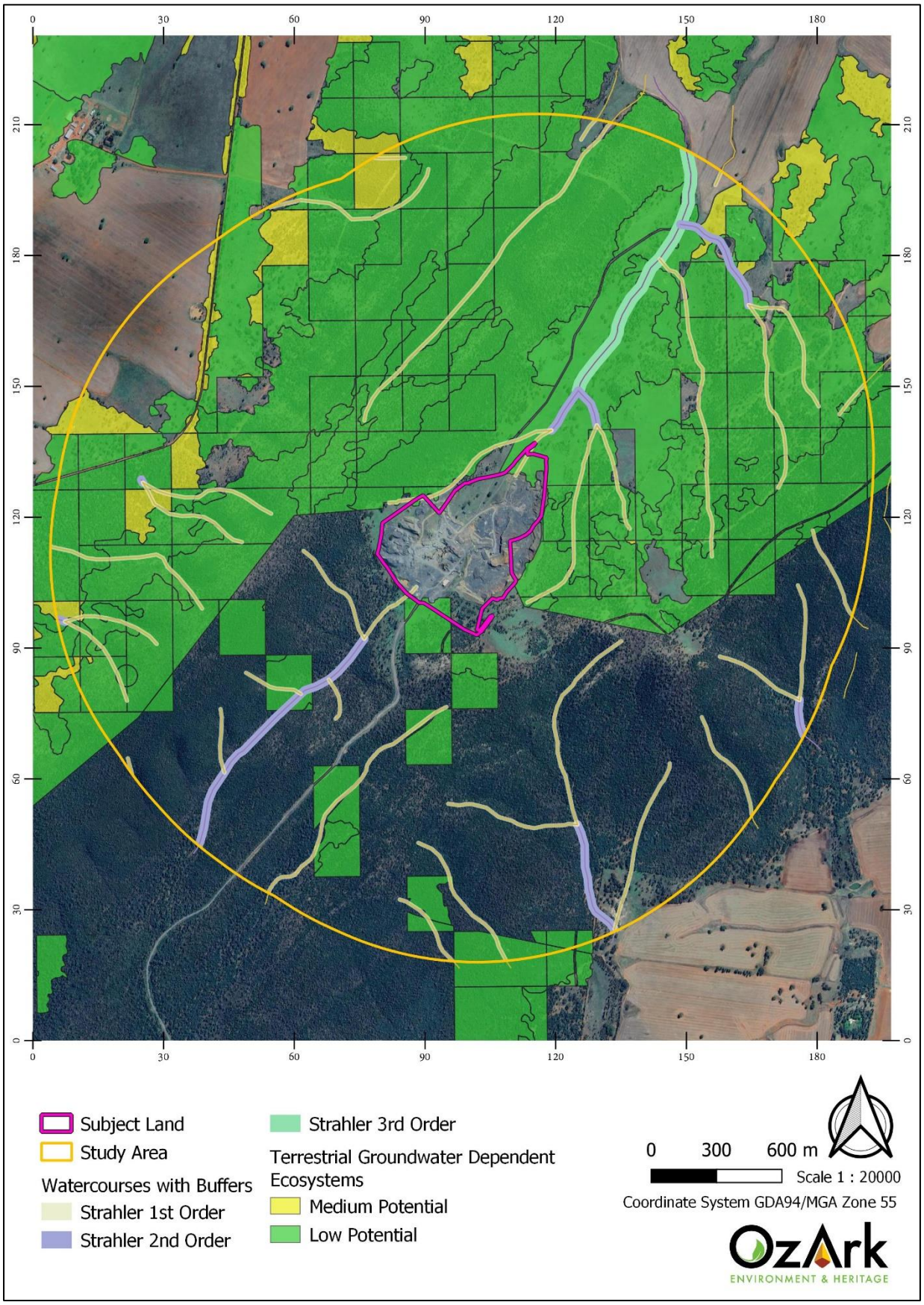

Figure 4-1. Groundwater Dependent Ecosystems and Watercourses within the Study Area.

4.5 Karst, Caves, Crevices, Cliffs and Areas of Geological Significance

The underlying geology and soil typical of the study area has been described in **Table 4-1** and **Table 4-2**. Rocky outcrops were recorded in close proximity to the subject land boundary (**Figure 7-1**), additionally, as the site is a quarry, considerable loose rock is present. No caves or karst formations were detected on the subject land, or within the section of the property that was assessed, though there is an extraction pit rocky wall creating an artificial rock face.

4.6 Areas of Outstanding Biodiversity Value

There are no areas of outstanding biodiversity value listed under the BC Act in the subject land, or study area.

4.7 State Environmental Planning Policy (SEPP) - Koala Habitat Protection

The SEPP 2020 applies to land zoned RU1 – Primary Production in Local Government Areas listed under Schedule 1 of the Policy. While the subject land is zoned RU1, the Carrathool Shire LGA is not listed under Schedule 1. For this reason, the proposal is not assessed under the SEPP.

For reference, the closest Koala records are over 12.5 km to the south-west.

4.8 Native Vegetation Cover

Native vegetation cover was assessed within the study area and the subject land and estimated as the amount of native vegetation (woody and non-woody vegetation, including regrowth and plantations comprised of plants native to NSW; see **Figure 1-4**). A summary of the vegetation cover estimate is provided in **Table 4-3**. For the purposes of the BAM, the native vegetation cover class has been determined as >70%.

Table 4-3. Native vegetation cover estimate in the study area.

Vegetation Cover Type	Description	Area Within Study Area (ha)	Total area of Study Area (ha)	% of Study Area native vegetation
Native woody and non-woody	Regrowth and remnant native vegetation	1145.57	1239.27	92.44

4.9 Landscape Connectivity

The subject land, a working quarry, is situated amongst agricultural land used for primary production and backs onto the Lachlan Range State Forest (**Figure 1-3** and **Figure 1-4**). According to the State Forest mapping (Forestry Corporation of NSW 2023), the subject land encompasses 10 m^2 of the Lachlan Range State Forest. However, updated cadastral boundary mapping confirmed that the subject land does not encroach within the state forest boundary.

The subject land is owned by Kalrag Pty Ltd and is leased to the applicant under an agreement which expires on 30 June 2060, including 2 x 15-year options.

4.10 Climate

The nearest weather station to the subject land is 34.8 km away at Weethalle (Station ID 75072), however this weather station records rainfall data only (**Figure 4-2**). The nearest weather station recording temperature data is the Griffith Airport (Station ID 75041) approximately 49.2 km from the subject land (**Figure 4-3**).

The vegetation field assessment was undertaken on 28 August 2019. Weather conditions at the time of the survey were cool, reaching a maximum temperature of 17.5°C. There was no rainfall recorded on the day of the survey, nor was there for 15 days previous. There was below average rainfall recorded for the month of August with a total of 5.4 mm, indicative of overall long-term climatic conditions being much drier than average (**Figure 4-2**).

The initial targeted flora surveys were undertaken on the 20th of September 2019. Weather conditions at the time of the survey were warm during the day (29.6°C) and cool-warm overnight (minimum of 16.7°C). Rainfall for the month of September 2019 was 8 mm, well below average.

The targeted fauna surveys were undertaken on 31st October 2019 and 1st November 2019. Weather conditions at the time of the survey were hot during the day (34.5°C on 31st October and 36°C on 1st November) and mild overnight (minimum of 13.6°C and 15.6°C on the respective days). There was no rainfall recorded on the survey days. The most recent rain was 1.6 mm recorded on 14th October.

Additional surveys took place on May 20, 2022. In the 15 days prior to the survey, the Griffith Airport weather station recorded 39.2 mm of rain. Conditions during the survey were cool, with a maximum temperature of 16.5°C recorded on the day.

Follow up targeted flora surveys were undertaken on 30 January 2023 and the 5th of October 2023. The January field survey was warm, reaching 27.6°C; there had been 11.6 mm of rain in the 15 days prior to the field survey. The October field survey was cool, reaching 18.6°C; no rain had been recorded in the 15 days prior to the survey, with the most recent rainfall comprising 1.8 mm that fell on the 8th of September.

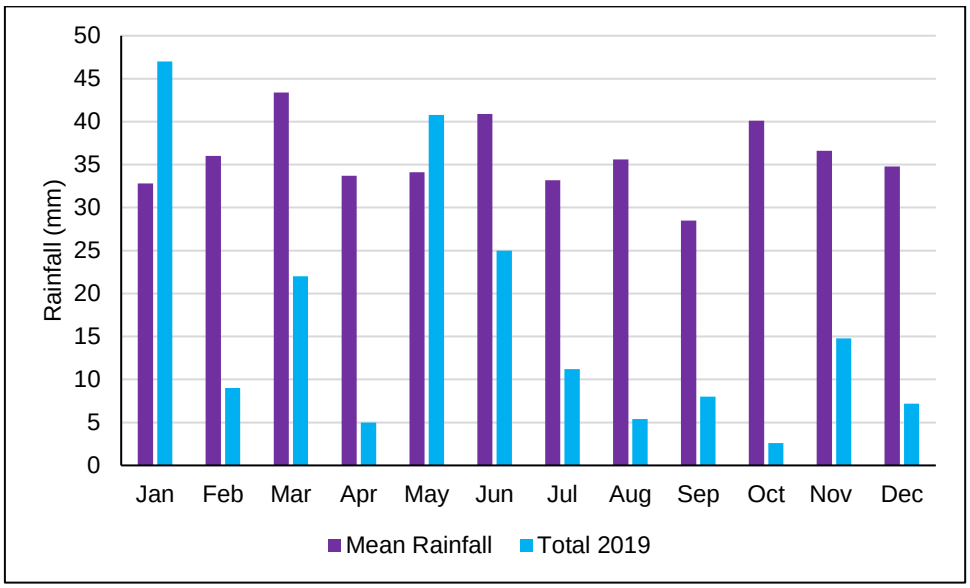

Figure 4-2. Rainfall data for nearby Weethalle, NSW showing mean monthly rainfall over the past 91 years, and total monthly rainfall in 2019 (Bureau of Meteorology, 2021).

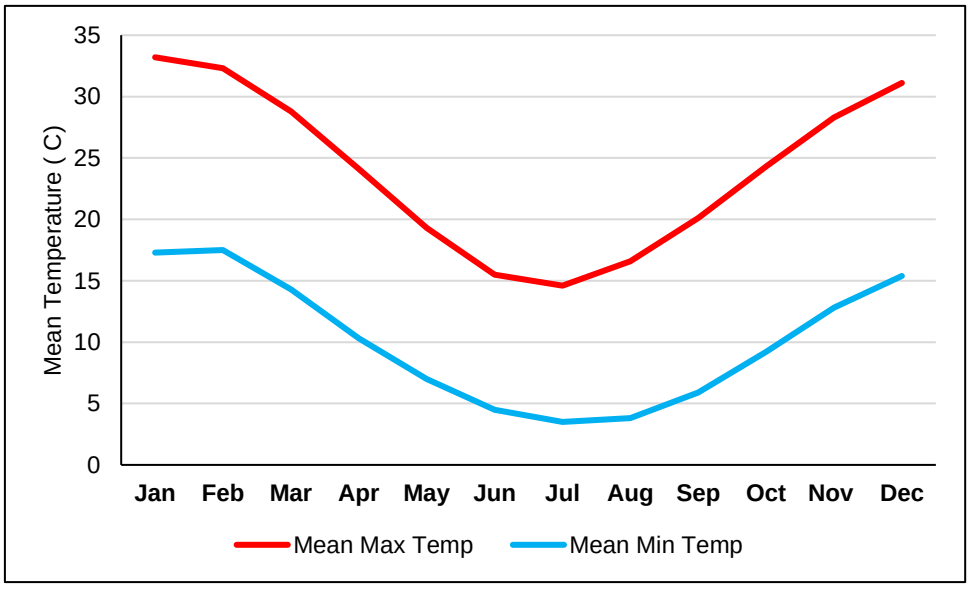

Figure 4-3. Temperature data for nearby Griffith, showing mean minimum and maximum monthly temperatures over the past 51 years (Bureau of Meteorology, 2021).

5 Native vegetation

5.1 Plant Community Types

Plant Community Types (PCTs) were identified by reviewing existing vegetation mapping of the study area (DPE 2022; see **Appendix I**) and taking the BAM plot data collected in the field (**Appendix B, Appendix C**) and comparing it to dominant upper, mid and ground layer species given in the online Vegetation Information System (VIS) descriptions of PCTs (DPE 2023).

Fifty-four native and nineteen exotic plant species were recorded during the field survey (**Appendix C**). The presence of characteristic upper, mid and ground layer species (where present) was important in identifying PCTs. Boundaries between the PCTs was detected by traversing the entire subject land on foot and interpreting aerial imagery.

Most of the 35.52 ha proposal footprint is occupied by an active quarry and hence lacks a covering of vegetation (**Figure 5-1**). Surviving native vegetation (4.23 ha) is confined to the periphery of the subject land, where it typically exists in a degraded condition. On the basis of existing mapping (DPE 2022) and the present fieldwork, this vegetation was identified as belonging to four PCTs:

- PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt. This PCT occupies the southern corner of the subject land and extends into the surrounding wooded areas.
- PCT 72 - White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion. Occurs in patches towards the northern limit of the subject land, mainly on lower slopes.
- PCT 185 - Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion. Occurs towards the northern limit of the subject land and extends outside the subject land on rocky slopes.
- PCT 186 - Dwyer's Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion. Occurs in small fragments at the southern and eastern limits of the subject land.

These PCTs were each assigned to a single condition class (**Figure 5-1**). PCTs are described and PCT determination justified in **Table 5-1.** The extent of each PCT is mapped in **Figure 5-1** and summarised in **Table 5-2**. Additional information, in the form of site photographs and datasheets completed in the field, is provided in **Appendix B** and **Appendix C**.

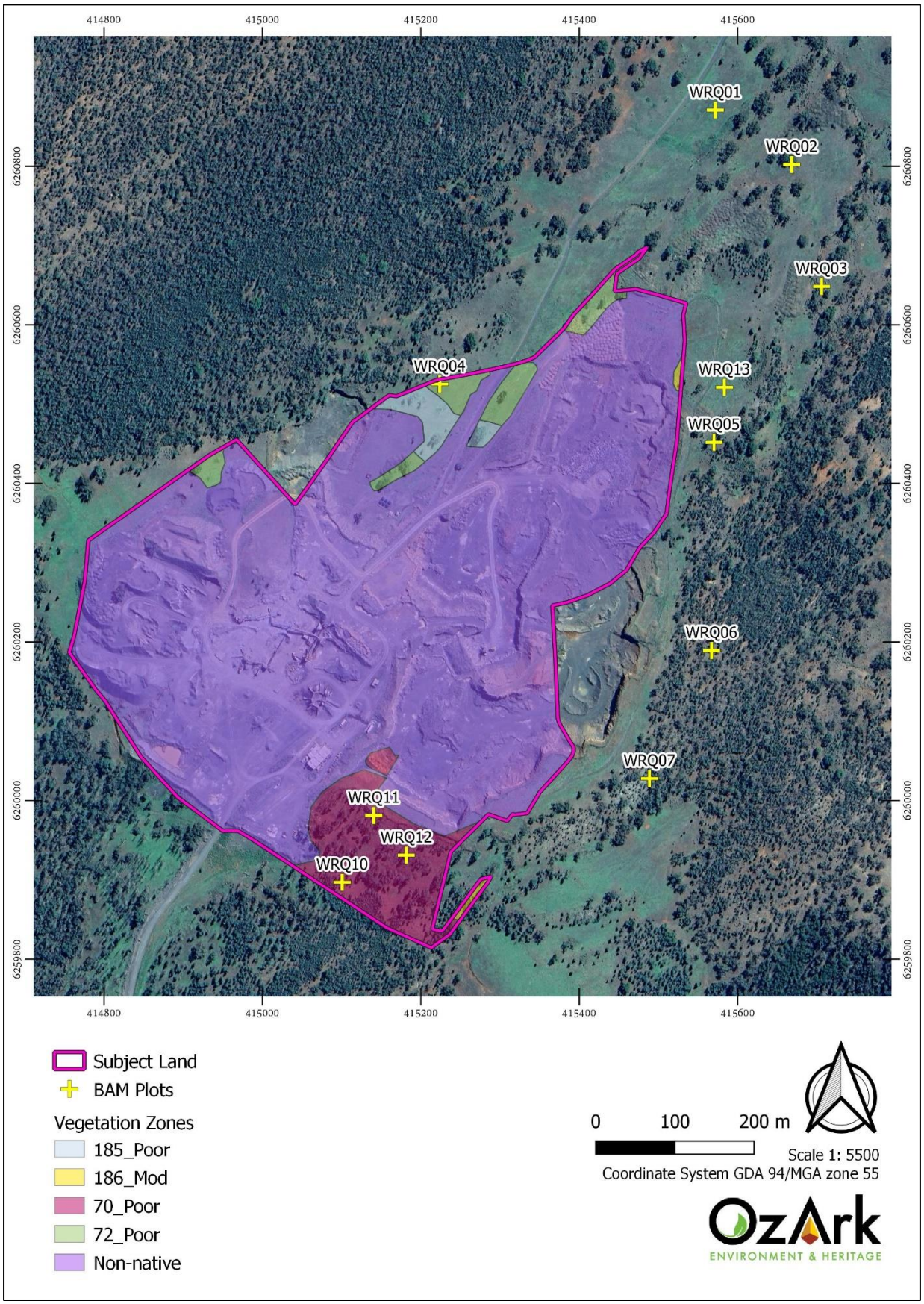

Figure 5-1. Vegetation Zones on the Subject Land and Locations of BAM Plots.

Table 5-1. Determination of Plant Community Types Present on the Subject Land.

PCT ID	PCT Name	Vegetation Formation	TEC Status	Justification of Identification	Current NSW Extent (ha)
70	White Cypress Pine woodland on sandy loams in central NSW wheatbelt	Grassy Woodlands	Not a TEC	• Canopy dominated by White Cypress-pine (*Callitris glaucophylla*). • Upper stratum contained a higher proportion of *C. glaucophylla* than areas mapped as PCT 72. *Eucalyptus populnea* subsp. *bimbil* was present but not dominant or co-dominant. • Shrubs were generally absent. • Groundcover, while weedy, included the associated species *Calotis cuneifolia, Oxalis perennans,* and *Cheilanthes sieberi* • PCT 70 is mapped close to the subject land, according to state predictive vegetation mapping. • Filtering the NSW Vegetation Classification Database by the relevant subregion and the dominant canopy species returns 17 perfect (3/3) matches. The depauperate condition of the PCT provides limited opportunities for further filtering of the database by species. However, of the 17 perfect matches, only two are typically dominated by *C. glaucophylla*: PCT 70 and PCT 72. Both PCTs may contain *E. populnea* subsp. *bimbil* but PCT 70, in which *C. glaucophylla* may account for more than 90% of the canopy, was judged to be the most suitable PCT for areas with a greater proportion of *C. glaucophylla*.	70,000
Description Tall or mid-high woodland to about 18 m high dominated by White Cypress Pine (*Callitris glaucophylla*) that may occupy >90% of the canopy cover. The canopy structure alters depending on degree of clearing, thinning or regrowth. Various box eucalypts may be present including Poplar Box (*Eucalyptus populnea*) and Western Grey Box (*Eucalyptus microcarpa*). Small trees may include Buloke (*Allocasuarina luehmannii*) or Belah (*Casuarina cristata*). Shrubs are sparse and include Deane's Wattle (*Acacia deanei subsp. deanei*), Wilga (*Geijera parviflora*), hopbush (*Dodonaea viscosa), Maireana enchylaenoides*, Thorny Saltbush (*Rhagodia spinescens*) and *Senna spp*. The ground cover is sparse dominated by grasses such as *Austrostipa scabra subsp. scabra, Enteropogon acicularis, Thyridolepis mitchellii, Austrodanthonia eriantha, Austrodanthonia setacea, Enteropogon acicularis* and *Eragrostis lacunaria*. Forb species include *Calotis cuneifolia, Sida cunninghamii, Oxalis perennans, Goodenia cycloptera, Xerochrysum bracteatum* and *Chrysocephalum apiculatum.* The rock fern *Cheilanthes sieberi subsp. sieberi* is often present. In dry times the ground may be nearly bare. Occurs on red, brown or yellow sandy or loamy soils on flats and rises on alluvial plains. Vegetation structure varies depending on the history of disturbance including logging. Dense regrowth of young Pines may be present. Distributed in central NSW, generally with annual rainfall between 400 and 600 mm. Mainly in the NSW South-western Slopes and Darling Riverine Plain Bioregions. A significant proportion of this community has been cleared as it occurs in the wheatbelt. Remnants occur in state forests, other public lands and on leasehold and private land. This community grades into Poplar Box or Western Grey Box woodlands in the mid-central and south and Poplar Box and Coolabah woodlands in the north that occur on finer texture soils. Grades into White Cypress Pine-Poplar Box community (ID72) in the Cobar Peneplain Bioregion.					

PCT ID	PCT Name	Vegetation Formation	TEC Status	Justification of Identification	Current NSW Extent (ha)
72	White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion. Occurs in patches towards the northern limit of the subject land, mainly on lower slopes	Grassy Woodlands	Not a TEC	• Upper stratum variably dominated by *Eucalyptus populnea* subsp. *bimbil* and *Callitris glaucophylla*. • Shrubs were generally absent. • Occurred mainly on footslopes, below or intergrading with PCT 185. • Native groundcover depauperate, but associated species *Calotis cuneifolia, Austrostipa scabra,* and *Rytidosperma* (syn. *Austrodanthonia*) spp. • State vegetation mapping does not map PCT 72 within the 1500 m study area, instead mapping these areas largely to PCT 82. However, PCT 72 does occur within the 10 km search area. • Filtering the NSW Vegetation Classification Database by the relevant subregion and the dominant canopy species returns 17 perfect (3/3) matches. As with PCT 70, the depauperate condition of the PCT provides limited opportunities for further filtering of the database by species. PCTs 54, 57, 70, 74, 77, 134, 176, 185, 193, 201, and 250 were removed from consideration as they do not reflect the prominence of Poplar Box within this community. PCTs 56, 105, and 244 were also eliminated as these communities are typically associated with alluvial flats. PCT 103 was also removed from consideration as Gum Coolabah (*Eucalyptus intertexta*) was not detected on site and as that PCT is typically a shrubby woodland and shrubs were largely absent from the subject land. • Of the two remaining PCTs – PCT 72 and PCT 82 – PCT 72 was preferred, as PCT 82 is characteristically dominated by Grey Box (*Eucalyptus microcarpa*) and no evidence of this species was noted within the subject land. Minor occurrences of Grey Box were noted along the access trail into the site, but not within close proximity to this vegetation zone.	120,000

Description

Tall to mid-high woodland to 14 m high dominated by White Cypress Pine (*Callitris glaucophylla*) with Poplar Box (*Eucalyptus populnea* subsp. *bimbil*) and more rarely Western Grey Box (*Eucalyptus microcarpa*). A shorter stratum of young *Callitris glaucophylla* regrowth is often present. The understorey contains a sparse cover of shrubs including Deane's Wattle (*Acacia deanei*), Budda (*Eremophila mitchellii*), Silver Cassia (*Senna* form taxon *'artemisioides'*), cough bush (*Cassinia laevis*) and hopbush (*Dodonaea viscosa*). The ground cover is mid-dense to sparse and is dominated by grass species such as *Austrostipa scabra* subsp. *scabra* and *Austrodanthonia* spp. and forbs such as *Sida cunninghamii*, *Chenopodium desertorum*, *Calotis cuneifolia* and *Chrysocephalum semipapposum*/*apiculatum*. The rock fern *Cheilanthes sieberi* may be present. Low shrubs include Galvanised Burr (*Sclerolaena birchii*), Grey Copperburr (*Sclerolaena diacantha*) and Ruby Saltbush (*Enchylaena tomentosa*). Occurs on red and brown loam soils that may be colluvial, on footslopes or flats on low hills or alluvial terraces. Distributed in central NSW in the 500-350 mm rainfall zone mainly in the eastern

half of Cobar Peneplain Bioregion. This community often occurs between Poplar Box and Western Grey Box grassy woodland on finer texture soils on the plains and Dwyer's Red Gum low open woodland on shallow, siliceous soils on hills. Grades into White Cypress Pine (ID70) on alluvium mainly to the east. Some areas cleared in the NSW wheatbelt with larger areas remaining inland.

PCT ID	PCT Name	Vegetation Formation	TEC Status	Justification of Identification	Current NSW Extent (ha)
185	Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	Semi-arid Woodlands (Shrubby sub-formation)	Not a TEC	• Upper stratum species dominated by *Eucalyptus dwyeri*, with White Cypress-pine (*Callitris glaucophylla*) as the sole *Callitris* species. Kurrajong (*Brachychiton populneus*) also occurs within this community. • Occurs on footslopes and stony ridges. • Shrubs largely absent. • Native groundcover depauperate but containing the associated species *Thyridolepis mitchelliana* and *Oxalis perennans*. • PCT 185 is not mapped within the 10 km search area; however, minor occurrences of this PCT occur in ridgelines connected to the subject land. PCT 186 is mapped nearby, as is PCT 184. • Filtering the NSW Vegetation Classification Database by the relevant subregion, the dominant canopy species, and the two main native grasses (*T. mitchelliana* and *Microlaena stipoides*) returns three close (5/6) matches. *Microlaena stipoides* is not listed as an associated species for any of the three communities. PCT 250, a derived grassland community, was removed from consideration as it is unsuitable for use in a BDAR, where the most likely parent community for any derived grassland should be identified. • The remaining two PCTs, PCT 184 and PCT 185, are poorly delineated and are said to intergrade in the south-eastern corner of the Cobar Peneplain, near the subject land. The recorded canopy species are shared by both communities. Only two minor differences relevant to the subject land were identified: (1) the understorey species *Oxalis perennans* is listed as an associated species for PCT 185 but not PCT 184 and was recorded from the subject land; and (2) PCT 184 is described as a community of “stony rises, rocky hills and hillslopes” but not footslopes, whereas PCT 185 is described as extending to the footslopes, where the occurrence of this community within the subject land was largely situated. For these two reasons, PCT 185 has been preferred here.	40,000

Description

Tall mallee open woodland dominated by Dwyer's Red Gum (*Eucalyptus dwyeri*), White Cypress Pine (*Callitris glaucophylla*) and/or Currawang (*Acacia doratoxylon*) occasionally with stands of Drooping She-oak (*Allocasuarina verticillata*), Poplar Box (*Eucalyptus populnea*) or Western Grey Box (*Eucalyptus microcarpa*). Grades into communities with Western Grey Box (*Eucalyptus microcarpa*) or Mugga Ironbark (*Eucalyptus sideroxylon*). Kurrajong (*Brachychiton populneus* subsp. *populneus*) occurs in

some locations. The understorey contains a sparse shrub layer that may include *Cassinia laevis*, *Grevillea floribunda*, *Acacia deanei* and in some areas *Leptospermum divaricatum*. Low shrubs species include *Melichrus urceolatus*, *Hibbertia obtusifolia* and thickets of *Platysace lanceolata*. The ground cover is sparse and is often covered in rocks. Species include forbs such as *Gonocarpus elatus*, *Calotis cuneifolia*, *Goodenia glabra* and *Hybanthus monopetalus* and grasses such as *Austrodanthonia setacea*, *Austrostipa scabra*, *Austrostipa densiflora, Austrodanthonia eriantha*, *Thyridolepis mitchelliana* and *Amphipogon caricinus*. The rock ferns (*Cheilanthes* spp.) are common. Occurs on shallow gravel, sandy or loamy soils derived from sandstone, conglomerate, chert, granite and volcanics on rocky hills, hill slopes and footslopes on isolated rocky ridges in the NSW South-western Slopes Bioregion extending into the eastern edge of the Cobar Peneplain and Riverina Bioregions. Mainly occurs in the temperate (hot summers) climate zone receiving between 400 and 600 mm of annual rainfall. Not threatened due to position in landscape (rocky ridges) but grazing by domestic stock and goats is adversely affecting some sites. The rare Glossy Black Cockatoo feeds on the fruit of the Drooping She-oak.

PCT ID	PCT Name	Vegetation Formation	TEC Status	Justification of Identification	Current NSW Extent (ha)
186	Dwyer's Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion	Semi-arid Woodlands (Shrubby sub-formation)	Not a TEC	• Upper stratum species included *Eucalyptus dwyeri* and *Callitris endlicheri,* • Minor occurrences of *Callitris glaucophylla* were noted, but areas with significant concentrations of this species were assigned to PCT 185. • Native groundcover depauperate but containing the associated species *Calotis cuneifolia*, *Stuartina muelleri* and *Cheilanthes sieberi*. • PCT 186 is mapped within and close to the subject land according to predictive vegetation mapping for the region • Filtering the NSW Vegetation Classification Database by the relevant subregion and the two dominant canopy species returns six perfect (3/3) matches. Of these, only two list *E. dwyeri* as a major species: PCT 186 and PCT 239. The remaining PCTs were variously dominated by mallee eucalypts (178), *Eucalyptus sideroxylon* and *E. microcarpa* (217), she-oak and heath vegetation (292), or *Eucalyptus dealbata* (1278). These vegetation types were not recorded within the subject land and consequently were removed from consideration. • Of the remaining two PCTs – 186 and 239 – 186 was preferred, as PCT 239 is typically dominated by *Eucalyptus macrorhyncha* and is considered to be confined to sheltered gullies.	50,000

Description

Woodland or mallee shrubland dominated by Dwyer's Red Gum (*Eucalyptus dwyeri*), Black Cypress Pine (*Callitris endlicheri*) with Currawang (*Acacia doratoxylon*) often present. Drooping She-oak (*Allocasuarina verticillata*) may be present in areas infrequently burnt. Mugga Ironbark (*Eucalyptus sideroxylon*) may be present on mid-lower slopes. Tumbledown Red Gum (*Eucalyptus dealbata*) may occur in eastern occurrences. The understorey contains a mid-dense to sparse shrub layer that includes *Calytrix tetragona, Cassinia laevis, Grevillea floribunda, Acacia linearifolia, Dodonaea viscosa subsp. spatulata, Dodonaea viscosa subsp. mucronata, Acacia paradoxa, Correa reflexa, Acacia lineata* and in some eastern location's patches of *Kunzea ambigua*. The ground cover is sparse and can be very sparse on rocky areas and rocks may compose 60% of a site. Small shrubs such as *Melichrus urceolatus, Astroloma humifusum, Platysace lanceolata, Brachyloma daphnoides* and *Hibbertia obtusifolia* may be present along with grasses such as *Austrodanthonia* spp*., Austrostipa densiflora, Austrostipa scabra, Austrostipa mollis, Aristida ramosa* and *Themeda australis*. The sedge *Lepidosperma laterale* is often abundant. Forbs include *Gonocarpus elatus, Calotis cuneifolia, Stuartina muelleri* and *Chrysocephalum semipapposum*. Rock Ferns (*Cheilanthes spp*.) are usually common. The rare plant *Senecio garlandii* occurs at several sites including The Rock Nature Reserve south of Wagga Wagga. The ground cover may form rock forblands in some areas and on a different scale this could be described as a community in itself. Occurs on skeletal or shallow lithosol soils derived from sandstones, granites or other siliceous substrates including quartzite and psammite. Generally present on steep upper slopes, ridgelines or steep gullies on rocky hills mainly

in the NSW South-western Slopes Bioregion but extending into the south-eastern edge of the Cobar Peneplain Bioregion. Due to its location on rocky ridges most of this community remains uncleared but grazing by stock or feral animals may threaten some locations. A broadly classified and widely distributed community that could be divided with floristic analyses.

Table 5-2. Extent of native vegetation on the subject land.

PCT ID	PCT Name	Area on Subject Land (ha)
PCT 70	White Cypress Pine woodland on sandy loams in central NSW wheatbelt.	2.66
PCT 72	White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	0.98
PCT 185	Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	0.49
PCT 186	Dwyer's Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion.	0.10
	Total native vegetation	**4.23**
0	Non-native / non-vegetated quarry land	31.29
Total		**35.52**

5.2 Vegetation Zones, Patch Size and Vegetation Integrity

To be assessed under the BAM, native vegetation within the subject land is required to be further stratified into broad condition states and patch size. To this end, native vegetation has been assigned a zone, based on its condition state and the patch to which it belongs.

Broad condition states have been determined by the presence or absence of the key structural elements of the respective PCT and the vegetation integrity (VI) score, calculated in the BAM-C using plot data. This method also compares data collected with the benchmarks for each PCT. The presence or absence of structural elements was assessed both by reviewing plot data and general observations made while carrying out field work. Results are shown in **Table 5-3** and depicted in **Figure 5-1.**

A number of the BAM plots are outside the subject land as the extent of the subject land footprint was reduced after the vegetation surveys were conducted. The original footprint and vegetation mapping is shown in **Figure 5-2.**

A patch is defined in the BAM (2020) as an area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100 metres from the next area of native vegetation (or ≤30 m for non-woody ecosystems). The patch may extend onto land adjoining the subject land. The patch size should include derived communities (i.e. one or more of the structural components or strata layers is missing, modified or new) as these are likely to provide suitable habitat for at least some species.

Patch size is entered as a categorical rather than a continuous input (with the largest category being >100 ha). The subject land is connected to a large parcel of native vegetation that extends beyond 5000 ha, far exceeding the 100 ha category. The patch was not mapped

beyond 5000 ha. The patch size for the vegetation zones that were recorded on the subject land are provided in **Table 5-3** and depicted in **Figure 5-3**.

Vegetation zones were identified and delineated on the subject land in accordance with Section 5.3 of the BAM and are shown in **Figure 5-1** and **Figure 5-2**. The latter figure displays the full extent of the quarry site rather than the subject land. The mapping of vegetation zones was later refined to the subject land as the final disturbance footprint was identified.

Table 5-3. Vegetation Zones and Patch Size of Native Vegetation on the Subject Land.

PCT ID	Condition State	Condition Description	VI Score	Composition	Structure	Function	HBT	Area Impacted	Patch Number	Patch Size	BAM Patch Size Class	Vegetation Zone	BAM Plots
70	Poor	Remnant woodland with a predominantly non-native understory.	40.8	28.7	58.5	40.5	No	2.66	1	>5000 ha	>100 ha	70_Poor	WRQ10 WRQ11 WRQ12
72	Poor	Isolated patches of remnant trees with a predominantly non-native understory.	25.5	44.1	9.7	38.6	Yes	0.98	1	>5000 ha	>100 ha	72_Poor	WRQ01 WRQ02 WRQ03 WRQ04
185	Poor	Scattered trees, including regrowth, with a weedy understorey.	18.5	48.3	7.4	17.8	No	0.49	1	>5000 ha	>100 ha	185_Poor	WRQ13
186	Moderate	Remnant woodland with some native grasses and forb present.	73.4	75.2	62	84.7	Yes	0.10	1	>5000 ha	>100 ha	186_Moderate	WRQ05 WRQ06 WRQ07

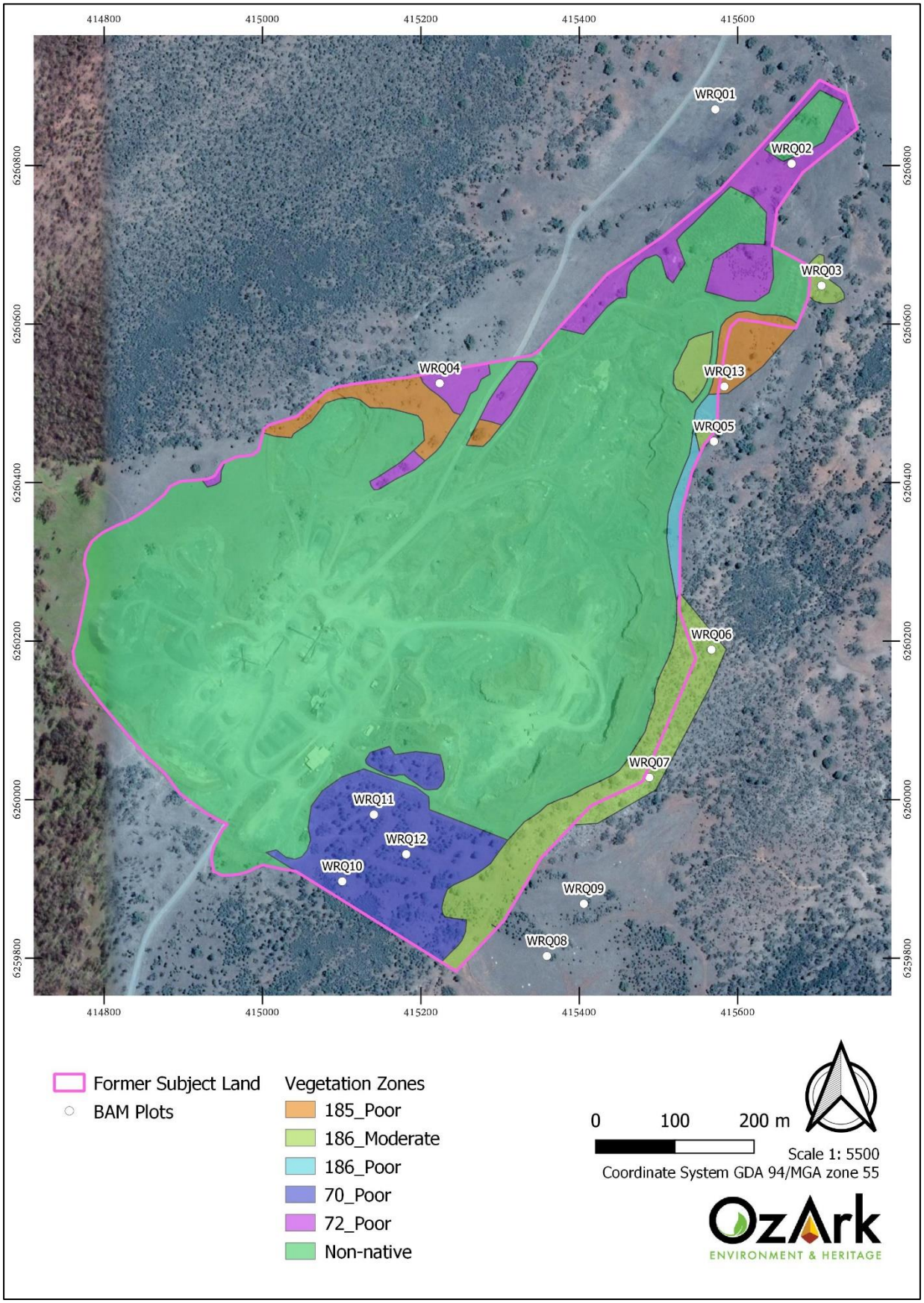

Figure 5-2. Original subject land boundary and vegetation mapping prior to footprint reduction.

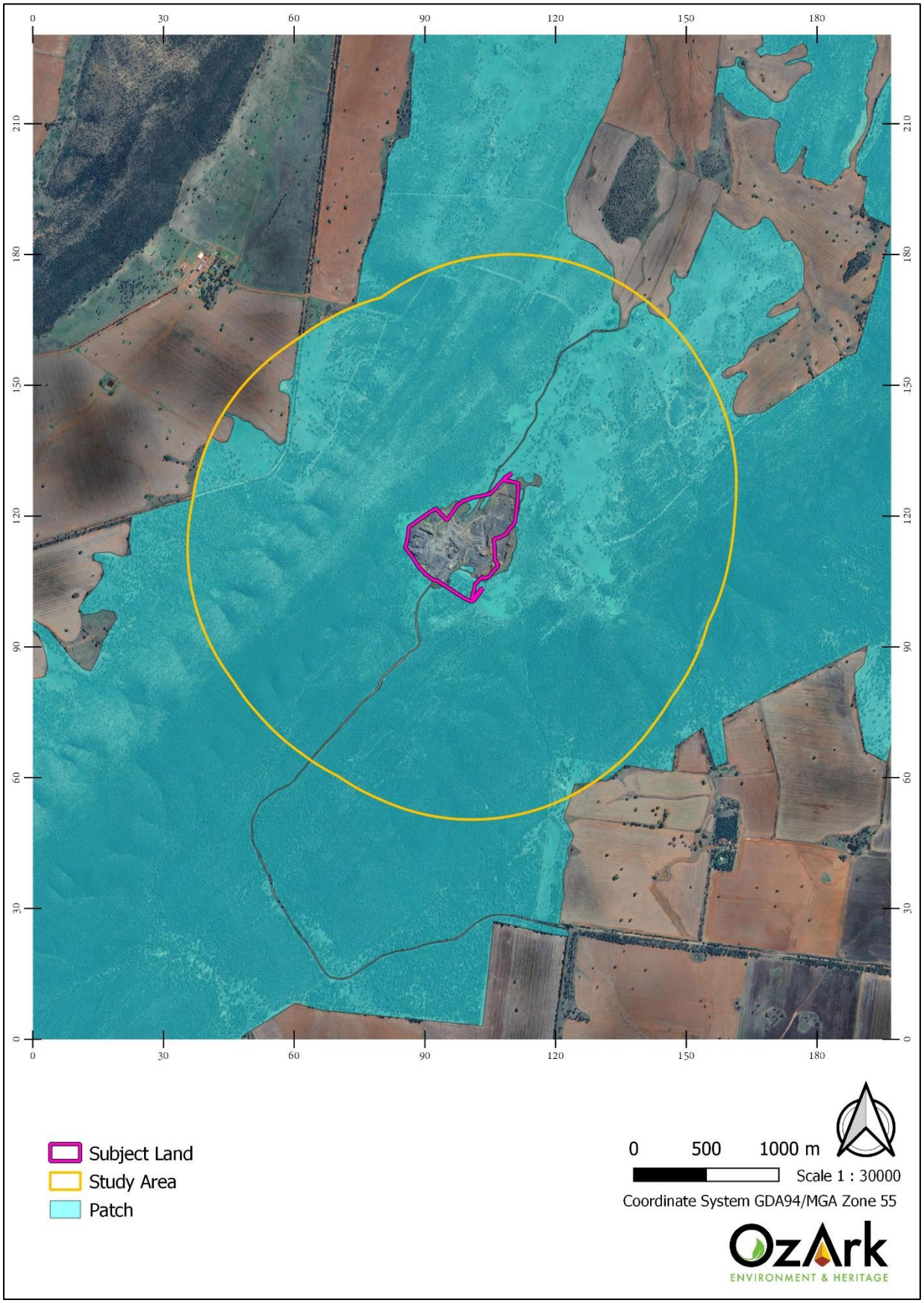

Figure 5-3. Intact Native Vegetation Patch.

5.3 Threatened Ecological Communities

The NSW Department of Climate, Change, Energy, the Environment and Water TEC listing determination descriptions were used to determine if the vegetation within the subject land should be classified as the below TECs. Only one of the four recorded PCTs – PCT 186 – is listed as having an associated TEC in the NSW Vegetation Classification database. PCT 186 is associated with the following TEC:

- BC Act-listed Critically Endangered Ecological Community (CEEC), Mallee and Mallee-Broombush dominated woodland and shrubland, lacking *Triodia*, in the NSW South Western Slopes Bioregion.

The NSW Scientific Committee – final determination document (OEH, 2010) was used to assess whether the listing is appropriate for the BC Act-listing. The occurrence of PCT 186 within the subject land did not meet the threshold conditions for the BC Act-listed CEEC for the following reasons:

- All NSW sites of the CEEC are contained within the NSW South Western Slopes Bioregion, whereas the subject land is within the Cobar Peneplain Bioregion.
- The canopy of the CEEC is dominated by mallee eucalypts. Dwyer's Red Gum (*Eucalyptus dwyeri*) may form part of this assemblage but is not the sole dominant canopy species.
- Where Dwyer's Red Gum does occur within this CEEC, it is typically co-dominant with or sub-dominant to Blue Mallee (*Eucalyptus polybractea*) and occurs with a layer of the shrub Broombush (*Melaleuca uncinata*). These species were not recorded within the subject site.

PCT 70, PCT 72, and PCT 185 are not associated with any TEC. Considering the above, no TEC will be affected by the proposal.

5.4 Weeds

Two high threat exotic weed species were recorded on the subject land, Mediterranean Turnip (*Brassica tournefortii*) and Bathurst Burr (*Xanthium spinosum*). These species have not been identified as Priority Weeds (PW) for the Riverina or as Weeds of National Significance (WoNs).

Actions to avoid, minimise and mitigate the impact from weeds have been suggested in **Section 7.2** of the BDAR.

6 Threatened species

For the purpose of credit calculations, these species are listed as either ecosystem credit species or species credit species, where:

- An ecosystem credit species is a species whose likelihood of occurrence can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. A targeted survey is not required for these species (DPIE, 2020).
- A species credit species is a species whose likelihood of occurrence cannot be predicted by vegetation surrogates and/or landscape features and can be reliably detected by survey. A targeted survey or expert report is required to confirm presence/absence of these species (DPIE, 2020).

The candidate ecosystem and species credit species generated by the BAM-C were reviewed in the context of information collected in the field surveys about the site context and presence / absence of habitat attributes. On this basis, candidate species were either assumed present, or considered absent due to habitat constraints (**Table 6-1, Table 6-2**, **Appendix E**). Assumed present species were then the subject of targeted surveys.

The likelihood of occurrence of ecosystem and species credit species was categorised as follows:

- 'Present' (surveyed) – the species was observed on the subject land during field surveys.
- 'Assumed Present' – the species was predicted to occur by the BAM-C and suitable habitat features occurred within the subject land for that species.
- 'Absent' (surveyed) – targeted survey during the species required survey timeframe did not detect the species.
- 'Absent' (habitat constraints) – habitat on-site and in the vicinity is unsuitable for the species
- EPBC listed fauna that were predicted to occur within 10 km of the subject land were also assessed for their likely presence or absence within the subject land according to habitat assessments (**Appendix F**).

6.1 Ecosystem Credit Species

In total, 29 ecosystem credit species were generated by the BAM-C (**Table 6-1**). The habitat suitability of the subject land for these species was assessed. Habitat features including but not limited to rock outcrops, caves and overhangs, hollow-bearing trees, wetlands including

dams, and watercourses were searched for on the subject land and recorded, if present. Hollow-bearing trees with both large (>20cm diameter) and small (<20 cm diameter) hollows in both horizontal and vertical orientations were also recorded. Numerous small hollows were recorded within the subject land. No large hollows occur within the impact area, but one was noted in a tree c. 50 m from the edge of the subject land (see **Figure 3-1**). Three species were removed from the list due to habitat constraints, two species was detected on site, and 24 further species are assumed present (**Table 6-1**). A habitat assessment summary for each species is detailed in **Appendix E**.

Table 6-1. Ecosystem credit species predicted to occur and their nature of presence within the subject land.

Common Name	Scientific Name	Presence
Antechinomys laniger	Kultarr	Assumed present
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Assumed present
Calyptorhynchus lathami	Glossy Black-Cockatoo	Absent (habitat constraints)*
Certhionyx variegatus	Pied Honeyeater	Assumed present
Chalinolobus picatus	Little Pied Bat	Assumed present
Chthonicola sagittata	Speckled Warbler	Present (surveyed)
Circus assimilis	Spotted Harrier	Assumed present
Daphoenositta chrysoptera	Varied Sittella	Assumed present
Falco hypoleucos	Grey Falcon	Assumed present
Falco subniger	Black Falcon	Assumed present
Grantiella picta	Painted Honeyeater	Absent (habitat constraints)*
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	Absent (habitat constraints)*
Hamirostra melanosternon	Black-breasted Buzzard (Foraging)	Assumed present
Hieraaetus morphnoides	Little Eagle (Foraging)	Assumed present
Hirundapus caudacutus	White-throated Needletail	Assumed present
Hylacola cautus	Shy Heathwren	Assumed present
Leipoa ocellata	Malleefowl	Assumed present
Lophochroa leadbeateri	Major Mitchell's Cockatoo (Foraging)	Assumed present
Lophoictinia isura	Square-tailed Kite (Foraging)	Assumed present
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Assumed present
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Assumed present
Neophema pulchella	Turquoise Parrot	Assumed present
Nyctophilus corbeni	Corben's Long-eared Bat	Assumed present
Pachycephala inornata	Gilbert's Whistler	Assumed present
Petroica phoenicea	Flame Robin	Assumed present
Polytelis swainsonii	Superb Parrot (Foraging)	Assumed present

Common Name	Scientific Name	Presence
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Present (surveyed)
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Assumed present
Stagonopleura guttata	Diamond Firetail	Assumed present

* See **Appendix E** for justification

6.2 Species Credit Species

In total, 17 species credit species or populations were generated by the BAM-C (**Table 6-2**). The habitat suitability of the subject land for these species was assessed. According to the BAM, if suitable habitat for these species occurs on the subject land, they must be the subject of an expert report or targeted survey according to the recommended guidelines, or else assumed present. After consideration, six species could be immediately discounted due to unsuitable habitat (**Appendix E**). The remaining species were surveyed for following relevant and approved BAM survey methodologies (**Section 3.3.3**); these species were not detected on the subject land. However, three candidate flora species were not able to be fully surveyed across the entire subject land as a small area (0.12 ha) of PCT 70_poor had already been disturbed prior to targeted surveys being conducted. As such, presence has been assumed for these three flora species in this area. Species polygons for these species are provided in **Figure 6-1.** Species polygons have been created in accordance with the TBDC and related threatened species survey guidelines, justification for the species polygons are outlined in **Appendix E**.

Table 6-2. Species credit species predicted to occur and their nature of presence within the subject land.

Common Name	Scientific Name	Presence
Curly-bark Wattle	*Acacia curranii*	Absent (surveyed)
A spear-grass	*Austrostipa metatoris*	Assumed present (0.12 ha of PCT 70) Absent surveyed (PCT 72)
A spear-grass	*Austrostipa wakoolica*	Absent (constraint)*
Bush Stone-curlew	*Burhinus grallarius*	Absent (surveyed)
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Absent (surveyed)
White-browed Treecreeper population in Carrathool LGA south of the Lachlan River and Griffith LGA	*Climacteris affinis* - endangered population	Absent (surveyed)
Pine Donkey Orchid	*Diuris tricolor*	Assumed present (0.12 ha of PCT 70) Absent (surveyed PCT 72)
Holly-leaf Grevillea	*Grevillea ilicifolia* subsp. *Ilicifolia*	Absent (surveyed)
White-bellied Sea-Eagle (Breeding)	*Haliaeetus leucogaster*	Absent (constraint)*
Black-breasted Buzzard (Breeding)	*Hamirostra melanosternon*	Absent (constraint)*
Little Eagle (Breeding)	*Hieraaetus morphnoides*	Absent (surveyed)
Major Mitchell's Cockatoo (Breeding)	*Lophochroa leadbeateri*	Absent (surveyed)
Square-tailed Kite (Breeding)	*Lophoictinia isura*	Absent (surveyed)
Barking Owl (Breeding)	*Ninox connivens*	Absent (constraint)*
Superb Parrot (Breeding)	*Polytelis swainsonii*	Absent (constraint)*
Silky Swainson-pea	*Swainsona sericea*	Assumed present (0.12 ha of PCT 70) Absent (surveyed PCT 72)
Masked Owl (Breeding)	*Tyto novaehollandiae*	Absent (constraint)*

*See **Appendix E** for justification

6.2.1 Species Credit Species Targeted Survey Results

None of the targeted threatened species were observed or heard. Fifteen species of fauna were observed directly during the field surveys (**Appendix C**). This includes fourteen bird species and a feral pig (*Sus scrofa*). Two species, the Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) and Speckled Warbler (*Chthonicola sagittata*), are listed as Vulnerable within NSW. Additionally, fifteen further species were detected through a SM4 Songmeter. This included twelve native birds, two mammals and one amphibian (**Appendix C**).

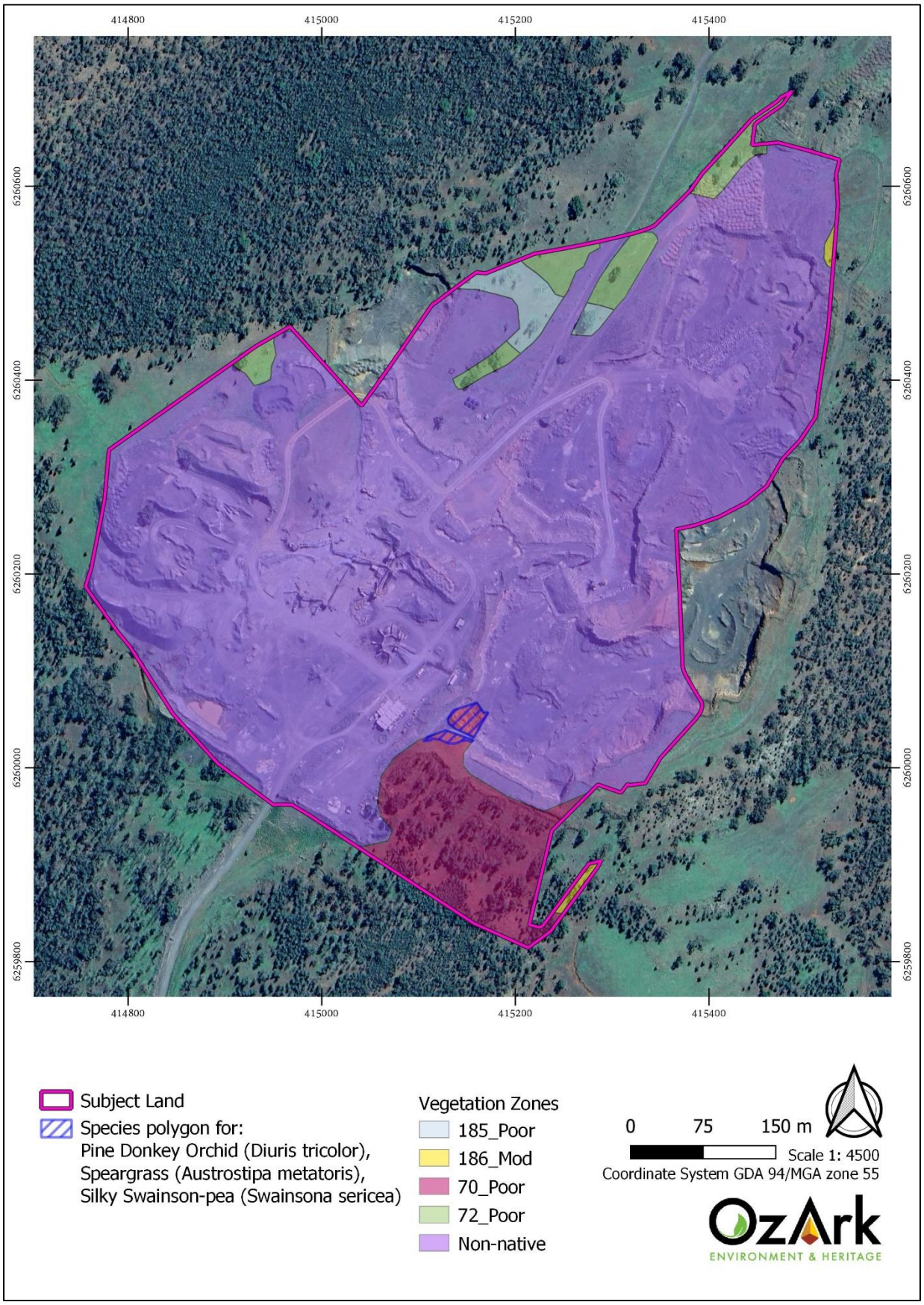

Figure 6-1. Species polygon for all species assumed present.

7 Impact Summary

7.1 Offset Scheme Threshold

The proposal will not impact land mapped on the Biodiversity Values Map. The proposal has been assessed against the relevant vegetation clearing thresholds under the NSW Biodiversity Offsets Scheme (BOS). The thresholds applicable to different lot size categories for the land zoning are provided in **Table 7-1** (DPIE, 2020). The subject land is currently zoned RU1 (primary production), with a minimum lot size of 40 ha. Clearing of 1 ha or more of native vegetation will require entry into the BOS. The proposal will clear up to 4.23 ha of native vegetation; thus, entry into the BOS is required.

Table 7-1. Area clearing thresholds for entry into the NSW Biodiversity Offsets Scheme.

LEP Minimum Lot Size	Threshold Area of Clearing
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	**0.5 ha or more**
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

7.2 Avoidance, Minimisation and Mitigation

The following avoidance measures have been integrated into the design and/or are suggested for the implementation of the proposal:

- The proposed impact footprint has been reduced and altered in the planning phase to minimise impact on biodiversity and heritage. The footprint has reduced in size by 12.30 ha, avoiding approximately 5.26 ha of native vegetation (**Figure 5-2**).
- In addition, the following minimisation methods have been or will be implemented:
    - Before starting work, erect a physical high visibility temporary boundary (e.g., with flagging tape) around the retained vegetation to prevent any accidental and unnecessary clearing
    - Vegetation will be removed in a manner that avoids damage to surrounding vegetation, ensuring disturbance to vegetation and soil is kept to a minimum.
- The proponent also intends to progressively rehabilitate areas of the subject land as they become available with a view to providing a low maintenance, geotechnically stable and safe landform with minimal erosion, and establishing native vegetation or pasture similar to that currently within and surrounding the Quarry Site. According to Section 2.14 of the Environmental Impact Statement, this would entail the following:

- Installation of silt-stop fencing downslope of areas under rehabilitation, if required.
- Removal of equipment and ripping of compacted areas with an excavator, where required.
- Backfilling of overburden, interburden and processing fines within nominated rehabilitation areas.
- Seeding of rehabilitation areas with suitable pasture crops.
- Use of overburden and/or interburden to form a substrate for the subsequent growth of trees and shrubs which would be planted either through direct seeding or tubestock.

Table 7-2 outlines further recommended environmental safeguards to reduce impacts on vegetation, soil, and biodiversity.

Table 7-2. Recommended environmental safeguards.

Impact	Environmental Safeguard	Timing
Clearing and prevention of over-clearing	• All personnel are to be inducted to be aware that disturbance of any stand of native vegetation outside the development footprint, or otherwise unauthorised disturbance, could have legislative consequences if done without approval. Evidence of all personnel receiving an induction would be kept on file (signed induction sheets). • Before start of work, clearly identify the extent of permitted vegetation clearing and areas to be retained as native vegetation. • A pre-clearing process and unexpected threatened species finds procedure is recommended. Any fauna found during the disturbance are to be allowed (or assisted) to relocate into adjoining habitat. • Vegetation will be removed in such a way to avoid unnecessary damage to surrounding vegetation. • Where possible, vegetation to be removed will be mulched on-site and re-used to stabilise disturbed areas. • Areas will be progressively rehabilitated as they become available and are no longer required for operations.	Pre-disturbance Pre-disturbance Pre-disturbance During operations Ongoing Ongoing
Bushfire protection	• Ensure vegetation management for bushfire protection is consistent, as far as practicable, with biodiversity protection and remove only the necessary vegetation to achieve fuel reduction.	Ongoing
Soil management	• An erosion and sediment control plan will be developed to comply with Council requirements and/or Landcom's Managing Urban Stormwater, Soils & Construction Guidelines 'The Blue Book' (Landcom 2004)	Pre-disturbance

Damage to native vegetation outside of impact zone	• Stockpile and compound sites are to be located within the assessed subject land and preferentially according to the following criteria:
	  • At least 40 m away from the nearest waterway.
	  • In areas of low ecological conservation significance (i.e. previously disturbed land).
	  • On relatively level ground.
	  • Stockpiling of materials and equipment, and parking of vehicles, is to be avoided within the dripline (extent of foliage cover) of any tree.
		During operations

Introduction and spread of significant weeds and pathogens	• Inspection and control of environmental weeds in accordance with a site vegetation management plan and subject to requirements of Council. • Machinery (bulldozers, excavators, trucks, loaders and graders) would be clean, and soil- and weed-free, before entry to the work site. • Weed-free fill only to be used for on-site earthwork. • Any herbicide use is to be in accordance with the requirements on the label. Any person carrying out herbicide application would be appropriately trained and competent in its use.	During operations
Disturbance to fallen timber, dead wood and bush rock	• All bush rock encountered on site is to be relocated to the edge of the disturbance area to enhance habitat and regeneration. • If threatened bats are detected, stop work immediately and either leave the area undisturbed until the individuals have dispersed or engage suitably qualified personnel to attempt their removal.	Pre-disturbance During operations
Disturbance to human made structures	• If threatened bats are detected, stop work immediately and either leave the area undisturbed until the individuals have dispersed or engage suitably qualified personnel to attempt their removal.	Pre-disturbance During operations

Impact	Environmental Safeguard	Timing
Threatened species	• No new areas to be cleared without further assessment, as threatened flora species may occur in any unassessed impact area. • If the impact footprint changes from the current extent assessed in the study, re-assessment of the potential impact of the activity would be needed to ensure impacts to threatened species are not inadvertently caused, given that suitable habitat for threatened species occurs elsewhere on the property. • Operational activities to occur only during approved hours of operation to avoid indirect impacts on threatened fauna such as vehicle strikes. • Enforce 40 km/h speed limits on access roads to reduce the risk of vehicle strikes. • Enforce lower speed limits (<20km/h) within the boundaries of the quarry itself.	Pre-disturbance, during operations, ongoing

7.3 Impacts to Wetlands, Watercourses and Aquatic habitat

There are no wetlands on the subject land or within the study area. Any potential for indirect impact to nearby watercourses from erosion and sedimentation related to construction activities will be avoided and minimised by developing and implementing an erosion and sediment control plan.

7.4 Impacts to Native Vegetation

There are four PCTs within the subject land occurring in one condition class each (poor or moderate). A total of 4.23 ha of native vegetation across these four vegetation zones will be cleared. The development will mitigate these impacts through the offset costs calculated in this report.

7.5 Serious and Irreversible Impacts

The Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE, 2019) and the NSW threatened species data collection has been used to determine which threatened species require further assessment for Serious And Irreversible Impacts (SAII).

No threatened species present or assumed present on the subject land require SAII assessment.

7.6 Prescribed Impacts

The BAM 2020 lists prescribed impacts that must be avoided, minimised and mitigated. These prescribed impacts and their relevance to the proposal are described in **Table 7-3**. Point 8.3.2 has been separated into two parts for the sake of clarity.

Table 7-3. Potential prescribed impacts of the proposal.

BAM 2020	Prescribed Impacts	Site Assessment	Mitigation Measure
8.3.1	Impacts on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs, rocks and other features of geological significance.	The subject land contains rock faces associated with actively quarried land. Impacts to these human-made rock faces will be continuous and unavoidable, given the nature of the proposal. No threatened entities likely to depend on rock faces for their lifecycle were generated by the BAM-C or identified during the site assessment. One ecosystem credit species, the Little Pied Bat (*Chalinolobus picatus*), is known to make use of outcrops and mine tunnels but not rock faces. Rock outcrops were noted in the surrounding landscape; however, the location of proposal activities avoids impacts to these areas. No natural karsts, caves, crevices, cliffs or other features of geological significance present on the subject land or within the study area.	None required.
8.3.2	Impacts of development on the habitat of threatened species or ecological communities associated with human-made structures.	Site plans indicate that the Quarry office may be relocated (**Figure 1-2**). Therefore, the existing office will be removed (**Figure 7-1**). This may result in the loss of habitat for species that make use of human-made structures. Only one threatened entity likely to make use of buildings was generated by the BAM-C: the Little Pied Bat (*Chalinolobus picatus*). The proposal will therefore result in minor, temporary disruption to potential habitat for this species. However, as the existing site office sees active use by workers, and as the site office will be reestablished nearby, the impact of this disruption is likely to be limited.	**Table 7-2**
8.3.2	Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.	Non-native vegetation on the subject land is unlikely to provide habitat for any threatened entity as it is located within an active quarry.	None required
8.3.3	Impacts of development on the habitat connectivity.	The impacts of the proposal are largely confined to land that has already undergone extensive historical clearance. The proposal area is surrounded by remnant vegetation; consequently, no impacts to connectivity for any threatened entity are likely.	**Table 7-2**
8.3.4	Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.	Three minor non-perennial watercourses are within the subject land (**Figure 7-1**). None of these watercourses contained water at the time of the surveys. Two of the mapped watercourses are within the	**Table 7-2**

BAM 2020	Prescribed Impacts	Site Assessment	Mitigation Measure
		existing quarry, and one runs parallel to the subject land, briefly crossing it. It is unlikely that these waterbodies support threatened entities, given that they are non-perennial watercourses within an already cleared landscape. The BAM-C and field surveys did not identify any threatened entities dependent on watercourses, beyond a general requirement of all species for sources of water. Minor sedimentation may result to watercourses if a sediment control plan is not implemented. See **Table 7-2**, "Soil management."	
8.3.5	Impacts of wind turbine strikes on protected animals.	The proposal does not entail the installation of wind turbines and no prescribed impacts of this kind will result from proposal activities.	None required.
8.3.6	Impact of vehicle strikes on threatened species of animals or on animals that are part of a TEC.	The possibility of vehicle strikes on animals exists both during the construction and operational phases of the proposal (**Figure 7-1)**. These impacts are most likely along the existing access road, though impacts may also occur at any location within the quarry itself. This applies to all threatened animal species that may occur within the subject land. Vehicle usage rates within the proposed quarry are uncertain and no reliable data exists as to the rate of vehicle strike within these areas. For these reasons, it is not possible to reliably quantify the likely impacts of vehicle strike on threatened flora. Mitigation measures, including enforcing reduced speed limits, have been identified.	**Table 7-2**

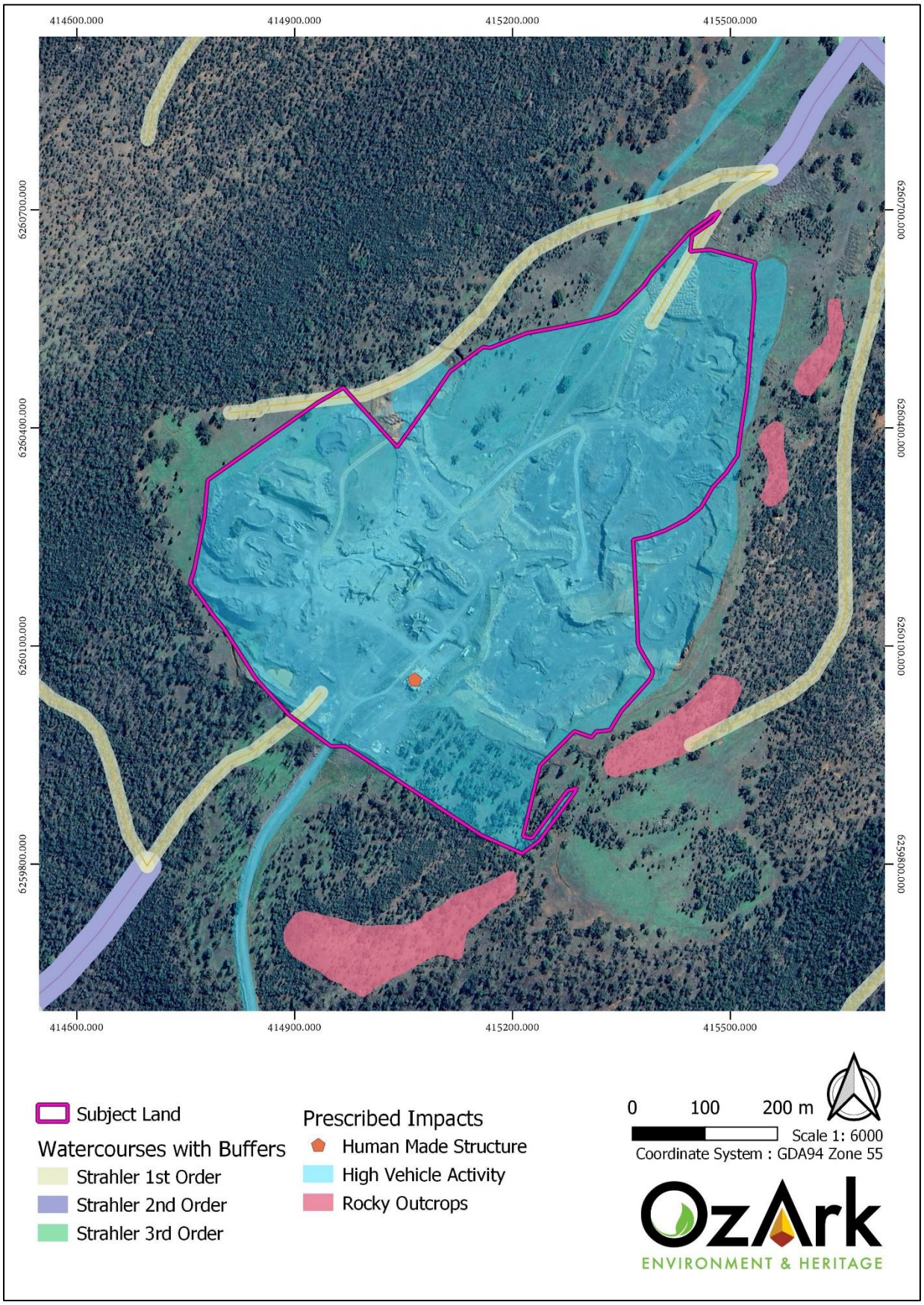

Figure 7-1. Prescribed impacts from the proposal.

7.7 Indirect Impacts

The main impacts of the proposal are expected to be contained within the subject land, provided there is adequate demarcation between operational areas and non-operational areas. Indirect impacts that have the potential to occur as a consequence of the proposal are listed within (**Table 7-4**). However, these indirect impacts will be minimised by following the environmental safeguards proposed in **Table 7-2**.

Table 7-4. Potential indirect impacts of the proposal

Nature of impact	Timing	Likelihood	Native species impacted	Impact on biodiversity
Inadvertent impacts on adjacent habitat or vegetation	During operations	Likely	• Native species surrounding the subject land • Threatened species assumed present and observed during fieldwork	Increased edge effects, loss of foraging habitat, potential injury or mortality to neighbouring fauna
Reduced viability of adjacent habitat due to edge effects	During operations	Likely	• Native vegetation surrounding the subject land • Threatened species assumed present and observed during fieldwork	Degradation of native vegetation and habitat for threatened flora and fauna
Reduce viability of adjacent habitat due to noise, dust or light spill	During operations	Likely	• Native species surrounding the subject land • Threatened species assumed present and observed during fieldwork	Minor foraging and breeding habitat for fauna may be altered or removed.
Transport of weeds and pathogens from the site to adjacent vegetation	During operations	Likely	• Native species surrounding the subject land	Degradation of native vegetation
Increased risk of starvation or exposure, and loss of shade or shelter	During operations	Unlikely	• Native species surrounding the subject land	Minor loss of foraging habitat
Loss of breeding habitat	During operations	Possible	• Native species surrounding the subject land • Threatened species assumed present and observed during fieldwork	Minor loss of potential breeding habitat
Trampling of threatened flora species	During operations	Unlikely	• Assumed present flora	Possible minor loss of threatened flora
Rubbish dumping or rubbish blowing off site	During operations	Likely	• Native species surrounding the subject land • Threatened species observed during fieldwork	Degradation of native vegetation and habitat for threatened species

7.8 Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, Matters of National Environmental Significance (MNES) and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government DAWE.

The EPBC Act protected matters search has identified three TECs, 25 threatened species, and eight migratory species that are known or predicted to occur in the 10 km search area (**Appendix A**). Of these, eight threatened and three migratory or marine species may occur within the impact footprint, based on the identification of potential habitat present in the subject land (**Appendices C** and **F**). An assessment of impact significance has been undertaken for these threatened species following EPBC guidelines (**Appendix G**).

A summary of these matters and whether the proposal is likely to impact them is provided in **Table 7-5**. It is concluded that no MNES will be significantly impacted by the proposal.

Table 7-5. Impacts to Matters of National Environmental Significance.

Consideration	Potential impact?
Any impact on a listed threatened species or communities?	Yes (non-significant, **Appendix G**)
Any impacts on listed migratory species?	Yes (non-significant, **Appendix G**)
Any impacts on a Ramsar wetland of international importance?	No
Any impacts on a Commonwealth marine environment?	No
Any impacts on a World Heritage property?	No
Any impacts on a National Heritage place?	No
Any impacts on the Great Barrier Reef Marine Park?	No
Does the proposal involve a nuclear action (including uranium mining)?	No
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	No
Additionally, any impact (direct or indirect) on Commonwealth land?	No

8 Biodiversity Credit and Offset Report

8.1 Management Zones

The BAM considers future vegetation condition of different areas of the development footprint when calculating biodiversity credits and offsets. Due to the absence of detailed site plans, it has been assumed that all vegetation within the development footprint will be managed the same: i.e. cleared. Therefore, offset requirements have been assessed assuming only one management zone.

8.2 Vegetation Integrity Assessment

Vegetation integrity (VI) scores have been calculated for each vegetation zone based on patch size, area to be impacted, vegetation composition, structure and function, as defined below.

Patch size – Area in hectares of total vegetation zone patch (i.e. the connected woody and non-woody vegetation).

Area – Area within the property that will be subject to clearing, modification or other treatment by the proposal. There is only one management zone as described above.

Composition – Score calculated based on species richness, i.e. the number of native species present.

Structure – Score calculated based on the cover (%) of each native species growth form.

Function – Score calculated based on habitat features, i.e. presence of tree sizes, hollow trees, coarse woody debris, litter cover (%) and high threat weed cover (%).

Benchmark data for the PCTs is also used in this calculation.

Data required for the calculation was collected in the field using the BAM, as described above. The VI assessment for each vegetation zone including the loss of VI due to the proposal is shown in **Table 8-1**.

Table 8-1. Vegetation Integrity (VI) assessment.

Vegetation Zone	PCT	Area of Zone to be Impacted (ha)	Assessed VI Score	Management Zone	Future VI Score	Change in VI Score
1	72_Poor	0.98	25.5	Proposed development area	0	-25.5
2	186_Moderate	0.10	73.4	Proposed development area	0	-73.4
3	70_Poor	2.66	40.8	Proposed development area	0	-40.8
4	185_Poor	0.49	18.5	Proposed development area	0	-18.5

8.3 Ecosystem Credit Summary

The ecosystem credits required to be retired are summarised in **Table 8-2**. Based on the VI score, 62 Ecosystem credits are required to be offset.

The full Biodiversity Credit Report generated by the BAM calculator is appended to the BDAR as **Appendix D**.

Table 8-2. Ecosystem Credits Required to be retired – like for like.

Impacted PCT	Number of Ecosystem Credits	IBRA Subregion	PCTs that can be used to offset the impacts from the development
PCT 70 – White Cypress Pine woodland on sandy loams in central NSW wheatbelt	47	Lachlan Plains	Floodplain Transition Woodlands This includes PCT's: 56, 70, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628
PCT 72 – White Cypress Pine – Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	9	Lachlan Plains	Western Peneplain Woodlands This includes PCT's: 72, 98, 103, 105, 108, 109, 134, 135, 145, 245, 246
PCT 185 – Dwyer's Red Gum – White Cypress Pine – Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	3	Lachlan Plains	Inland Rocky Hill Woodlands This includes PCT's: 104, 106, 122, 175, 176, 177, 178, 180, 184, 185, 186, 188, 218, 239, 256, 257, 258, 292, 317, 318, 319, 328, 329, 332, 334, 357, 424, 427, 439
PCT 186 – Dwyer's Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion	3	Lachlan Plains	Inland Rocky Hill Woodlands This includes PCT's: 104, 106, 122, 175, 176, 177, 178, 180, 184, 185, 186, 188, 218, 239, 256, 257, 258, 292, 317, 318, 319, 328, 329, 332, 334, 357, 424, 427, 439
TOTAL	62		

8.4 Species Credit Summary

The species credits required for the proposal are summarised in **Table 8-3**. Three species credit species were assumed present in a small area (0.12 ha) of PCT 70 that was not able to be surveyed, generating 6 species credits.

The full biodiversity credit summary report is provided in **Appendix D**.

Table 8-3. Species credits required to be retired – like for like.

Impacted Species Credit Species	Number of Species Credits	IBRA Subregion
Austrostipa metatoris / A spear-grass	2	Anywhere in NSW
Diuris tricolor / Pine Donkey Orchid	2	Anywhere in NSW
Swainsona sericea / Silky Swainson-pea	2	Anywhere in NSW

8.5 Offset Requirement

Offsetting is required for the 62 Ecosystem Credits and 6 Species Credits listed above and in **Appendix D**. The proponent intends to satisfy their Ecosystem and Species Credit obligations by buying and retiring the necessary credits from the open market or by paying directly into the Biodiversity Conservation Fund.

9 Summary and conclusions

The proposal will clear up to 4.23 ha of native vegetation to extend quarry operations, which includes an extraction area, processing and product stockpiling area, ancillary components area and operational disturbance area.

As the proposal will clear more than 1 ha of native vegetation, a BDAR is required to assess the impacts of the proposal on biodiversity and the proponent's offset obligations under the BOS.

The native vegetation consists of four PCTs:

- PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt.
- PCT 72 - White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion.
- PCT 185 - Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion.
- PCT 186 - Dwyer's Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion.

PCT 186 is associated with the following TEC:

- BC Act listed, EEC, Mallee and Mallee-Broombush dominated woodland and shrubland, lacking *Triodia*, in the NSW South Western Slopes Bioregion.

Based on the results of the field survey, the occurrence of this PCT within the subject land did not meet the composition criteria to be considered an example of this TEC. No TECs occur within the subject land.

In total, 29 Ecosystem Credit Species were generated by the BAM-C. Three species were removed from the list due to habitat constraints, two species were detected on site, and 24 further species are assumed present on the subject land, generating a total of 62 Ecosystem Credits. In addition, 17 Species Credit Species were generated by the BAM-C. Of these, six species were removed due to habitat constraints. The remaining species were surveyed for following relevant and approved BAM survey methodologies; these species were not detected on the subject land. However, three candidate flora species were not able to be fully surveyed across the entire subject land as a small area (0.12 ha) of PCT 70_poor had already been disturbed prior to targeted surveys being conducted. As such, presence has been assumed for these three flora species in this area generating a total of six Species Credits.

Offsetting is required for 62 Ecosystem Credits and 6 Species Credits. The proponent intends to satisfy their Ecosystem and Species Credit obligations by buying and retiring the necessary credits from the open market or by paying directly into the Biodiversity Conservation Fund.

The significance of the proposed impact to EPBC Act-listed entities predicted to occur within a 10 km search area was assessed. No significant impact to a wetland, TEC, threatened, migratory, or marine species is expected as a result of this proposal. The residual ecological impacts of the proposal would be adequately mitigated using the management actions recommended. Therefore, a referral of the proposal to the Federal DCCEEW for these matters is not required.

This assessment covers the current form of the proposal, any change to the scope of work may require re-assessment.

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Appendix A: Database Search Results

Australian Government
Department of Climate Change, Energy, the Environment and Water

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. Please see the caveat for interpretation of information provided here.

Report created: 19-Jun-2024

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment 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 (Ramsar	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	25
Listed Migratory Species:	8

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 https://www.dcceew.gov.au/parks-heritage/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 Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	3
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity
Banrock station wetland complex	500 - 600km upstream from Ramsar site
Hattah-kulkyne lakes	300 - 400km upstream from Ramsar site
Riverland	400 - 500km upstream from Ramsar site
The coorong, and lakes alexandrina and albert wetland	600 - 700km upstream from Ramsar site

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.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat may occur within area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Lophochroa leadbeateri leadbeateri Major Mitchell's Cockatoo (eastern), Eastern Major Mitchell's Cockatoo, Pink Cockatoo (eastern) [82926]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Melanodryas cucullata cucullata		
South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat likely to occur within area
Neophema chrysostoma		
Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area
Pedionomus torquatus		
Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii		
Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Stagonopleura guttata		
Diamond Firetail [59398]	Vulnerable	Species or species habitat likely to occur within area
FISH		
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
FROG		
Crinia sloanei		
Sloane's Froglet [59151]	Endangered	Species or species habitat may occur within area
MAMMAL		
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may 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]	Endangered	Species or species habitat may occur within area
PLANT		

Scientific Name	Threatened Category	Presence Text
Acacia curranii		
Curly-bark Wattle [3908]	Vulnerable	Species or species habitat likely to occur within area
Lepidium monoplocoides		
Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area
REPTILE		
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]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
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]	Vulnerable	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

Scientific Name	Threatened Category	Presence Text
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
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 overfly marine area
Bubulcus ibis as Ardea ibis		
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Chalcites osculans as Chrysococcyx osculans		
Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area overfly marine area
Neophema chrysostoma		
Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato)		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Not controlled action (particular manner)			
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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

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Please feel free to provide feedback via the Contact us page.

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BioNET Atlas search – threatened species predicted to occur within the Lachlan Plains subregion of the Cobar Peneplain Bioregion

Class	Scientific Name	Common Name	*NSW status	+Comm. status	Records
Amphibia	*Crinia sloanei*	Sloane's Froglet	E1,P	E	2
Amphibia	*Litoria raniformis*	Southern Bell Frog	E1,P	V	3
Reptilia	*Aprasia inaurita*	Mallee Worm-lizard	E1,P		2
Reptilia	*Tiliqua occipitalis*	Western Blue-tongued Lizard	V,P		3
Aves	*Leipoa ocellata*	Malleefowl	E1,P	V	95
Aves	*Anseranas semipalmata*	Magpie Goose	V,P		33
Aves	*Oxyura australis*	Blue-billed Duck	V,P		78
Aves	*Stictonetta naevosa*	Freckled Duck	V,P		62
Aves	*Apus pacificus*	Fork-tailed Swift	P	C,J,K	2
Aves	*Hirundapus caudacutus*	White-throated Needletail	P	V,C,J,K	3
Aves	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1,P		1
Aves	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	26
Aves	*Circus assimilis*	Spotted Harrier	V,P		39
Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		27
Aves	*^^Hamirostra melanosternon*	Black-breasted Buzzard	V,P,3		1
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		49
Aves	*^^Lophoictinia isura*	Square-tailed Kite	V,P,3		4
Aves	*^^Pandion cristatus*	Eastern Osprey	V,P,3		1
Aves	*^Falco hypoleucos*	Grey Falcon	V,P,2	V	3
Aves	*Falco subniger*	Black Falcon	V,P		7
Aves	*Grus rubicunda*	Brolga	V,P		11
Aves	*Ardeotis australis*	Australian Bustard	E1,P		6
Aves	*Burhinus grallarius*	Bush Stone-curlew	E1,P		3
Aves	*Pluvialis squatarola*	Grey Plover	P	C,J,K	1
Aves	*Rostratula australis*	Australian Painted Snipe	E1,P	E	4
Aves	*Actitis hypoleucos*	Common Sandpiper	P	C,J,K	3
Aves	*Calidris acuminata*	Sharp-tailed Sandpiper	P	C,J,K	63
Aves	*Calidris ferruginea*	Curlew Sandpiper	E1,P	CE,C,J,K	17
Aves	*Calidris melanotos*	Pectoral Sandpiper	P	J,K	3
Aves	*Calidris ruficollis*	Red-necked Stint	P	C,J,K	13
Aves	*Calidris subminuta*	Long-toed Stint	P	C,J,K	1
Aves	*Gallinago hardwickii*	Latham's Snipe	P	J,K	12
Aves	*Limosa lapponica*	Bar-tailed Godwit	P	C,J,K	2
Aves	*Limosa limosa*	Black-tailed Godwit	V,P	C,J,K	15
Aves	*Numenius minutus*	Little Curlew	P	C,J,K	1
Aves	*Tringa glareola*	Wood Sandpiper	P	C,J,K	12
Aves	*Tringa nebularia*	Common Greenshank	P	C,J,K	20
Aves	*Tringa stagnatilis*	Marsh Sandpiper	P	C,J,K	62
Aves	*Gelochelidon nilotica*	Gull-billed Tern	P	C	9
Aves	*Hydroprogne caspia*	Caspian Tern	P	J	14

Class	Scientific Name	Common Name	*NSW status	+Comm. status	Records
Aves	*^Calyptorhynchus lathami lathami*	South-eastern Glossy Black-Cockatoo	V,P,2	V	35
Aves	*^Lophochroa leadbeateri*	Major Mitchell's Cockatoo	V,P,2	E	108
Aves	*Neophema chrysostoma*	Blue-winged Parrot	V,P	V	5
Aves	*^^Neophema pulchella*	Turquoise Parrot	V,P,3		30
Aves	*^^Polytelis swainsonii*	Superb Parrot	V,P,3	V	22
Aves	*^^Ninox connivens*	Barking Owl	V,P,3		9
Aves	*^^Tyto novaehollandiae*	Masked Owl	V,P,3		1
Aves	*Climacteris affinis*	White-browed Treecreeper population in Carrathool local government area south of the Lachlan River and Griffith local government area	E2,P		20
Aves	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V,P	V	194
Aves	*Chthonicola sagittata*	Speckled Warbler	V,P		256
Aves	*Hylacola cautus*	Shy Heathwren	V,P		42
Aves	*Certhionyx variegatus*	Pied Honeyeater	V,P		6
Aves	*Epthianura albifrons*	White-fronted Chat	V,P		57
Aves	*Grantiella picta*	Painted Honeyeater	V,P	V	60
Aves	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V,P		2
Aves	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V,P		120
Aves	*Cinclosoma castanotum*	Chestnut Quail-thrush	V,P		22
Aves	*Daphoenositta chrysoptera*	Varied Sittella	V,P		55
Aves	*Pachycephala inornata*	Gilbert's Whistler	V,P		22
Aves	*Pachycephala rufogularis*	Red-lored Whistler	E4A,P	V	9
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		54
Aves	*Drymodes brunneopygia*	Southern Scrub-robin	V,P		19
Aves	*Melanodryas cucullata cucullata*	Hooded Robin (south-eastern form)	V,P	E	135
Aves	*Petroica phoenicea*	Flame Robin	V,P		5
Aves	*Stagonopleura guttata*	Diamond Firetail	V,P		71
Mammalia	*Antechinomys laniger*	Kultarr	E1,P		1
Mammalia	*Ningaui yvonneae*	Southern Ningaui	V,P		K
Mammalia	*Sminthopsis macroura*	Stripe-faced Dunnart	V,P		1
Mammalia	*Phascolarctos cinereus*	Koala	E1,P	E	1
Mammalia	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		P
Mammalia	*Chalinolobus picatus*	Little Pied Bat	V,P		7
Mammalia	*Myotis macropus*	Southern Myotis	V,P		1
Mammalia	*Nyctophilus corbeni*	Corben's Long-eared Bat	V,P	V	6
Mammalia	*Vespadelus baverstocki*	Inland Forest Bat	V,P		2
Flora	*Brachyscome papillosa*	Mossgiel Daisy	V	V	1
Flora	*Kippistia suaedifolia*	Fleshy Minuria	E1		2

Class	Scientific Name	Common Name	*NSW status	+Comm. status	Records
Flora	*Lepidium monoplocoides*	Winged Peppercress	E1	E	4
Flora	*Threlkeldia inchoata*	Tall Bonefruit	E1		2
Flora	*Eleocharis obicis*	Spike-Rush	V	V	4
Flora	*Swainsona murrayana*	Slender Darling Pea	V	V	P
Flora	*Swainsona sericea*	Silky Swainson-pea	V		8
Flora	*Acacia curranii*	Curly-bark Wattle	V	V	53
Flora	*^Caladenia arenaria*	Sand-hill Spider Orchid	E1,P,2	E	1
Flora	*^Diuris tricolor*	Pine Donkey Orchid	V,P,2		1
Flora	*Austrostipa metatoris*	A spear-grass	V	V	4
Flora	*Austrostipa wakoolica*	A spear-grass	E1	E	9
Flora	*Distichlis distichophylla*	Australian Saltgrass	E1		6
Flora	*Grevillea ilicifolia subsp. ilicifolia*	Holly-leaf Grevillea	E4A		5
Flora	*Pomaderris cocoparrana*	Cocoparra Pomaderris	E1	E	282

*NSW Status: P=Protected, P13=Protected native plant, V=Vulnerable, E1=Endangered, E2=Endangered population, E4=Extinct, E4A=Critically endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species.
+ Comm. Status: C=CAMBA, J=JAMBA, K=ROKAMBA, CE=Critically endangered, E=Endangered, V=Vulnerable.
- Number of Records: P = predicted to occur.

BioNET Atlas search – threatened ecological communities predicted to occur within the Lachlan Plains subregion of the Cobar Peneplain Bioregion

Community Name	*NSW status	+Comm. status	Records
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions		E	K
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia		E	K
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	E3		K
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	E3		K
Poplar Box Grassy Woodland on Alluvial Plains		E	K
Weeping Myall Woodlands		E	K
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	K

*NSW Status: P=Protected, P13=Protected native plant, V=Vulnerable, E1=Endangered, E2=Endangered population, E4=Extinct, E4A=Critically endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species. +Comm. Status: C=CAMBA, J=JAMBA, K=ROKAMBA, CE=Critically endangered, E=Endangered, V=Vulnerable. - Number of Records: P = predicted to occur.

BioNET Atlas search – key threatening processes predicted to occur within the Lachlan Plains subregion of the Cobar Peneplain Bioregion

Key Threatening Process	NSW status	Comm. status	Records
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	KTP		P
Anthropogenic Climate Change	KTP	KTP	P
Bushrock removal	KTP		P
Clearing of native vegetation	KTP	KTP	P
Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus* (L.)	KTP	KTP	P
Competition and habitat degradation by Feral Goats, *Capra hircus* Linnaeus 1758	KTP	KTP	P
Competition from feral honey bees, *Apis mellifera* L.	KTP		P
Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	KTP		P
Habitat degradation and loss by Feral Horses (brumbies, wild horses), *Equus caballus* Linnaeus 1758	KTP		P
Herbivory and environmental degradation caused by feral deer	KTP		P
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	KTP		P
Importation of Red Imported Fire Ants *Solenopsis invicta* Buren 1972	KTP	KTP	P
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	KTP	KTP	P
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	KTP	KTP	P
Infection of native plants by *Phytophthora cinnamomi*	KTP	KTP	P
Introduction of the Large Earth Bumblebee *Bombus terrestris* (L.)	KTP		P
Invasion and establishment of exotic vines and scramblers	KTP		P
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)	KTP		P
Invasion and establishment of the Cane Toad (*Bufo marinus*)	KTP	KTP	P
Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.	KTP		P
Invasion of native plant communities by *Chrysanthemoides monilifera*	KTP		P
Invasion of native plant communities by exotic perennial grasses	KTP		P
Invasion of the Yellow Crazy Ant, *Anoplolepis gracilipes* (Fr. Smith) into NSW	KTP		P
Invasion, establishment and spread of Lantana (*Lantana camara L. sens*. Lat)	KTP		P
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	KTP	KTP	P
Loss of Hollow-bearing Trees	KTP		P
Loss or degradation (or both) of sites used for hill-topping by butterflies	KTP		P
Predation and hybridisation by Feral Dogs, *Canis lupus familiaris*	KTP		P

Key Threatening Process	NSW status	Comm. status	Records
Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish)	KTP		P
Predation by the European Red Fox *Vulpes Vulpes* (Linnaeus, 1758)	KTP	KTP	P
Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)	KTP	KTP	P
Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa* Linnaeus 1758	KTP	KTP	P
Removal of dead wood and dead trees	KTP		P

Records: P = predicted to occur.

Biodiversity Values Map.

No areas mapped on the Biodiversity Values Map occur within the subject land (blue polygon).

NSW GOVERNMENT Department of Planning and Environment

Biodiversity Values Map and Threshold Report

This report is generated using the Biodiversity Values Map and Threshold (BMAT) tool. The BMAT tool is used by proponents to supply evidence to your local council to determine whether or not a Biodiversity Development Assessment Report (BDAR) is required under the Biodiversity Conservation Regulation 2017 (Cl. 7.2 & 7.3).

The report provides results for the proposed development footprint area identified by the user and displayed within the blue boundary on the map.

There are two pathways for determining whether a BDAR is required for the proposed development:

1. Is there Biodiversity Values Mapping?
2. Is the 'clearing of native vegetation area threshold' exceeded?

Biodiversity Values Map and Threshold Report

Date of Report Generation		19/06/2024 3:17 PM
1. Biodiversity Values (BV) Map - Results Summary (Biodiversity Conservation Regulation Section 7.3)		
1.1	**Does the development Footprint intersect with BV mapping?**	no
1.2	**Was ALL BV Mapping within the development footprinted added in the last 90 days?** (dark purple mapping only, no light purple mapping present)	no
1.3	**Date of expiry of dark purple 90 day mapping**	N/A
1.4	**Is the Biodiversity Values Map threshold exceeded?**	no
2. Area Clearing Threshold - Results Summary (Biodiversity Conservation Regulation Section 7.2)		
2.1	**Size of the development or clearing footprint**	392,835.7 sqm
2.2	**Native Vegetation Area Clearing Estimate (NVACE)** (within development/clearing footprint)	120,935.7 sqm
2.3	**Method for determining Minimum Lot Size**	LEP
2.4	**Minimum Lot Size** (10,000sqm = 1ha)	400,000 sqm
2.5	**Area Clearing Threshold** (10,000sqm = 1ha)	10,000 sqm
2.6	**Does the estimate exceed the Area Clearing Threshold?** (NVACE results are an estimate and can be reviewed using the Guidance)	yes
REPORT RESULT: Is the Biodiversity Offset Scheme (BOS) Threshold exceeded for the proposed development footprint area? (Your local council will determine if a BDAR is required)		**yes**

Page 1 of 4

NSW GOVERNMENT Department of Planning and Environment

What do I do with this report?

• If the result above indicates the BOS Threshold has been exceeded, your local council **may require** a Biodiversity Development Assessment Report with your development application. Seek further advice from Council. An accredited assessor can apply the Biodiversity Assessment Method and prepare a BDAR for you. For a list of accredited assessors go to: https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor.

• If the result above indicates the BOS Threshold has not been exceeded, you may not require a Biodiversity Development Assessment Report. This BMAT report can be provided to Council to support your development application. Council can advise how the area clearing threshold results should be considered. Council will review these results and make a determination if a BDAR is required. Council may ask you to review the area clearing threshold results. You may also be required to assess whether the development is "likely to significantly affect threatened species" as determined under the test in Section 7.3 of the *Biodiversity Conservation Act 2016*.

• If a BDAR is not required by Council, you may still require a permit to clear vegetation from your local council.

• If **all** Biodiversity Values mapping within your development footprint was less than 90 days old, i.e. areas are displayed as dark purple on the BV map, a BDAR may not be required if your Development Application is submitted within that 90 day period. Any BV mapping less than 90 days old on this report will expire on the date provided in Line item 1.3 above.

For more detailed advice about actions required, refer to the **Interpreting the evaluation report** section of the Biodiversity Values Map Threshold Tool User Guide .

Review Options:

• If you believe the Biodiversity Values mapping is incorrect please refer to our BV Map Review webpage for further information.

• If you or Council disagree with the area clearing threshold estimate results from the NVACE in Line Item 2.6 above (i.e. area of Native Vegetation within the Development footprint proposed to be cleared), review the results using the Guide for reviewing area clearing threshold results from the BMAT Tool.

Acknowledgement

I, as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature: _____ Date: _____

(Typing your name in the signature field will be considered as your signature for the purposes of this form)

19/06/2024 03:17 PM

Page 2 of 4

Department of Planning and Environment

Biodiversity Values Map and Threshold Tool

The Biodiversity Values (BV) Map and Threshold Tool identifies land with high biodiversity value, particularly sensitive to impacts from development and clearing.

The BV map forms part of the Biodiversity Offsets Scheme threshold, which is one of the factors for determining whether the Scheme applies to a clearing or development proposal. You have used the Threshold Tool in the map viewer to generate this BV Threshold Report for your nominated area. This report calculates results for your proposed development footprint and indicates whether Council may require you to engage an accredited assessor to prepare a Biodiversity Development Assessment Report (BDAR) for your development.

This report may be used as evidence for development applications submitted to councils. You may also use this report when considering native vegetation clearing under the State Environmental Planning Policy (Biodiversity and Conservation) 2021 - Chapter 2 vegetation in non-rural areas.

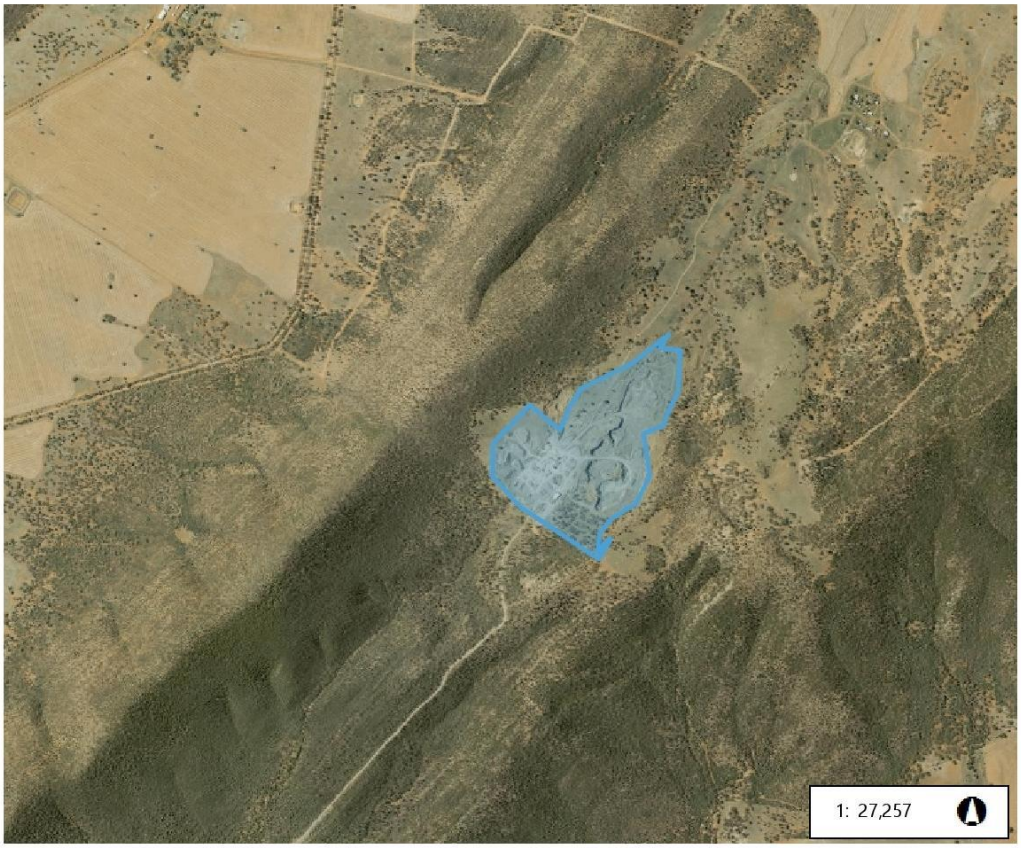
What's new? For more information about the latest updates to the Biodiversity Values Map and Threshold Tool go to the updates section on the Biodiversity Values Map webpage.

Map Review: Landholders can request a review of the BV Map where they consider there is an error in the mapping on their property. For more information about the map review process and an application form for a review go to the Biodiversity Values Map Review webpage.

If you need help using this map tool see our Biodiversity Values Map and Threshold Tool User Guide or contact the Map Review Team at map.review@environment.nsw.gov.au or on 1800 001 490.

Page 3 of 4

Biodiversity Values Map



1,384.6 0 692.32 1,384.6 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days
- Native Vegetation Area Clearing Estimate (NVACE)
- Development area selected by proponent

19/06/2024 03:17 PM

Imagery © Airbus DS/Spot Image 2016

© NSW Department of Customer Service, Basemaps 2019

© NSW Department of Planning and Environment

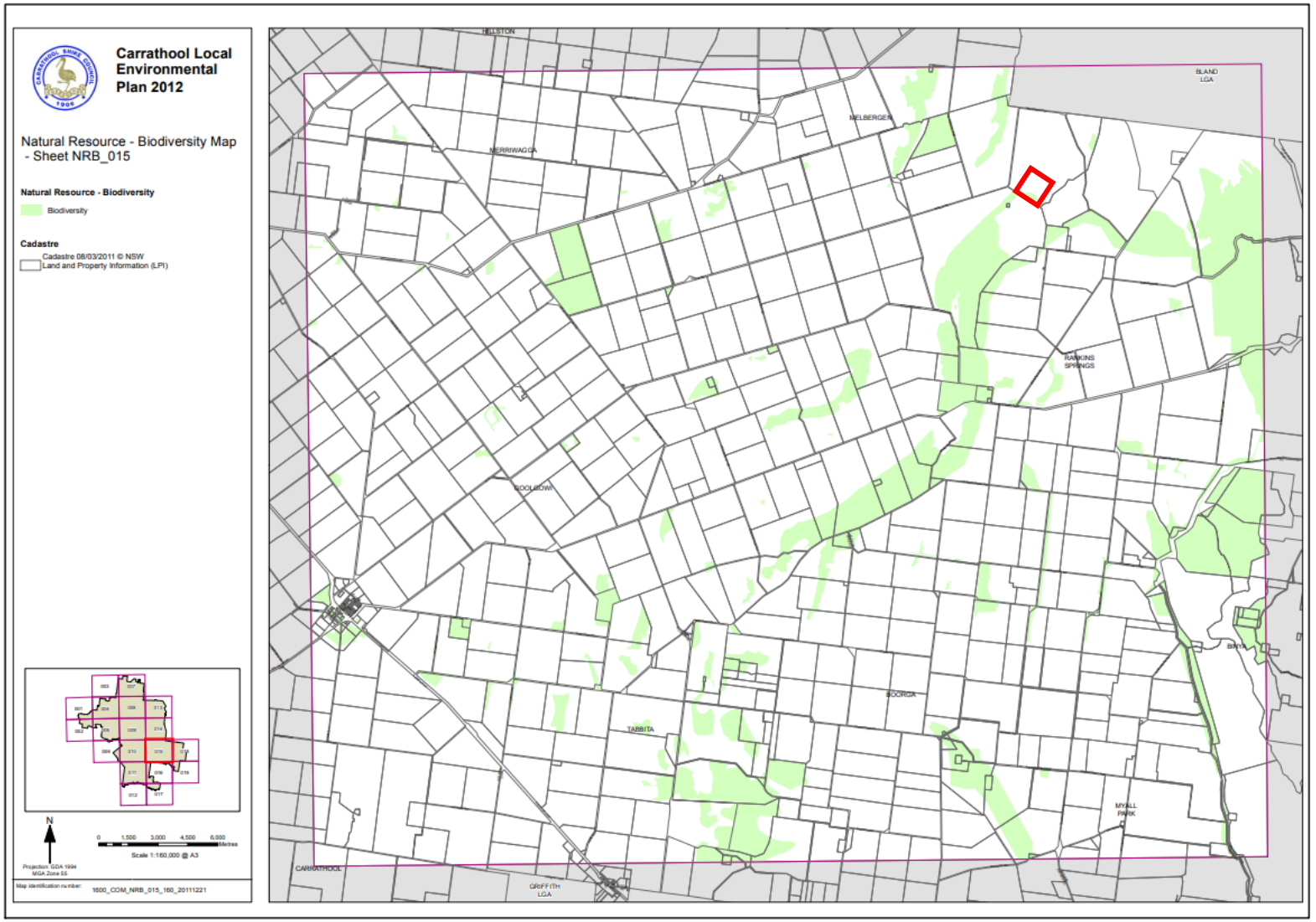
The results provided in this tool are generated using the best available mapping and knowledge of species habitat requirements.

This map is valid as at the date the report was generated. Checking the Biodiversity Values Map viewer for mapping updates is recommended.

Page 4 of 4

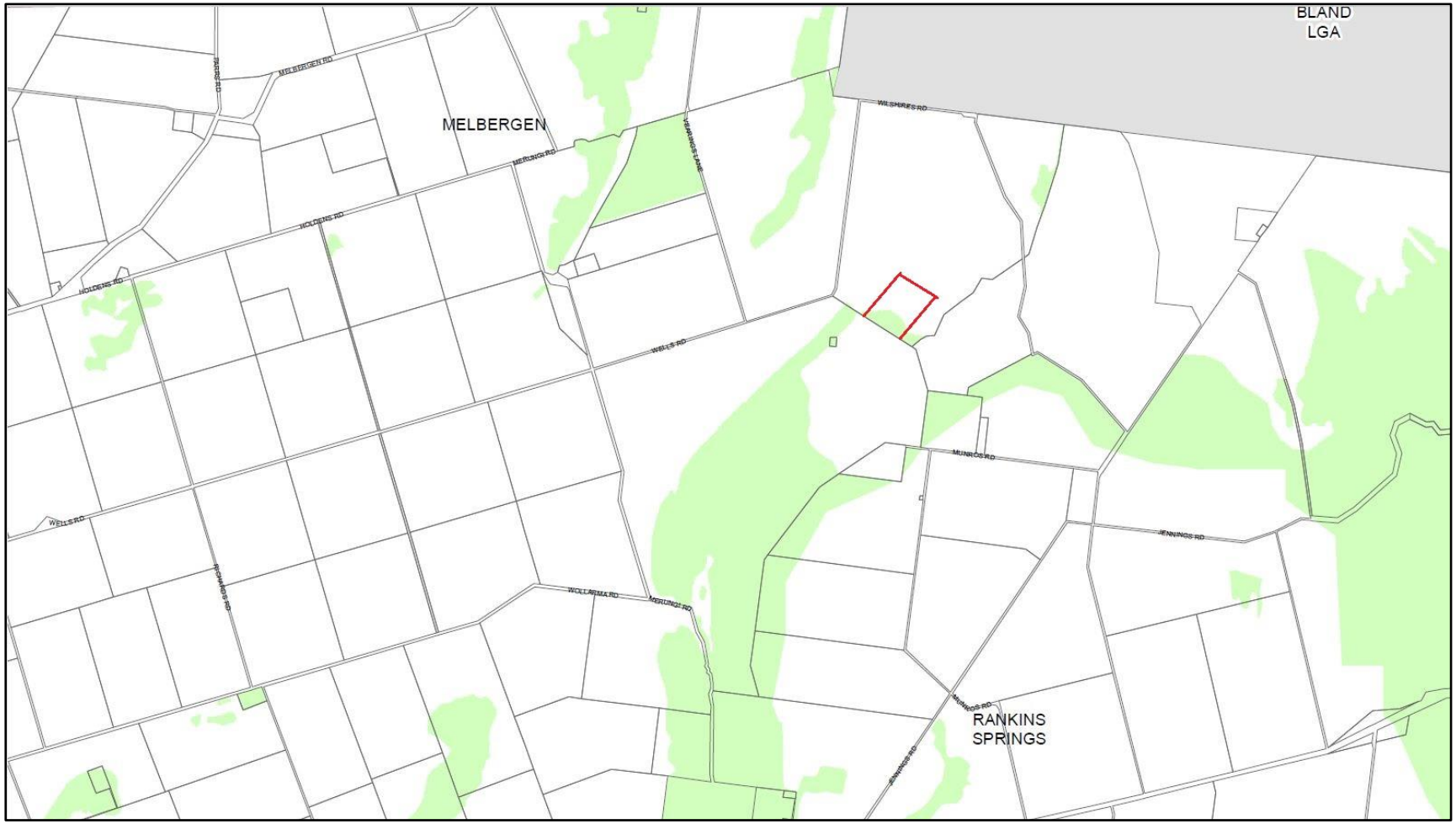
Carrathool Local Environmental Plan 2012 – Biodiversity Map.

Areas marked as green are areas of high biodiversity value. The red polygon indicates the approximate location of the subject land.



Carrathool Local Environmental Plan 2012 – Biodiversity Map (Magnified).

Areas marked as green are areas of high biodiversity value. The red polygon indicates the approximate location of the subject land.



Appendix B: Vegetation Plot Locations and Photographs

Plot Name	PCT	Easting (Zone 55)	Northing (Zone 55)	Photographs	
WRQ01	72	415571	6260870		

WRQ02	72	416658	6149912		

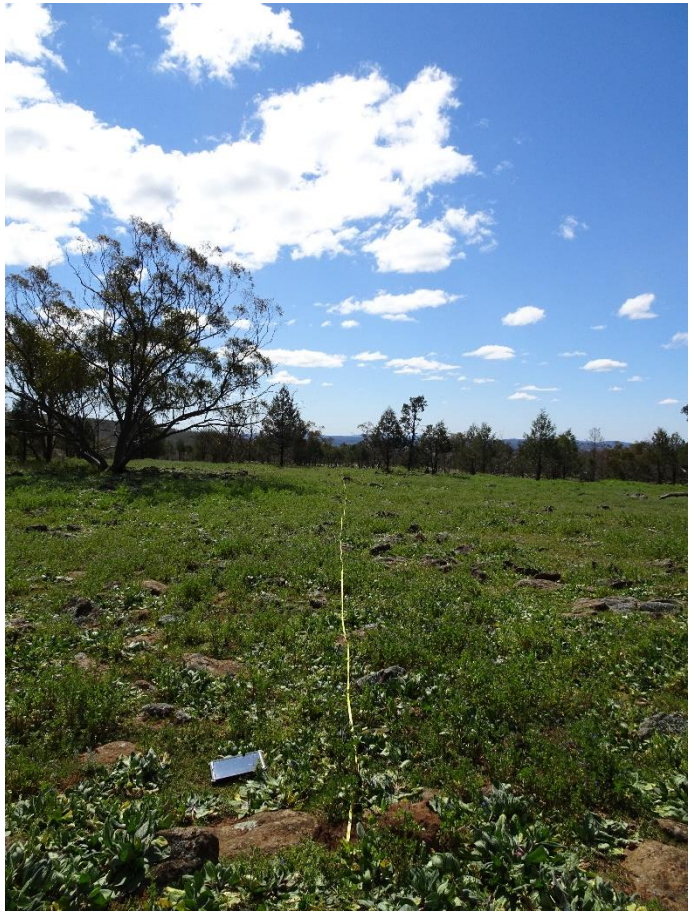
WRQ03	72	415705	6260650		

WRQ04	72	415223	6260526		

WRQ05	186	415570	6260452		

WRQ06	186	415565	6260190		

WRQ07	186	415490	6260029		

WRQ08	186	415358	6259804		
WRQ09	186	415406	6259869	No photographic record – plot data was not used in BDAR	No photographic record – plot data was not used in BDAR

WRQ10	70	415099	6259897		

WRQ11	70	415138	6260288		

WRQ12	70	415179	6259928		

WRQ13	186	415583	6260520		

Appendix C: Field Survey Results

Flora species list

The species listed below were identified on the subject land during the August 2019 field survey and the additional site visit in May 2022.

Growth Form: FG = Forb, GG = Grass and Grass-like, SG = Shrub, TG = Tree, EG = Fern, OG = Other

Status: N = Native, E = Exotic, HTE = High Threat Exotic

Growth form	Common name	Scientific name	Status
TG	Kurrajong	*Brachychiton populneus*	N
TG	Black Cypress-pine	*Callitris endlicheri*	N
TG	White Cypress-pine	*Callitris glaucophylla*	N
TG	Dwyer's Red Gum	*Eucalyptus dwyeri*	N
TG	Poplar Box	*Eucalyptus populnea*	N
SG	Urn Heath	*Melichrus urceolatus*	N
SG	Buckbush	*Salsola australis*	N
FG	Bristle Poppy	*Papaver aculeatum*	E
FG	Flannel Cudweed	*Actinobole uliginosum*	N
FG	Capeweed	*Arctotheca calendula*	E
FG	Mediterranean Turnip	*Brassica tournefortii*	HTE
FG	Bulbine Lily	*Bulbine alata*	N
FG	Purslane	*Calandrinia* sp.	N
FG	Purple Burr-daisy	*Calotis cuneifolia*	N
FG	Rough Burr-daisy	*Calotis hispidula*	N
FG	Maltese Cockspur	*Centaurea melitensis*	E
FG	Common Everlasting	*Chrysocephalum apiculatum*	N
FG	Darling Lily	*Crinum flaccidum*	N
FG	Native Carrot	*Daucus glochidiatus*	N
FG	Kidneyweed	*Dichondra repens*	N
FG	Sundew	*Drosera* sp.	N
FG	Goosefoot	*Dysphania* sp.	N
FG	Paterson's Curse	*Echium plantagineum*	E
FG	Climbing Saltbush	*Einadia nutans*	N
FG	Common Storksbill	*Erodium cicutarium*	E
FG	Blue Crowsfoot	*Erodium crinitum*	N
FG	Caustic Weed	*Euphorbia drummondii*	N
FG	Native Geranium	*Geranium solanderi*	N
FG	Hill Raspwort	*Gonocarpus elatus*	N
FG	Ivy Goodenia	*Goodenia hederacea*	N
FG	Goodenia	*Goodenia heteromera*	N
FG	Slender Violet-bush	*Hybanthus monopetalus*	N
FG	Smooth Catsear	*Hypochaeris glabra*	E
FG	African Peppercress	*Lepidium africanum*	E

Growth form	Common name	Scientific name	Status
FG	Horehound	*Marrubium vulgare*	E
FG	Burr Medic	*Medicago polymorpha*	E
FG	Medic	*Medicago* sp.	E
FG	Native Tobacco	*Nicotiana* sp.	N
FG	Native Oxalis	*Oxalis chnoodes*	N
FG	Native Oxalis	*Oxalis perennans*	N
FG	Native Oxalis	*Oxalis radicosa*	N
FG	Midget Greenhood	*Pterostylis mutica*	N
FG	Green Pussytails	*Ptilotus spathulatus*	N
FG	Brilliant Sunray	*Rhodanthe polygalifolia*	N
FG	Pigmy Sunray	*Rhodanthe pygmaea*	N
FG	Swamp Dock	*Rumex brownii*	N
FG	Bushy Groundsel	*Senecio cunninghamii*	N
FG	Cotton Fireweed	*Senecio quadridentatus*	N
FG	Groundsel	*Senecio* sp.	N
FG	Indian Hedge Mustard	*Sisymbrium orientale*	E
FG	Spoon Cudweed	*Stuartina muelleri*	N
FG	Dandelion	*Taraxacum officinale*	E
FG	White Clover	*Trifolium repens*	E
FG	Stinging Nettle	*Urtica incisa*	N
FG	New Holland Daisy	*Vittadinia cervicularis*	N
FG	Fuzzweed	*Vittadinia cuneata*	N
FG	Tall Bluebell	*Wahlenbergia communis*	N
FG	Bluebell	*Wahlenbergia* sp.	N
FG	Early Nancy	*Wurmbea dioica*	N
FG	Bathurst Burr	*Xanthium spinosum*	HTE
FG	Golden Everlasting	*Xerochrysum bracteatum*	N
GG	Rough Speargrass	*Austrostipa scabra*	N
GG	Wild Oat	*Avena fatua*	E
GG	Red Brome	*Bromus rubens*	E
GG	Brome	*Bromus* sp.	E
GG	Lovegrass	*Eragrostis* sp.	N
GG	Barley	*Hordeum vulgare*	E
GG	Weeping Grass	*Microlaena stipoides*	N
GG	Bandicoot Grass	*Monachather paradoxus*	N
GG	False Hairgrass	*Pentaschistis airoides*	E
GG	Wallaby Grass	*Rytidosperma* sp.	N
GG	Mulga Mitchell Grass	*Thyridolepis mitchelliana*	N
OG	Purple Coral-pea	*Hardenbergia violacea*	N
EG	Poison Rock Fern	*Cheilanthes sieberi*	N

Fauna species list

These species were identified on the site during the field surveys:

Species Name	Common Name	*BC Act	EPBC Act	Observation Type
Dacelo novaeguineae	Laughing Kookaburra			Seen/heard
Pomatostomus temporalis temporalis	Grey-crowned Babbler	V		Seen/heard
Nymphicus hollandicus	Cockatiel			Seen/heard
Northiella haematogaster	Bluebonnet			Seen/heard
***Corvus* sp.**	Raven			Seen/heard
Manorina melanocephala	Noisy Miner			Seen/heard
Coracina novaehollandiae	Black-faced cuckooshrike			Seen/heard
Gymnorhina tibicen	Australian Magpie			Seen/heard
Acanthiza pusilla	Brown Thornbill			Seen/heard
Acanthiza apicalis	Inland Thornbill			Seen/heard
Chthonicola sagittata	Speckled Warbler	V		Seen/heard
Myiagra inquieta	Restless Flycatcher			Seen/heard
Lalage tricolor	White-winged Triller			Seen/heard
Psephotus haematonotus	Red-rumped Parrot			Seen/heard
Macropus giganteus	Eastern Grey Kangaroo			SM4
Phaps chalcoptera	Common Bronzewing			SM4
Ocyphaps lophotes	Crested Pigeon			SM4
Aegotheles cristatus	Australian Owlet-nightjar			SM4
Vanellus miles	Masked Lapwing			SM4
Eolophus roseicapillus	Galah			SM4
Pardalotus striatus	Striated Pardalote			SM4
Acanthagenys rufogularis	Spiny-cheeked Honeyeater			SM4
Lichenostomus virescens	Singing Honeyeater			SM4
Cracticus torquatus	Grey Butcherbird			SM4
Corvus coronoides	Australian Raven			SM4
Grallina cyanoleuca	Magpie-lark			SM4
Struthidea cinereal	Apostlebird			SM4
Limnodynastes peronii	Brown-striped Frog			SM4
+Capra hircus	Feral Goat			SM4
+Sus scrofa	Feral Pig			Seen/heard

*V = vulnerable. + = Non-native

BAM Plot survey data sheets

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 18/8/19	Survey Name MILBRAE		
Recorders L		Plot ID # NRQ01	Zone ID
Photo #		Plot dimensions 20X50	
Datum	Zone	Plot bearing along midline 108	
Easting	Northing	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Grey Box / Poplar Box PCT82	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m / 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m / 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) /	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) /	Record stems for living trees only, and for all species
30 - 49	(+/-) –	For multistemmed trees, record only the largest stem
20 - 29	(+/-) –	Presence of <5cm stems records regeneration
10 - 19	(+/-) –	Record # trees with hollows, not number of hollows
5 - 9	(+/-) –	Count as one stem where tree is multistemmed
< 5	(+/-) –	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
/	<20cm /	/
	>20cm** /	

Length of logs: 卌 卌 卌 卌 丅 — Total (m): 25

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	20	10	10	80	80	
	Bare ground	0	70	60	–	10	
	Cryptogam	0	0	0	–	–	
	Rock	0	0	0	–	–	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	O	Microrelief
Cultivation	0		Slope ~~Plain~~ Lower slope
Grazing (native / stock)	1	R	Aspect
Soil erosion	0		Soil surface texture loam
Firewood removal	0		Soil colour Red-brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Isolated clumps of trees. Mid layer absent. Very weedy ground layer. No upper layer regen

BH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 28/8/19	Survey Name MLBR95				
Recorders		Plot ID # WRQ01		Zone ID	
GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Erodium crinitum	25			
	Echium plantagineum	15		E	
	Arctotheca calendula	50		E	
	Sabola tragus	0.5	50		
	Medicago polymorpha	5		E	
	Chrysocephalum apiculatum	0.1	5		
	Austrostipa sp	0.5	100		
	Microlaena stipoides	0.5	100	E	
	Forb 1 Erodium circutarium	10		E	
	~~Herbaceous~~ Marrubium vulgare	5		E	
	~~Unknown~~ Hordeum leporinum	5		E	
	Brassica tournefortii	~~2~~ 1		100	
	Oxalis perennans	0.5		200	
	Austrostipa scabra *	0.5		100	
	stuartina muelleri	0.5		200	
	Calotis hispidula	0.1		50	
	Calotis cuneifolia	0.1		10	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

RH - Version 1.1 - Date 1/11/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 28/8/19	Survey Name NL BRAE		
Recorders		Plot ID # WRQL	Zone ID
Photo #		Plot dimensions 20 x 50	
Datum	Zone	Plot bearing along midline 160°	
Easting 146°05'20.5" E	Northing 33°47'22.5" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point). Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Grey box / Poplar Box PCT 82	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) –	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) –	Record stems for living trees only, and for all species
30 - 49	(+/-) 1	For multistemmed trees, record only the largest stem
20 - 29	(+/-) –	Presence of <5cm stems records regeneration
10 - 19	(+/-) –	Record # trees with hollows, not number of hollows
5 - 9	(+/-) –	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
0	<20cm	
	>20cm**	0

Length of logs: ~~HH HH~~ HH HH | Total (m): 19

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	10	10	20	10	10	
	Bare ground	30	50	60	20	50	
	Cryptogam	-	-	5	5	-	
	Rock	-	-	5	50	5	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	0	Microrelief
Cultivation	0		Slope Lower slope
Grazing (native / stock)	1	C	Aspect
Soil erosion	0		Soil surface texture loam
Firewood removal	0		Soil colour red - brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes No Isolated clumps of trees. No shrub layer. Very weedy ground layer.

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 23/8/19	Survey Name MILGRAE				
Recorders		Plot ID #AR002		Zone ID	
GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Eucalyptus populnea	5			
	Callitris glaucophylla	0.1	2		
	Echium plantagineum	25		E	
	Erodium cygnorum	25			
	~~Horehound~~ Marrubium vulgare	0.5	10	E	
	Arctotheca calendula	10		E	
	Microlaena stipoides	0.5	100		
	Rumex brownii	0.1	20		
	Vittadinia ~~sp~~ cuneata	0.1	5		
	Chamaesyce drummondii	5			
	Austrostipa scabra	0.5	100	~~E~~	
	Oxalis perennans	0.1	50		
	Calotis hispidula	1 ~~0~~	500		
	~~Tragus~~ Salsola tragus	0.1	10		
	Oxalis perennans	1	200		
	Brassica tournefortii	1	100	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

KH - Version 2.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 28/8/19	Survey Name MILBRAE		
Recorders		Plot ID # WRQ03	Zone ID
Photo #		Plot dimensions 20 x 50	
Datum	Zone	Plot bearing along midline 4H	
Easting 146°05'22.0" E	Northing 33°47'27.4" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Grey Box / Poplar Box PCT 82	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) –	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) –	Record stems for living trees only, and for all species
30 - 49	(+/-) /	For multistemmed trees, record only the largest stem
20 - 29	(+/-) –	Presence of <5cm stems records regeneration
10 - 19	(+/-) –	Record # trees with hollows, not number of hollows
5 - 9	(+/-) –	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		
/	<20cm 2	Total # 2
	>20cm**	

Length of logs: HH III — Total (m)

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	20	20	10	20	10	
	Bare ground	0	0	40	10	60	
	Cryptogam	0	0	–	–	5	
	Rock	0	5	5	–	5	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	O	Microrelief
Cultivation	0		Slope lower slope
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture clay loam
Firewood removal	0		Soil colour red-brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes HS for WRQ01, 02.

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 28/8/17	Survey Name MILBRAE				
Recorders JC		Plot ID # MR03		Zone ID	
GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	E. populnea	5			
	C. glaucophylla	0.5	12		
	Austrostipa bigeniculata	5			
	Cheilanthes sieberi	0.5	100		
	Forb + Erodium cicutarium	5		E	
	Erodium crinitum	20			
	Arctotheca calendula	10		E	
	Echium plantagineum	30		E	
	Oxalis perennans	1	500		
	Medicago polymorpha	5		E	
	Sharsstina muelleri	1	200		
	Microlaena stipoides	1	200		
	Austrostipa scabra	0.5	100		
	Brassica tournefortii	0.5	50	E	
	27/8 Forb 1 Rhodanthe pygmaea	0.1	100		
	Salsola tragus	0.1	5		
	Trifolium repens	0.5	30		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

NPI - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 28/8/19	Survey Name MIL BRAE		
Recorders JC		Plot ID # NRQ04	Zone ID
Photo #		Plot dimensions 20 x 50	
Datum	Zone	Plot bearing along midline 84°	
Easting 146°05'03.2" E	Northing 33°47'31.3"	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Grey Box / Pilular Box PCT 82	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m / 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m / 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) -	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) -	Record stems for living trees only, and for all species
30 - 49	(+/-) -	For multistemmed trees, record only the largest stem
20 - 29	(+/-) -	Presence of <5cm stems records regeneration
10 - 19	(+/-) -	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-) -	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
0	<20cm	
	>20cm**	

Length of logs	Total (m)
Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.	0

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	10	30	30	20	20	
	Bare ground	30	20	20	5	20	
	Cryptogam	0	5	0	10	0	
	Rock	30	50	50	30	20	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	O	Microrelief
Cultivation	0		Slope Mid slope
Grazing (native / stock)	1	R	Aspect
Soil erosion	0		Soil surface texture Rocky clay - loam
Firewood removal	0		Soil colour Brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop / cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Rocky mid slope.

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 23/8/19	Survey Name MILGATE				
Recorders		Plot ID # NRQ04		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	C. glaucophylla	1	1		
	Vittadinia cuneata	25			
	Stuartina muelleri	10			
	Echium plantagineum	2		E	
	Arctotheca calendula	5		E	
	~~Forb~~ Erodium cicutarium	5		E	
	Erodium brinitatum	10			
	Medicago polymorpha	5		E	
	Calotis hispidula	5			
	Hypochaeris glabra	1	300	~~300~~ E	
	Brassica tournefortii	5		E	
	Oxalis perennans	1	300		
	Dysphania sp.	0.1	20		
	Rhicksleuna stipoides	0.5	100		
	Senecio sp. (dwarf) quadridentatus ~~cunninghamii~~	0.1	10		
	Cheilanthes sieberi	0.5	100		
	Salsola tragus	0.1	10		
	Trifolium repens	0.5	100		
	~~Phlebus~~ ~~Forb~~ spathulatus	0.1	10		
	Salvia prgpg	0.1	5		
	Wahlenbergia ~~sp~~ communis	0.1	20		
	~~Senecio sp.~~ Taraxacum officinale	0.1	10	E	
	Daisy 1 Rhodanthe polygalifolia	0.1	5		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, .. 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 28/8/19	Survey Name MCBRAE		
Recorders EC		Plot ID # WRQ85	Zone ID
Photo #		Plot dimensions 20 x 50	
Datum	Zone	Plot bearing along midline 109	
Easting 146°05'16.7" E	Northing 32°47'33.8" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Dwyers Red Gum PCT 186	Condition state Mod.

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#)	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) II	Record stems for living trees only, and for all species
30 - 49	(+/-) ✓	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
//// 4	<20cm ////	5
	>20cm** 1	

Length of logs	Total (m)
//// //// //// //// ////	25

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	10	30	30	20	60	
	Bare ground	60	60	0	0	0	
	Cryptogam	10	5	0	10	0	
	Rock	5	~~20~~ 5	70	70	5	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	1	O	Microrelief
Cultivation	0		Slope
Grazing (native / stock)	1	R	Aspect
Soil erosion	0		Soil surface texture
Firewood removal	0		Soil colour
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

Intact upper layer, but shrub layer absent. Weedy ground layer, but native species present.

XH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 28/8/17	Survey Name				
Recorders		Plot ID # WRQ 05		Zone ID	
GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Eucalyptus dwyeri	~~25~~			
	Callitris (~~black cypress~~) *endlicheri*	20			
	Bothriochloa decipiens	60		E	
	Brachychiton populneus	20			
	Forb 1 (27/8) Rhodanthe pygmaea	5			
	Echium plantagineum	15		E	
	~~*Erodium*~~ *Erodium circularium*	0.5	100	~~E~~ E	
	~~*Sonchus*~~ *Grass Moraschallon pradosus*	0.1	30	E	
	Erodium crinitum	5			
	Calotis hispidula	5			
	Brachyscome serrulata	0.1	100		
	Goodenia hederacea	0.1	20		
	Early Nancy Wearnbea dissica	0.1	50		
	Calandrinia sp	0.1	100		
	Cheilanthes sieberi	0.5	100		
	Xerochrysum bracteatum	0.1	5		
	Minuartia stypoides	0.5	100		
	Austrostipa scabra	0.1	50		
	Daucus ~~sp~~ *glochidiatus*	0.1	50		
	Bulbine ~~sp~~ *alata*	0.1	100		
	Cirsium vulgare	0.1	10		
	Brassica tournefortii	0.5	50		
	Malacocarpus stylocarpus	0.5	100		
	Hyparrhenia hirta	1	200		
	Bromus sp	0.1	20	E	
	~~*Forb 2*~~ *Euphorbia drummondii*	0.1	5		
	Vittadinia cuneata	0.1	10		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 28/8/19	Survey Name MILGRATE		
Recorders JC		Plot ID # WRQOG	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 220°	
Easting 149°05'16.4" E	Northing 33°47'42.3" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point). Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Dwyers Red PCT 18G	Condition state Mod.

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)

		Notes on function attributes:
>80	(#) —	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) —	Record stems for living trees only, and for all species
30 - 49	(+/-)	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
/	<20cm /	/
	>20cm**	

Length of logs: 1111 111 — Total (m): 13

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	5	50	50	5	50	
	Bare ground	90	30	~~35~~	90	20	
	Cryptogam	0	0	10	0	0	
	Rock	5	0	5	5	20	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	1	O	Microrelief
Cultivation	0		Slope Upper slope.
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture rocky clay - loam
Firewood removal	0		Soil colour red
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

H1 - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 28/8/19	Survey Name MIGRATE				
Recorders SZ		Plot ID # WRQ06		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	E. dwyeri	50			
	Callitris endlicheri	10			
	Eucalyptus crinitum	5			
	Arctotheca calendula	50		E	
	Microlaena stipoides	0.5	100		
	Calotis hispidula	5			
	Bromdicaot grass Monochather paradoxa	0.1	100		
	Senecio cunninghamii	0.1	10		
	Forb 1 (27/8) Rhodanthe pygmaea	1	500		
	Gonocarpus elatus	0.1	100		
	Hypochaeris glabra	0.5	200	E	
	Daisy (photo) Rhodanthe uliginosum	0.1	1500		
	Thyridolepis mitchelliana	0.1	50		
	Goodenia hederacea	0.1	20		
	Microlaena stipoides	0.5	100		
	Chrysocephalum apiculatum	0.1	10		
	Forb Dioecy Wurmbea dioica	0.1	50		
	Cheilanthes sieberi	0.1	50		
	Eragrostis sp.	0.1	10		
	Austrostipa scabra	0.1	50		
	Nicotiana sp.	0.1	5		
	Erodium plumbagineum	0.5	20		
	Rumex brownii	0.1	5		
	Calandrinia sp.	0.1	100		
	Dysphania sp.	0.1	200		
	Sulbine sp. glauca	0.1	30		
	Xerochrysum bracteatum	0.1	5		
	Einadia nutans	0.1	5		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, .. 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of 1

Date 28/8/09	Survey Name MILBRAE		
Recorders		Plot ID # VRQ07	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline	65
Easting 146°05'13.4" E	Northing 33°47'47.5" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point). Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Dry yars RG. PCT 186	Condition state Mod.

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m; 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m; 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) —	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) –	Record stems for living trees only, and for all species
30 - 49	(+/-) 𝍸 5	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows 11	<20cm 𝍸	Total #
	>20cm** //	
Length of logs		Total (m)

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	40	50	40	70	80	
	Bare ground	10	20	10	0	20	
	Cryptogam	10	10	10	0	0	
	Rock	40	20	40	10	0	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	2	O	Microrelief
Cultivation	0		Slope Upper slope
Grazing (native / stock)	1	R	Aspect
Soil erosion	0		Soil surface texture Rocky clay - loam
Firewood removal	0		Soil colour red
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	1	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

EH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 28/8/19	Survey Name MCBRAD				
Recorders		Plot ID # NR007		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Cheilanthes sieberi	5	~~300~~		
	Drosera sp.	0.5	200		
	Daucus glochidiatus	0.5	200		
	Arctotheca calendula	15		E	
	Hypochaeris glabra (check native)	15		E	
	Geranium solanderi	0.1	5		
	Hybanthus monopetalum	0.1	5		
	Thysanotus mitchelliana	0.5	50		
	Sherardia muelleri	1	200		
	Philotheca (Eriostemon) spathulatus	0.1	50		
	E. divaricatissimus	40			
	Callitris ~~endlicheri~~ endlicheri	5			
	Callitris glaucophylla	20			
	Dysphania sp.	1	200		
	Calotis hispidula	1	200		
	Bulbine sp. alata	0.1	50		
	~~Forb Hairy~~ Wurmbea dioica	0.1	50		
	Melichrus urceolatus	0.1	2		
	Pterostylis nutica	0.1	5		
	Hardenbergia sp.	0.1	50		
	~~Pterostylis~~	~~0.1~~	~~to~~		
	Myoporum stipatulum	0.1	50		
	Austrostipa scabra	0.1	100		
	Eroclinium cunninghamii	1	~~100~~ 1		
	Bandiera- grass Monachather paradoxus	0.1	100		
	Goodenia glauca	0.1	50		
	Calandrinia sp.	0.1	20		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, .. 10, 20, 30, .. 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use ~~my~~ own stratum definitions)
Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 2/8/19	Survey Name MILBRAE		
Recorders JC		Plot ID # WRQ08	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 347°	
Easting 146°05'08.2" E	Northing 33°47'54.8 S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Dwyers RG PCT 186	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) –	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) /	Record stems for living trees only, and for all species
30 - 49	(+/-) /	For multistemmed trees, record only the largest stem
20 - 29	(+/-) –	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) –	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
0	<20cm	0
	>20cm**	
Length of logs 4441 ///		Total (m) 8

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	5	5	20	10	15	
	Bare ground	10	10	20	10	10	
	Cryptogam	–	–	10	10	10	
	Rock	50	50	30	70	70	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	0	Microrelief
Cultivation	0		Slope Crest
Grazing (native / stock)	0		Aspect
Soil erosion	0		Soil surface texture Stony clay loam
Firewood removal	0		Soil colour red
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	3	a	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Sparse upper layer. Shrub layer absent and weedy ground layer.

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 28/8/19	Survey Name MILBRAE				
Recorders		Plot ID # WRQ08		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Echium plantagineum	25		E	
	Erodium arthiricum	50			
	Medicago polymorpha	50		E	
	Brachychiton populneus	5			
	Eucalyptus dwyeri	0.1	1		
	Microlaena stipoides	0.5	100		
	Actotheca calendula	10		E	
	Hypochaeris glabra	0.5	500	E	
	Thyridolepis mitchelliana	0.1	100		
	~~Erodium~~ Erodium circularium	~~5~~ 5	~~100~~	E	
	Oxalis perennans	0.1	100		
	~~Stigmatophyllum~~ Urtica incisa	0.1	50		
	Austrostipa scabra	0.1	50		
	Brassica tournefortii	2.5	100		
	Lepidium africanum	0.1	20	E	
	Hordeum vulgare	0.5	200	E	
	Senecio sp	0.1	5		
	Vittadinia cuneata	0.1	5		
	Dysphania sp				

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, .. 10, 20, 30, .. 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 28/8/19	Survey Name MILBRAE		
Recorders		Plot ID # WRQ09	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 16°	
Easting 460510.1"E	Northing 33°47'52.7"S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Derived RG PCT 186	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20x20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20x50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) —	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) —	Record stems for living trees only, and for all species
30 - 49	(+/-) 1	For multistemmed trees, record only the largest stem
20 - 29	(+/-) —	Presence of <5cm stems records regeneration
10 - 19	(+/-) —	Record # trees with hollows, not number of hollows
5 - 9	(+/-) —	Count as one stem where tree is multistemmed
< 5	(+/-) —	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	Total #
	>20cm**	0
Length of logs		Total (m) 2

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	10	5	20	20	10	
	Bare ground	5	5	30	30	10	
	Cryptogam	10	10	5	0	0	
	Rock	50	50	30	20	20	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	0	Microrelief
Cultivation	0		Slope Upper slope
Grazing (native / stock)	1	R	Aspect
Soil erosion	0		Soil surface texture stony clay - loam
Firewood removal	0		Soil colour red
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 28/8/19	Survey Name MILDRAE				
Recorders SC		Plot ID # WRQ09		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Echium plantagineum	20		E	
	Arctotheca calendula	20		E	
	Medicago polymorpha	70		E	
	Erodium crinitum	30		E	
	Dysphania sp	0.5		200	
	Callitris glaucophylla	10			
	Cheilanthes sieberi	0.1	50		
	Stinging nettle Urtica incisa	0.5	20		
	Emex australis	0.1	5		
	Calotis hispidula	1	300		
	Hordeum vulgare	0.5	500	E	
	Eragrostis	0.1	50		
	Microlaena stipoides	0.1	50		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 28/8/14	Survey Name MILBEAT		
Recorders K		Plot ID # MKQ10	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 70	
Easting 146°09'58.2" E	Northing 33°47'51.7"S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point). Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type PCT 70	Condition state

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20x20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20x50 m | 10 x 100 m

Tree stem DBH (cm) — Notes on function attributes:

>80	(#) –	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) ~	Record stems for living trees only, and for all species
30 - 49	(+/-) ✓	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	Total # 0
	>20cm**	
Length of logs ||||| |||	Total (m) 27

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	5	10	5	5	15	
	Bare ground	0	5	20	20	0	
	Cryptogam	10	0	0	0	0	
	Rock	10	5	5	5	0	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	2	0	Microrelief
Cultivation	0		Slope Mid slope
Grazing (native / stock)	0		Aspect
Soil erosion	0		Soil surface texture Clay-loam
Firewood removal	0		Soil colour Brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 28/8/19	Survey Name MURRAY				
Recorders		Plot ID # WRD10		Zone ID	
GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	E. populnea	10			
	Callitris glaucophylla	5			
	Vittadinia cuneata	0.5	50		
	~~Calendula~~ Arctotheca calendula	~~20~~		E	
	Erodium crinitum	10			
	Cakile lanceolata	10			
	Medicago polymorpha	50		E	
	Bromus sp.	0.5	200	E	
	Wahlenbergia sp	0.1	50		
	Bonscarpus elatus	0.1	50		
	Echium plantagineum	20			
	Forb 1 (23/8) Rhodanthe pygmaea	0.1	100		
	Senecio ~~sp~~ quadridentatus	0.1	10		
	Microlaena stipoides	0.1	100		
	Brassica tournefortii	0.5	100	E	
	Cheilanthes sieberi	0.1	50		
	Oxalis perennans	0.1	50		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, .. 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

RH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 20/8/19	Survey Name		
Recorders		Plot ID # WRQ11	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 170°	
Easting 146°09'59.8"	Northing 33°47'39.0" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Cypress Pine PCT70	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#)	Stem size class records # large trees (cf. benchmark)
50 - 79	(#)	Record stems for living trees only, and for all species
30 - 49	(+/-) ✓	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-)	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-) —	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
0	<20cm	0
	>20cm**	
Length of logs		Total (m) 47

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	20	10	10	30	40	
	Bare ground	10	10	0	-	10	
	Cryptogam	-	-	-	-	-	
	Rock	10	10	5	0	-	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	0	Microrelief
Cultivation	0		Slope Mid slope
Grazing (native / stock)	0		Aspect
Soil erosion	0		Soil surface texture Rock sandy loam
Firewood removal	0		Soil colour red-brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage Com dr
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Upper layer of Callitris | Poplar box, with cleared areas. No shrub layer. Non-native ground layer (also WRQ10)

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Date 28/8/19	Survey Name MICBRAE				
Recorders JC		Plot ID # WRQ11		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Lolium perenne	30			
	Echium plantagineum	25		E	
	Brassica ~~sp (rapistrum)~~ tournefortii	50		E	
	Arctotheca calendula	5		E	
	Erodium cicutarium	5			
	~~Horehound~~ Marrubium vulgare	0.1	5	E	
	Medicago polymorpha	1	200	E	
	Cheilanthes sieberi	0.1	50		
	Geranium solanderi	0.1	50		
	Microlaena stipoides ?	0.1	100		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 28/8/17	Survey Name MILBRAE		
Recorders K		Plot ID # WRR12	Zone ID
Photo #		Plot dimensions 10 X 100	
Datum	Zone	Plot bearing along midline 101°	
Easting 146°05'01.3"	Northing 33°47'50.7" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point). Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Cypress pine PCT70	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m; 10 x ~~40~~ m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m; 10 x ~~100~~ m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) —	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) —	Record stems for living trees only, and for all species
30 - 49	(+/-) ✓	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) —	Count as one stem where tree is multistemmed
< 5	(+/-) —	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	Total # 0
	>20cm**	
Length of logs		Total (m) ~~75~~

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	30	10	5	5	10	
	Bare ground	20	40	5	10	5	
	Cryptogam	5	0	0	5	5	
	Rock	30	20	10	~~5~~	~~15~~	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	~~B~~ NR	Microrelief
Cultivation	0		Slope Upper slope
Grazing (native / stock)	0		Aspect
Soil erosion	0		Soil surface texture sandy loam
Firewood removal	0		Soil colour brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 28/8/19	Survey Name MILBRAE				
Recorders		Plot ID # WRQ12		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Callitris glaucophylla	60			
	Brassica ~~mustard~~ tournefortii	25		E	
	Echium plantagineum	25		E	
	Arctotheca calendula	25		E	
	Erodium cribrum	5			
	~~Stinging nettle~~ Urtica incisa	0.1	20	N	
	Cheilanthes sieberi	0.1	50		
	Medicago polymorpha	10		E	
	~~Horehound~~ Marrubium vulgare	0.1	5	E	
	Oxalis ~~pes-caprae~~ chnoodes	0.5	100		
	Dichondra repens	0.1	100		
	Calandrinia sp	0.1	10		
	Microlaena stipoides	0.1	50		
	Senecio sp	0.1	10		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, .. 10, 20, 30, .. 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 1 of 1

Date 28/8/17	Survey Name MILBRAE		
Recorders		Plot ID # WRQ13	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 18°	
Easting 196°05'17.2" E	Northing 35°47'31.6" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point). Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Dry open PCT 186	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m (circled) | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20x 50 m (circled) | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) —	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) —	Record stems for living trees only, and for all species
30 - 49	(+/-) —	For multistemmed trees, record only the largest stem
20 - 29	(+/-) —	Presence of <5cm stems records regeneration
10 - 19	(+/-) —	Record # trees with hollows, not number of hollows
5 - 9	(+/-) —	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	Total # 0
	>20cm**	
Length of logs		Total (m) 10

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter						
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	NR	Microrelief
Cultivation	0		Slope
Grazing (native / stock)	0		Aspect
Soil erosion	0		Soil surface texture
Firewood removal	0		Soil colour
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Upper layer sparse - absent, but regenerating. No mid layer. Weedy ground layer.

KH - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 18/8/17	Survey Name MURRAY				
Recorders		Plot ID # NRA03		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Callitris glaucophylla	0.1	5		
	Eucalyptus dwyeri	0.1	2		
	Echium plantagineum	30		E	
	Arctotheca calendula	40		E	
	Hordeum vulgare	1	200	E	
	Erodium crinitum	10			
	~~Forb~~ Erodium circularium	5		E	
	Carlotis hispidula	5			
	Medicago polymorpha	1	300	E	
	Minuartia stypoides	0.1	150		
	Thysanotopis mitchelliana	0.1	150		
	Lappulaeria glabra	0.1	200	E	
	Dysphania	0.1	200		
	Wahlenbergia	0.1	30		
	Vittadinea cuneata	0.5	50		
	Oxalis perennans	0.1	50		
	Minuartia muelleri	0.1	50		
	Goodenia (Smooth Flower) heteromera	0.1	20		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, .. 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

XPI - Version 1.1 - Date 1/12/2017

Appendix D: BAM Calculator Credit Report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017759/BAAS21028/19/00017760	Western Riverina - Milbrae Quarries	14/03/2024
Assessor Name	Report Created	BAM Data version *
Emma Gray	19/06/2024	67
Assessor Number	BAM Case Status	Date Finalised
BAAS19069	Finalised	19/06/2024
Assessment Revision	Assessment Type	BOS entry trigger
10	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

NSW GOVERNMENT

BAM Credit Summary Report

Dwyer's Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion												
2	186_moderate	Not a TEC	73.4	73.4	0.1	PCT Cleared - 17%	High Sensitivity to Gain			1.50		3
											Subtotal	**3**
Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion												
4	185_poor	Not a TEC	18.5	18.5	0.49	PCT Cleared - 20%	High Sensitivity to Gain			1.50		3
											Subtotal	**3**
White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion												
1	72_poor	Not a TEC	25.5	25.5	0.98	PCT Cleared - 40%	High Sensitivity to Gain			1.50		9
											Subtotal	**9**
White Cypress Pine woodland on sandy loams in central NSW wheatbelt												
3	70_poor	Not a TEC	40.8	40.8	2.7	PCT Cleared - 65%	High Sensitivity to Gain			1.75		47
											Subtotal	**47**
											Total	**62**

Species credits for threatened species

BAM Credit Summary Report

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Austrostipa metatoris / A spear-grass (Flora)									
70_poor	40.8	40.8	0.12			Vulnerable	Vulnerable	False	2
								Subtotal	**2**
Diuris tricolor / Pine Donkey Orchid (Flora)									
70_poor	40.8	40.8	0.12			Vulnerable	Not Listed	False	2
								Subtotal	**2**
Swainsona sericea / Silky Swainson-pea (Flora)									
70_poor	40.8	40.8	0.12			Vulnerable	Not Listed	False	2
								Subtotal	**2**

Assessment Id
00017759/BAAS21028/19/00017760

Proposal Name
Western Riverina - Milbrae Quarries

Page 3 of 3

Appendix E: Habitat Suitability Assessment

The habitat suitability of the subject land for all of the ecosystem credit species and species credit species generated by the BAM-C were assessed.

Unless otherwise indicated, species background information has been sourced from NSW DCCEEW Threatened Biodiversity Profiles, available at https://www.environment.nsw.gov.au/threatenedSpeciesApp/

Ecosystem Credit Species

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
Antechinomys laniger	Kultarr	E	-	No	Widespread across arid and semi-arid NSW but present in very low numbers. Records typically derive from captures by domestic cats or are collected after falling into steep-sided holes. Recent records have come primarily from the Cobar and Brewarrina region. A terrestrial insectivore that inhabits open country, especially claypans among Acacia woodlands. **Suitable habitat, no habitat constraints or geographic limitations.**	Assumed present
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	No	Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understory of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland. **Open woodlands present on subject land, no habitat constraints or geographic limitations**	Assumed present
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	No	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important food. **No *Allocasuarina* or *Casuarina* trees present, therefore no foraging habitat.**	Absent (constraint)

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
Certhionyx variegatus	Pied Honeyeater	V	-	No	Widespread throughout acacia, mallee and spinifex scrubs of arid and semi-arid Australia. Occasionally occurs further east, on the slopes and plains and the Hunter Valley, typically during periods of drought. Inhabits wattle shrub, primarily Mulga (*Acacia aneura*), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering; feeds on nectar, predominantly from various species of emu-bushes (*Eremophila spp.*); also from mistletoes and various other shrubs (e.g. *Grevillea spp.*); also eats saltbush fruit, berries, seed, flowers and insects. Highly nomadic, following the erratic flowering of shrubs; can be locally common at times. **Semi-arid woodlands present on subject land, no habitat constraints or geographic limitations**	Assumed present
Chalinolobus picatus	Little Pied Bat	V	-	Yes	The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. **Open woodlands present on subject land, records within 10km of subject land, no habitat constraints or geographic limitations**	Assumed present
Chthonicola sagittata	Speckled Warbler	V	-	Yes	The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understory, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger	Present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter. A side entrance allows the bird to walk directly inside. A clutch of 3-4 eggs is laid, between August and January, and both parents feed the nestlings. The eggs are a glossy red-brown, giving rise to the unusual folk names 'Blood Tit' and 'Chocolatebird'. Some cooperative breeding occurs. The species may act as host to the Black-eared Cuckoo. Speckled Warblers often join mixed species feeding flocks in winter, with other species such as Yellow-rumped, Buff-rumped, Brown and Striated Thornbills. ***Eucalyptus* communities within subject land, records within 10km of subject land, no habitat constraints or geographic limitations, species detected just outside of the subject land during field surveys**	
Circus assimilis	Spotted Harrier	V	-	No	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. **Habitat broadly appropriate, no habitat constraints or geographic limitations**	Assumed present
Daphoenositta chrysoptera	Varied Sittella	V	-	No	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					Habitat broadly appropriate, no habitat constraints or geographic limitations	
Falco hypoleucos	Grey Falcon	E	-	No	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three eggs are laid. **Marginal foraging habitat, no habitat constraints or geographic limitations**	Assumed present
Falco subniger	Black Falcon	V	-	No	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres. The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring. **Habitat broadly appropriate, no habitat constraints or geographic limitations**	Assumed present
Grantiella picta	Painted Honeyeater	V	V	No	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping	Absent (habitat constraints)

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. **No mistletoe was recorded within the subject land; consequently, the site was deemed unsuitable for use by this species.**	
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	V	-	No	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground. May be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young. Typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days. **No suitable waterbodies or watercourses occur within 1 km of the subject land; consequently, the land was deemed unsuitable for use by this species.**	Absent (habitat constraints)
Hamirostra melanosternon	Black-breasted Buzzard (Foraging)	V	-	No	The Black-breasted Buzzard is found sparsely in areas of less than 500mm rainfall, from north-western NSW and north-eastern South Australia to the east coast at about Rockhampton, then across northern Australia south almost to Perth, avoiding only the Western Australian deserts. Lives in a range of inland habitats, especially along timbered	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					watercourses which is the preferred breeding habitat. Also hunts over grasslands and sparsely timbered woodlands. **Sparsely timbered woodlands within subject land. No habitat constraints or geographic limitations.**	
Hieraaetus morphnoides	Little Eagle (Foraging)	V	-	No	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. **Open woodlands within subject land, no habitat constraints or geographic limitations**	Assumed present
Hirundapus caudacutus	White-throated Needletail	-	V	No	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. **Habitat broadly appropriate, no habitat constraints or geographic limitations**	Assumed present
Hylacola cautus	Shy Heathwren	V	-	No	Occurs across southern Australia extending from the wheatbelt in southern Western Australia east to central NSW, including Kangaroo Island. Two subspecies occur in NSW. The first (*macrorhyncha*) is confined to central NSW between Griffith, Roto, Nymagee and West Wyalong, with most records within OEH managed reserves (including Yathong, Nombinnie, Round Hill and The Charcoal Tank Nature Reserves and Cocoparra National Park). The nominate subspecies	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					(*cautus*) occurs in the far south west between Balranald and Trentham Cliffs (including Mallee Cliffs National Park), north into the Scotia Mallee (including Tarawi Nature Reserve and Scotia Sanctuary). This subspecies also occurs in north west Victoria and eastern South Australia (as far west as the Flinders Ranges). Inhabits mallee woodlands with a relatively dense understory of shrubs and heath plants. The central NSW population (for example in Cocoparra NP) also occurs at low densities in rocky hilltop vegetation with a thick shrub layer such as Broombush or Tea-tree. **Marginally suitable vegetation within subject land, no habitat constraints or geographic limitations**	
Leipoa ocellata	Malleefowl	E	V	Yes	The stronghold for this species in NSW is the mallee in the south west centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary and is part of a larger population north of the Murray River in South Australia. The population in central NSW has been significantly reduced through land clearance and fox predation and now occurs chiefly in Yathong, Nombinnie and Round Hill NRs and surrounding areas, though birds continue to survive in Loughnan NR. To the south of this area the species is probably locally extinct in such reserves as Pulletop NR (last recorded 1989), Ingalba NR (1982) and Buddigower NR (1990) and the intensely studied population at Yalgogrin was still known to have at least one active mound in 2017. Further east, a population continues to persist in the Goonoo forest near Dubbo, though the size of this population is unknown. Outside these areas, occasional records have been made in the Pilliga forests (most recently 1999), around Cobar (1991) and Goulburn River NP (1989) though the extent and status of populations in these areas are unknown. Predominantly inhabit mallee communities, preferring the tall, dense and floristically rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species.	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					Mallee woodlands within subject land, records within 10km of subject land, no habitat constraints or geographic limitations	
Lophochroa leadbeateri	Major Mitchell's Cockatoo (Foraging)	V	-	Yes	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres. **Habitat broadly appropriate, records within 10km of subject land, no habitat constraints or geographic limitations**	Assumed present
Lophoictinia isura	Square-tailed Kite (Foraging)	V	-	No	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. **Habitat broadly appropriate, no habitat constraints or geographic limitations**	Assumed present
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	No	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies *picata*. Two other subspecies occur outside NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. **Open woodlands near open areas within subject land, no habitat constraints or geographic limitations**	
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern	V	-	No	The Black-chinned Honeyeater has two subspecies, with only the nominate (gularis) occurring in NSW. The eastern subspecies extends south from central Queensland, through NSW, Victoria into south eastern South Australia, though it is very rare in the last state. In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. A gregarious species usually seen in pairs and small groups of up to 12 birds. Feeding territories are large making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares. Moves quickly from tree to tree, foraging rapidly along outer twigs, underside of branches and trunks, probing for insects. Nectar is taken from flowers, and honeydew is gleaned from foliage. Breeds solitarily or co-operatively, with up to five or six adults, from June to December. The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. It is a compact, suspended, cup-shaped nest. **Habitat broadly appropriate, no habitat constraints or geographic limitations**	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
Neophema pulchella	Turquoise Parrot	V	-	No	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. **Habitat broadly appropriate, no habitat constraints or geographic limitations**	Assumed present
Ninox connivens	Barking Owl (Foraging)	V	-	No	The Barking Owl is found throughout continental Australia except for the central arid regions. Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. Many populations crashed as woodland on fertile soils was cleared over the past century, leaving linear riparian strips of remnant trees as the last inhabitable areas. Surveys in 2001 demonstrated that the Pilliga Forest supported the largest population in southern Australia. The owls sometimes extend their home range into urban areas, hunting birds in garden trees and insects attracted to streetlights. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile riparian soils. **Appropriate foraging habitat within subject land, no habitat constraints or geographic limitations**	Assumed present
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	No	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					Habitat broadly appropriate, no habitat constraints or geographic limitations	
Pachycephala inornata	Gilbert's Whistler	V	-	No	The Gilbert's Whistler is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia, from the western slopes of NSW to the Western Australian wheatbelt. The species was probably once distributed almost continuously across the woodlands and mallee of southern NSW, but this range has been greatly reduced. The Gilbert's Whistler occurs in a range of habitats within NSW, though the shared feature appears to be a dense shrub layer. It is widely recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests, though at this stage it is only known to use this habitat along the Murray, Edwards and Wakool Rivers. Within the mallee the species is often found in association with an understory of spinifex and low shrubs including wattles, hakeas, sennas and hop-bushes. In woodland habitats, the understory comprises dense patches of shrubs, particularly thickets of regrowth Callitris pine. Parasitic 'cherries' (*Exocarpus* species) appear to be an important habitat component in Belah and Red Gum communities, though in the latter case other dense shrubs, such as Lignum and wattles, are also utilised. **Habitat broadly appropriate, no habitat constraints or geographic limitations**	Assumed present
Petroica phoenicea	Flame Robin	V	-	No	The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. Prefers clearings or areas with open understoreys. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains), in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees.	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					Habitat broadly appropriate, no habitat constraints or geographic limitations	
Polytelis swainsonii	Superb Parrot (Foraging)	V	V	No	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. This species inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. May forage up to 10 km from nesting sites, and feed in trees and understory shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. **Appropriate foraging habitat within subject land, no habitat constraints or geographic limitations**	Assumed present
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	Yes	The eastern subspecies (temporalis) occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions. Lives in family groups that consist of a breeding pair and young from previous breeding seasons. A group may consist of up to fifteen individuals. Feed on invertebrates and nests in several conspicuous, dome-shaped stick structures that are about the size of a football. A nest is used as a dormitory for	Present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
					roosting each night. Nests are maintained year-round, and old nests are often dismantled to build new ones. **The species was observed on two occasions during the fieldwork**	
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	No	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn. **Habitat broadly appropriate, no habitat constraints or geographic limitations**	Assumed present
Stagonopleura guttata	Diamond Firetail	V	-	No	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. **Habitat broadly appropriate, no habitat constraints or geographic limitations**	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Habitat Assessment	Species presence
Tyto novaehollandiae	Masked Owl (Foraging)	V	-	No	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. **Appropriate foraging habitat within subject land, no habitat constraints or geographic limitations**	Assumed present

Species Credit Species

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
Acacia curranii	Curly-bark Wattle	V	V	No	The majority of the species distribution lies within the Mt. Hope - Lake Cargelligo - Hillston region, including populations in the conservation areas of Yathong National Park, Nombinnie State Conservation Area and Round Hill Nature Reserve. There are about 20 populations with fewer than 5000 individuals each and one population with an estimated 150,000 individuals. Also known in Qld from two populations totalling several hundred individuals near Gurulmundi. **Targeted surveys conducted for the species. Refer to Section 3.3.3 for targeted survey effort**	Absent (surveyed)
Austrostipa metatoris	A spear-grass	V	V	No	Most records occur in the Murray Valley with sites including Cunninyeuk Station, Stony Crossing, Kyalite State Forest (now part of Murrumbidgee Valley Regional Park) and Lake Benanee. Scattered records also occur in central NSW including Lake Cargelligo, east of Goolgowi, Condobolin and south west of Nymagee. Otherwise only known from near Bordertown in south east South Australia, where it may be locally extinct. Grows in sandy areas of the Murray Valley; habitats include sandhills, sandridges, undulating plains and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils. **No habitat constraints or geographic limitations. Targeted surveys were conducted for this species throughout all associated PCT except 0.12 ha of PCT 70 that was not accessible. The species has been assumed present in that area, otherwise the species is absent surveyed.**	Assumed present (0.12 ha of PCT70) Absent (surveyed, remainder of site).
Austrostipa wakoolica	A spear-grass	E	E	No	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest (now part of South West Woodland Nature Reserve). Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise.	Absent (habitat constraints)

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					Subject land is not on an alluvial plain; consequently, the species can be ruled out	
Burhinus grallarius	Bush Stone-curlew	E	-	No	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer. **Targeted surveys conducted for the species. Refer to Section 3.3.3 for targeted survey effort**	Absent (surveyed)
Calyptorhynchus lathami lathami	Glossy Black-Cockatoo	E2	E	Yes	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. **No *Allocasuarina* or *Casuarina* present. Targeted surveys conducted for the species. Refer to Section 3.3 for targeted survey effort**	Absent (surveyed)
Calyptorhynchus lathami	Glossy Black-Cockatoo, Riverina Population	E2		Yes	The Riverina population of *Calyptorhynchus lathami* is largely restricted to hills and low ridges where suitable assemblages of its food plant Drooping She-Oak *Allocasuarina verticillata* remain within the Narrandera Range and to the north-west in the Brobenah Hills, McPhersons Range, Cocoparra Range, Lachlan Range and Jimberoo State Forests, and the Naradhan Range. This population now occurs west of longitude 146° 40' E, within Cobar, Carrathool, Narrandera and Leeton Local Government Areas. This line runs through an area which is extensively cleared and this cleared area now seems to isolate the western population. This population requires trees with suitable large hollows to breed, normally Grey Box Eucalyptus microcarpa or Dwyer's Gum *Eucalyptus dwyeri*, within close proximity to feeding habitat.	Absent (surveyed)

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					No *Allocasuarina* or *Casuarina* present. Targeted surveys conducted for the species. Refer to Section 3.3 for targeted survey effort.	
Climacteris affinis - endangered population	White-browed Treecreeper population in Carrathool lga south of the Lachlan River and Griffith lga	E2	-	No	In NSW, occupies a broad area of western NSW, west from a line from Balranald to Lake Cargelligo then Lightning Ridge. The species appears absent in the far north west of the state with no records occurring west of a line from Broughams Gate, 100km northwest of Broken Hill to Hungerford. A small population, now recognised as isolated, occurs in Carrathool local government area south of the Lachlan River and Griffith local government areas. Occurs in a range of semi-arid and arid tall shrublands and woodlands across the southern half of Australia. In NSW, the species occupies a variety of habitats including Mulga, Brigalow, Gidgee, Belah, Buloke and White Cypress. The species may also occur in habitats adjacent to those detailed above, including Coolibah, River Red Gum and Black Box. **Targeted surveys conducted for the species. Refer to Section 3.3.3 for targeted survey effort**	Absent (surveyed)
Diuris tricolor	Pine Donkey Orchid	V	-	No	Sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the north of NSW. Localities in the south include Red Hill north of Narrandera, Coolamon, and several sites west of Wagga Wagga. Condobolin-Nymagee road, Wattamondara towards Cowra, Eugowra, Girilambone, Dubbo and Cooyal, in the Central West. Pilliga SCA, Pilliga National Park and Bibblewindi State Forest in the north (and extending into Queensland) and Muswellbrook in the east. Disturbance regimes are not known, although the species is usually recorded from disturbed habitats. **No habitat constraints or geographic limitations. Targeted surveys were conducted for this species throughout all associated PCT except 0.12 ha of PCT 70 that was not accessible. The species has been assumed present in that area, otherwise the species is absent surveyed.**	Assumed present (0.12 ha of PCT70) Absent (surveyed, remainder of site).
Grevillea ilicifolia subsp. Ilicifolia	Holly-leaf Grevillea	CE	-	No	*Grevillea ilicifolia*, commonly known as holly grevillea, is a species of the plant genus *Grevillea*. It is a shrub of variable form, growing to between 0.3 and 2 metres in height and 3 metres wide. Typically, leaves are lobed and holly like, but may also be unlobed. The flowers have perianths that have a base that is cream to green grading to grey-mauve. Styles may be	Absent (surveyed)

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					pink, red, orange or yellow. The main flowering period in the species' native range is September to November. **Targeted surveys conducted for the species. Refer to Section 3.3.3 for targeted survey effort.**	
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	V	-	No	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground. May be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young. Typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days. **This species requires living or dead mature trees within 1 km of appropriately large waterbodies or watercourses. No substantial, perennial waterbodies occur within 1 km of the subject land. The only watercourses within this area are minor, non-perennial drainage lines, and, near the 1 km limit, a single small farm dam. These are highly unlikely to be sufficient for this species. Consequently, it has been removed from consideration.**	Absent (habitat constraint)

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
Hamirostra melanosternon	Black-breasted Buzzard	V	-	No	The Black-breasted Buzzard is found sparsely in areas of less than 500mm rainfall, from north-western NSW and north-eastern South Australia to the east coast at about Rockhampton, then across northern Australia south almost to Perth, avoiding only the Western Australian deserts. Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. Also hunts over grasslands and sparsely timbered woodlands. **This species requires proximal waterbodies or land within 40 m of riparian woodland on inland watercourses. It may make use of waterholes containing dead or dying eucalypts. These landscape features do not occur on the subject land.**	Absent (habitat constraint)
Hieraaetus morphnoides	Little Eagle (Breeding)	V	-	No	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. **Targeted surveys conducted for the species. Refer to Section 3.3.3 for targeted survey effort**	Absent (surveyed)
Lophochroa leadbeateri	Major Mitchell's Cockatoo (Breeding)	V	-	Yes	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres. **Targeted surveys conducted for the species. Refer to Section 3.3.3 for targeted survey effort**	Absent (surveyed)

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
Lophoictinia isura	Square-tailed Kite	V	-	No	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. **Targeted surveys conducted for the species. Refer to Section 3.3.3 for targeted survey effort**	Absent (surveyed)
Ninox connivens	Barking Owl (Breeding)	V	-	No	The Barking Owl is found throughout continental Australia except for the central arid regions. Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. Many populations crashed as woodland on fertile soils was cleared over the past century, leaving linear riparian strips of remnant trees as the last inhabitable areas. Surveys in 2001 demonstrated that the Pilliga Forest supported the largest population in southern Australia. The owls sometimes extend their home range into urban areas, hunting birds in garden trees and insects attracted to streetlights. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile riparian soils. **The species requires hollows > 20 cm in diameter. The TBDC states that the species polygon should be established by providing a circular buffer with a 100 m radius around the nest tree. One large hollow was recorded within 100 m of the site boundary; however, the hollow fell within a PCT that is not known to be utilized by this species and the buffer likewise did not overlap any areas of vegetation associated with this species.**	Absent (constraint)

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
Polytelis swainsonii	Superb Parrot (Breeding)	V	V	No	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. This species inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. May forage up to 10 km from nesting sites, and feed in trees and understory shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. **This species requires hollow-bearing trees of the following species: *Eucalyptus blakelyi*, *E. melliodora*, *E. albens*, *E. camaldulensis*, *E. microcarpa, E. polyanthemos*, *E. mannifera*, or *E. intertexta*. The hollows must be > 4 m from the ground and located in trees with a DBH of >30 cm. No trees meeting these requirements were recorded within the subject land.**	Absent (habitat constraint)
Swainsona sericea	Silky Swainson-pea	V	-	No	Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Found in Natural Temperate Grassland and Snow Gum *Eucalyptus pauciflora* Woodland on the Monaro. **No habitat constraints or geographic limitations. Targeted surveys were conducted for this species throughout all associated PCT except 0.12 ha of PCT 70 that was not accessible. The species has been assumed present in that area, otherwise the species is absent surveyed.**	Assumed present (0.12 ha of PCT70) Absent (surveyed, remainder of site).
Tyto novaehollandiae	Masked Owl (Breeding)	V	-	No	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW,	Absent (habitat constraints)

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. **The species requires hollows > 20 cm in diameter. The TBDC states that the species polygon should be established by providing a circular buffer with a 100 m radius around the nest tree. One large hollow was recorded within 100 m of the site boundary; however, the hollow fell within a PCT that is not known to be utilized by this species and the buffer likewise did not overlap any areas of vegetation associated with this species.**	

Appendix F: EPBC Act Habitat Assessment and Matters of National Environmental Significance

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance. The EPBC Act policy *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (Australian Government Department of Agriculture, Water and the Environment, 2013) forms the basis of determining if impact to protected matters is significant.

A Protected Matters Search identified three Endangered Ecological Communities, 25 threatened species and eight migratory species as potentially occurring within 10 km of the subject land (**Appendix A**).

The following tables give an overview of the assessments of these threatened entities and shows that the Proposed activity:

1. Is not likely to have a significant impact on a matter of national environmental significance. The matters of national environmental significance are:
    i. World heritage properties.
    ii. National heritage places.
    iii. Wetlands of international importance.
    iv. Threatened species and ecological communities.
    v. Migratory species.
    vi. Commonwealth marine areas.
    vii. The Great Barrier Reef Marine Park.
    viii. Nuclear actions (including uranium mines).
    ix. A water resource, in relation to coal seam gas development and large coal mining development.
2. Is not likely to have a significant impact on the environment in general (for actions by Commonwealth agencies or actions on Commonwealth land) or the environment on Commonwealth land (for actions outside Commonwealth land).

Notes:

Important Population as determined by the *Environment Protection and Biodiversity Conservation Act 1999*, is one that for a vulnerable species:

a) is likely to be key source populations either for breeding or dispersal
b) is likely to be necessary for maintaining genetic diversity
c) is at or near the limit of the species range.

A ‘significant impact’ is an impact which is important, notable, or of consequence, having regard to its context or intensity (Australian Government Department of Agriculture, Water and the Environment, 2013)

Wetlands of International Importance

Name	Proximity	Assessment of significance required (Yes / No)
Banrock Station Wetland complex	500 – 600 km	No, the proposal does not occur close to the wetland.
Hattah-kulkyne lakes	300 – 400 km	No, the proposal does not occur close to the wetland.
Riverland	400 – 500 km	No, the proposal does not occur close to the wetland.
The Coorong, and Lakes Alexandrina and Albert Wetland	600 – 700 km	No, the proposal does not occur close to the wetland.

Listed Threatened Ecological Communities

Name	Status	Significance of Impact
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	No, the community does not occur at the subject site.
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	No, the community does not occur at the subject site.
Weeping Myall Woodlands	Endangered	No, the community does not occur at the subject site.

Likelihood of occurrence table for EPBC Act listed threatened species and populations

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
AMPHIBIANS				
Crinia sloanei	Sloane's Froglet	E	Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. It has not been recorded recently in the northern part of its range and has only been recorded infrequently in the southern part of its range in NSW. It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. **Low – There are no associated vegetation communities present or records from within 10 km.**	No
REPTILES				
Aprasia parapulchella	Pink-tailed Legless Lizard	V	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda australis*). **Low – There are no associated vegetation communities present or records from within 10 km.**	No
BIRDS				
Aphelocephala leucopsis	Southern Whiteface	V	The Southern Whiteface prefers the drier habitats of southern Australia. In Queensland they are found only as far north as Birdsville and east to Darling Downs, in NSW east to about Tenterfield and south-west to the shale areas in the Sydney region. In Victoria they occur mostly in the drier foothills north of the Divide, in SA south to Eyre Peninsula. They are also found in southern Northern Territory and southern WA except the far south-west corner. Dry open forests and woodland and inland scrubs of mallee, mulga and saltbush are the preferred habitat of Southern Whiteface, especially areas with fallen timber or dead trees and stumps. **Low – There are no associated vegetation communities present or records from within 10 km.**	No
Botaurus poiciloptilus	Australasian Bittern	E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Hides during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects, and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs in a clutch. **Low – The only potential waterbodies within the subject land are non-perennial creeks, not adequate habitat for the species. No records from within 10 km.**	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
Calidris acuminata	Sharp-tailed Sandpiper	V	The sharp-tailed sandpiper breeds in northern Siberia from the Lena River delta, east to the Chaun Gulf and the Kolyma River delta. The species is a passage migrant through eastern Mongolia, China, Korea, Japan, Micronesia, the Philippines, and southeast Asia. It also occurs less frequently as a passage migrant in the Malay Peninsula, Borneo, and Melanesia. Small numbers of individuals occur in North America, mainly in western Alaska and the Aleutian Islands, and occasionally further south along the Pacific coast. The species is a casual visitor elsewhere in North America, including a rare passage migrant in Hawaii, and is vagrant to Scandinavia, western Europe, India, Sri Lanka, Fiji, and Tristan da Cunha. During the non-breeding season, approximately 91 percent of the East Asian – Australasian population occurs in Australia and New Zealand. Sharp-tailed sandpipers occur within all states of Australia. They are found mostly in the south-east and are widespread in both inland and coastal locations. The species also occurs in both freshwater and saline habitats. The species utilises fresh and hypersaline environments, feeding along the edge of water on mudflats, coastal and inland wetlands, and sewage ponds. After rainfall events, the species may also feed on areas of agricultural pasture. **Low – The only potential waterbodies within the subject land are non-perennial creeks, not adequate habitat for the species. No records from within 10 km.**	No
Calidris ferruginea	Curlew Sandpiper	CE	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. **Low – The only potential waterbodies within the subject land are non-perennial creeks, not adequate habitat for the species. No records from within 10 km.**	No
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina.	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			Absent – Although associated vegetation communities were present (PCTs 70, 72, 185 and 186), the survey effort failed to encounter any individuals of this species.	
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo, and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper Climacteris picumnus picumnus which then occupies the remaining parts of the state. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. The population density of this subspecies has been greatly reduced over much of its range, with major declines recorded in central NSW and the northern and southern tablelands. Declines have occurred in remnant vegetation fragments smaller than 300 hectares, that have been isolated or fragmented for more than 50 years. **Low – There are no associated vegetation communities present or records from within 10 km.**	
Falco hypoleucos	Grey Falcon	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three eggs are laid. **Moderate – Associated vegetation communities were present (PCTs 70, 72), although there are no records from within 10 km.**	Yes
Gallinago hardwickii	Latham's Snipe	V	Latham's snipes breed in Hokkaido and highland areas of Honshu in Japan, and in Sakhalin and the nearby Kuril Islands of far eastern Russia. During migration, the species passes through New Guinea. Latham's Snipes have also been recorded as vagrants in New Zealand. Latham's Snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia. The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia, including the Adelaide plains, Mount Lofty Ranges, and the Eyre Peninsula. The range extends inland over the eastern tablelands in south-eastern Queensland, and occasionally from Rockhampton in the north, and west of the Great Dividing Range in New South	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			Wales. The species is widespread in Tasmania and is found in all regions of Victoria except for the north-west. Most birds spend the non-breeding period at sites located south of the Richmond River in New South Wales. Latham's snipe feed in soft mudflats or shallow water typically at night, early morning, or evening. The species is omnivorous and feeds on seeds and other plant material (mainly from species in families such as Cyperaceae, Poaceae, Juncaceae, Polygonaceae, Ranunculaceae and Fabaceae), and on invertebrates including insects (mainly flies and beetles), earthworms, spiders, and occasionally molluscs, isopods, and centipedes. The species feeds by thrusting its long bill into mud with an up and down 'sewing machine' action. **Low – No mudflat or wet habitat occurs within the site. No records from within 10 km.**	
Grantiella picta	Painted Honeyeater	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches. **Low – Although associated vegetation communities were present (PCTs 70, 72, 185, 186), in the few trees present within the subject land no mistletoe was recorded. There are no records within the 10 km search area. As the species is nomadic and occurs at low density, it is likely to be underrepresented in BioNet Atlas records.**	No
Lathamus discolor	Swift Parrot	CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Forest Red Gum *E. tereticornis*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. **Low – Favoured feed trees not recorded within subject land. No records within the IBRA subregion.**	No
Leipoa ocellata	Malleefowl	V	The stronghold for this species in NSW is the mallee in the southwest centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary and is part of a larger population north of the Murray River in South Australia. The population in central NSW	Yes

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			has been significantly reduced through land clearance and fox predation and now occurs chiefly in Yathong, Nombinnie and Round Hill NRs and surrounding areas, though birds continue to survive in Loughnan NR. To the south of this area the species is probably locally extinct in such reserves as Pulletop NR (last recorded 1989), Ingalba NR (1982) and Buddigower NR (1990) and the intensely studied population at Yalgogrin was still known to have at least one active mound in 2017. Further east, a population continues to persist in the Goonoo forest near Dubbo, though the size of this population is unknown. Outside these areas, occasional records have been made in the Pilliga forests (most recently 1999), around Cobar (1991) and Goulburn River NP (1989) though the extent and status of populations in these areas are unknown. **High – Associated vegetation communities were present (PCTs 185, 186) and there are records (*n* = 3) within 10 km.**	
Lophochroa leadbeateri leadbeateri	Major Mitchell's Cockatoo	E	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. **High – Associated vegetation communities were present (PCTs 70, 72, 185, 186) and there are records (*n* = 8) within 10 km.**	Yes
Melanodryas cucullata cucullata	South-eastern Hooded Robin	E	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies *picata*. Two other subspecies occur outside NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. **Moderate – Associated vegetation communities were present (PCTs 70, 72, 185, 186), although there are no records from within 10 km.**	Yes
Neophema chrysostoma	Blue-winged Parrot	V	The main populations of Blue-winged Parrots are in Tasmania and Victoria, particularly in southern Victoria and the midlands and eastern areas of Tasmania. Sparser populations are found in western New South Wales and eastern South Australia, extending to south-west Queensland and occasionally into the Northern Territory **Low – There are no associated vegetation communities present or records from within 10 km.**	No
Pedionomus torquatus	Plains-wanderer	CE	The vast majority (>99%) of records of Plains-wanderers in NSW over the past 30 years come from an area of the western Riverina bounded by Hay and Narrandera on the Murrumbidgee River in the north, the Cobb Highway in the west, the Billabong Creek in the south, and Urana in the east. Even	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			within its western Riverina stronghold, the Plains-wanderer has a very patchy distribution. Surveys in the 1990s across 5,000km2 of the western Riverina covering 37 properties found only 5% of the total area comprised suitable habitat. The amount of high-quality habitat in the Riverina drops to 1-2% during very wet or dry years when grasslands become too dense or are grazed too bare for Plains-wanderers. The Plains-wanderer has declined greatly since European settlement. Areas where the species was formerly common and is now so reduced in numbers that it is effectively extinct include eastern NSW, south-western Victoria, and south-eastern South Australia. Its current stronghold is the western Riverina of southern NSW. Areas of secondary importance include north-central Victoria and central-western Queensland. The bird was formerly fairly common until about 1920 on the Slopes and Tablelands, and there are two earlier records of birds near Sydney. The main reason for the decline in the numbers and distribution of Plains-wanderers in all eastern States has been the conversion of native grasslands to dense introduced pasture or croplands. If native grasslands are not overgrazed or cultivated then Plains-wanderers are largely sedentary, though there is some recent evidence to suggest that birds may not remain sedentary during prolonged drought conditions. **Low – There are no associated vegetation communities present or records from within 10 km.**	
Pezoporus occidentalis	Night Parrot	E	The distribution of the Night Parrot has not been well documented, but it is known to be restricted to arid and semi-arid Australia. Twenty-two museum specimens existed prior to 1990, all but one taken in the 19th century. Of the specimens, three were collected in north-west and north-central Western Australia (including the only 20th century specimen in 1912) and the remainder in South Australia. A specimen was apparently taken in south-west New South Wales in 1897 and a number of recent sightings, including a carcass by the roadside in 1990, came from north-western Queensland. Prior to the discovery of the 1990 specimen, the Night Parrot was widely considered to be extinct. **Low – There are no associated vegetation communities present or records from within 10 km.**	No
Polytelis swainsonii	Superb Parrot	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. Breed between September and January. May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain. **Absent – Although associated vegetation communities were present (PCTs 70, 72), the survey effort failed to encounter any individuals of this species.**	
Rostratula australis	Australian Painted Snipe	E	The Australian Painted Snipe is restricted to Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks, or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally, occurs from September to December. Incubation and care of young is all undertaken by the male only. Forages nocturnally on mudflats and in shallow water. **Low – No permanent waterbodies or inundated areas within subject land. No records within 10km.**	No
Stagonopleura guttata	Diamond Firetail	V	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley, and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. **Moderate – Associated vegetation communities were present (PCTs 70, 72, 185, 186), although there are no records from within 10 km.**	Yes
MAMMALS				
Nyctophilus corbeni	Corben's Long-eared Bat, South-eastern Long-eared Bat	V	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, Bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	Yes

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			Moderate – Associated vegetation communities were present (PCTs 70, 72, 185, 186), although there are no records from within 10 km.	
Phascolarctos cinereus	Koala	E	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Koalas naturally inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species (Martin & Handasyde 1999). Koala habitat can be broadly defined as any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. The distribution of this habitat is largely influenced by land elevation, annual temperature and rainfall patterns, soil types and the resultant soil moisture availability and fertility. Preferred food and shelter trees are naturally abundant on fertile clay soils. Along the Great Dividing Range and the coastal belt throughout the species' range, Koalas inhabit moist forests and woodlands mostly dominated by *Eucalyptus* species. In coastal lowlands in Queensland and NSW, Koalas are also found in vegetation communities dominated by Melaleuca or Casuarina species (TSSC 2012p). On the western slopes, tablelands and plains in Queensland and NSW Koalas are found in sub-humid Eucalyptus-dominated forests and woodlands in riparian and non-riparian environments, and some Acacia-dominated forests and woodlands in non-riparian environments (Melzer et al. 2000). In the dry, subtropical to semi-arid environments in the western parts of the species' range, Koalas inhabit Eucalyptus-dominated forests and woodlands, particularly in the vicinity of riparian environments, and Acacia-dominated forests, woodlands and shrublands (Melzer et al. 2000; NSW DECC 2008; Sullivan et al. 2003a). Koalas are also known to occur in modified or regenerating native vegetation communities, as well as urban and rural landscapes where food trees or shelter trees may be highly scattered. There is a growing body of evidence that identifies the importance of shelter (non-food) trees to koalas. Crowther and colleagues (2013) expand on this and suggest that shelter trees are equally important as food trees and should be weighted as such when assessing habitat suitability. Shelter trees play an essential role in thermoregulation and are likely to be selected based on height, canopy cover and elevation (i.e. trees occurring in gullies are preferable) (Crowther et al. 2013). The difficulty in regards to shelter trees is that, unlike food trees, there is no identified sub-set of forest and woodland trees known to be shelter trees. The use of a particular tree species, or individual trees within a species is highly contextual and variable (Crowther et al. 2013). **Moderate – No associated vegetation communities present, or from within 10km. However, two Koala feed tree species within subject land.**	Yes
FISH				
Macquaria australasica	Macquarie Perch	E	The Macquarie Perch was once widespread through the cooler upper reaches of the southern tributaries of the Murray-Darling river system in Victoria and New South Wales, however its distribution did not usually extend to the sources of these rivers. Although it was considered rare	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			downstream in the Murray River, in Victoria the Macquarie Perch occurred in the Barmah Lakes area and tributaries such as Broken Creek. New South Wales, the species occurred in the upper reaches of the Macquarie River system. Macquarie Perch have declined considerably from their historical distribution within NSW and they are now considered isolated to the upper reaches of the Lachlan and Murrumbidgee Rivers in southern NSW. It is also found in low numbers in the Mongarlowe River, where the population is considered likely to be the result of a translocation from the Murray-Darling Basin. Other populations exist in Cataract Dam in the Nepean River catchment, as well as a 2008 record from Georges River near Campbelltown, the first record from the river since 1894. It persists in the Burrinjuck, Cotter (Murrumbidgee) and Wyangala impoundments (McDowall 1996). A breeding population in the Queanbeyan River upstream of the Googong Reservoir exists solely due to a translocation of individuals from the reservoir past a natural barrier. The Googong reservoir population is believed to be effectively extinct. Macquarie perch may occasionally become displaced downstream from the Queanbeyan River into Googong, but they do not form a population in the reservoir. **Absent – No perennial watercourses occur on the subject land.**	
FLORA				
Acacia curranii	Curly-bark Wattle	V	The majority of the species distribution lies within the Mt. Hope – Lake Cargelligo – Hillston region, including populations in the conservation areas of Yathong National Park, Nombinnie State Conservation Area and Round Hill Nature Reserve. There are about 20 populations with fewer than 5000 individuals each and one population with an estimated 150,000 individuals. Also known in Qld from two populations totalling several hundred individuals near Gurulmundi. **Absent – Although associated vegetation communities were present (PCT 72), the survey effort failed to encounter any individuals of this species.**	No
Swainsona murrayana	Slender Darling-pea	V	Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. The species has been collected from clay-based soils, ranging from grey, red, and brown cracking clays to red-brown earths and loams. **Low – There are no associated vegetation communities present or records from within 10 km.**	No
MIGRATORY SPECIES				
Migratory Marine Birds				
Apus pacificus	Fork-tailed Swift	C,J,K	The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			Bulloo River and Thurloo Downs. The Fork-tailed Swift is almost exclusively aerial, flying from less then 1 m to at least 300 m above ground and probably much higher. **Low – The species is almost exclusively aerial and does not breed in Australia.**	
Migratory Terrestrial Species				
Motacilla flava	Yellow Wagtail	M	Widespread wagtail, favouring wet meadows, marshland, grassy and muddy lakeshores. Occurs in fields and often near livestock during migration. Like other wagtails, walks on ground and pumps its long, white-sided tail up and down. Plumage highly variable, but breeding male wholly bright yellow below, with greenish back. Male head pattern varies regionally: in U.K. has greenish head with yellow eyebrow; in northern Europe head slaty grey overall; in central and southwest Europe head blue grey with white eyebrow. Individuals of several subspecies may winter together. Female and nonbreeding plumages drabber and paler, with ghosting of male patterns. Uncertainty exists regarding this species presence outside of northern Europe. **Low – The subject land is outside of the species geographical distribution and there are no records (BioNet and Atlas of Living Australia) within 10 km.**	No
Myiagra cyanoleuca	Satin Flycatcher	M	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. The Satin Flycatcher is not a commonly seen species, especially in the far south of its range, where it is a summer breeding migrant. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. The Satin Flycatcher takes insects on the wing, foraging actively from perches in the mid to upper canopy. After the breeding season, it may forage in loose groups, usually of adults and their newly-fledged young, in drier, more open forests. The Satin Flycatcher nests in loose colonies of two to five pairs nesting at intervals of about 20 m - 50 m apart. It builds a broad-based, cup-shaped nest of shredded bark and grass, coated with spider webs and decorated with lichen. **Low – Although the subject land is within the species known distribution, there are no records (BioNet and Atlas of Living Australia) within 10 km. Vegetation associations not recorded but preference for tall, wet forest in gullies suggests that the subject land is unlikely to be suitable.**	No
Migratory Wetlands Species				
Actitis hypoleucos	Common Sandpiper	C,J,K	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. **Low – Although the subject land is within the species known distribution, there are no records (BioNet and Atlas of Living Australia) within 10 km. As the species breeds in the Northern Hemisphere, subject land could only represent marginal foraging habitat (at best) .**	
Calidris acuminata	Sharp-tailed Sandpiper	V,C,J,K	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh, or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands. **Low – Although the subject land is within the species known distribution, there are no records (BioNet and Atlas of Living Australia) within 10 km. As the species breeds in the Northern Hemisphere, subject land could only represent marginal foraging habitat (at best).**	No
Calidris ferruginea	Curlew Sandpiper	CE	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. **Low – The only potential waterbodies within the subject land are non-perennial creeks, not adequate habitat for the species. No records from within 10 km.**	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
Calidris melanotos	Pectoral Sandpiper	J,K	The Pectoral Sandpiper breeds in northern Russia and North America. Within Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent, or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands. **Low – Although the subject land is within the species known distribution, there are no records (BioNet and Atlas of Living Australia) within 10 km. As the species breeds in the Northern Hemisphere, subject land could only represent marginal foraging habitat (at best).**	No
Gallinago hardwickii	Latham's Snipe	C,J,K	Latham's Snipe breeds mainly in Northern Japan, with smaller colonies in the eastern Russian mainland and Sakhalin. The entire population migrates and spends the non-winter breeding season principally in eastern Australia. **Low – Although the subject land is within the species known distribution, there are no records (BioNet and Atlas of Living Australia) within 10 km. As the species breeds in the Northern Hemisphere, subject land could only represent marginal foraging habitat (at best).**	No

Appendix G: EPBC Act Tests of Significance

EPBC Act-Listed Critically Endangered and Endangered Species

Major Mitchell's Cockatoo (*Lophochroa leadbeateri*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal will impact up to 4.23 ha of potential habitat for the Major Mitchell's Cockatoo. Requiring large hollows for reproduction, their absence from the subject site would preclude the species from being reproductively active. While there are eight records from the search area, given their age (all from 1990), it is doubtful whether this represents an active population. Given the conditions of the subject site, its habitat could only be used for transient foraging purposes. As such, the proposal will not induce a long-term decline in the size of this species' population.
Reduce the area of occupancy of the species	As indicated above, it is unlikely that an established population exists at the site. If it were to be active, the absence of suitable hollows would preclude it from being reproductively active. As such, the proposal will not significantly reduce the species area of occupancy.
Fragment an existing population into two or more populations	The proposal will not generate new fragments or exacerbate issues relating to existing fragments.
Adversely affect habitat critical to the survival of a species	As indicated above, it is unlikely that the 4.23 ha of associated habitat is of critical importance to the survival of the species given the absence of breeding habitat features.
Disrupt the breeding cycle of a population	No, see above.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 4.23 ha of potential habitat for the species. This removal/modification of available habitat is unlikely to cause the species to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks would be implemented (see **Section 7**).
Interfere with the recovery of the species.	Loss of key breeding and foraging habitat; climate change; and Psittacine circovirus disease (PCD); are the main threats to this species. Although the loss of one large hollow may be detrimental to the recovery of the species, given the lack of records from the search area, the impact will not be significant.
Conclusion	**Non-significant impact**

Hooded Robin, south-eastern form (*Melanodryas cucullata cucullata*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal will impact up to 4.23 ha of potential habitat for the Hooded Robin. Although some areas of the subject site satisfy the conditional criteria for inhabitation (e.g., a structurally diverse environment), there are no records from within the search area and the study area is not within a priority management area. Considering the above, and the relatively small size of the impact footprint, relative to the quantity of vegetation that will continue to persist in the study area, it is very unlikely for the proposal to induce a long-term decline in the size of a population of this species.
Reduce the area of occupancy of the species	As indicated above, it is unlikely that the removal of 4.23 ha of potential habitat will significantly reduce the species' area of occupancy.
Fragment an existing population into two or more populations	The proposal will not generate new fragments or exacerbate issues relating to existing fragments.
Adversely affect habitat critical to the survival of a species	As indicated above, it is unlikely that the 4.23 ha of associated habitat is of critical importance to the survival of the species.
Disrupt the breeding cycle of a population	As indicated above, it is very unlikely that a population inhabits the subject site. If a hypothetical population were to persist, it is dubious whether it was reproductively active (as no cup-shaped nest was detected). Give the substantial amount of habitat that will continue to exist in the general area following the implementation of the proposal, the breeding cycle of the species will not be disrupted.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up 4.23 ha of potential habitat for the species. This removal/modification of available habitat is unlikely to cause the species to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Interfere with the recovery of the species.	Clearing of woodlands; modification and destruction of ground habitat; competition of Noisy Miners; and increasing drought conditions due to anthropogenic climate change are the main threats to this species. The proposal alone is unlikely to directly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Koala (*Phascolarctos cinereus*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The Koala is a highly selective browser, dependent on the presence of their food tree species. As per the Western Slopes and Plains Koala Management Area, no Primary Feed Tree species and two Secondary Feed Tree species (*E. dwyeri, E. populneus*) occurred at the subject site. However, no vegetation community at the subject site is associated with the species. Further, there are no records within the 10 km search area. While there is one record 12 km to the south, this is an isolated sighting (by up to 100 km) that is quite old (from 1971). As it appears unlikely that the Koala continues to inhabit the area, the proposal will not lead to long-term decline in the size of its population.
Reduce the area of occupancy of the species	As indicated above, it is unlikely that an established population exists at the site. As such, the proposal will not significantly reduce the species area of occupancy.
Fragment an existing population into two or more populations	The proposal will not generate new fragments or exacerbate issues relating to existing fragments.
Adversely affect habitat critical to the survival of a species	As indicated above, no Koala population is known from the area. While two Secondary Feed Tree species were present, no associated vegetation community was present. As such, the habitat present would not be critical to the survival of the Koala.
Disrupt the breeding cycle of a population	No, see above.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will not remove/modify any known habitat for the species. This removal/modification of available habitat is unlikely to cause the species to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Interfere with the recovery of the species.	Habitat loss, modification, and fragmentation; vehicular strikes; predation by dogs; koala disease; anthropogenic climate change; and inadequate support for fauna rehabilitation are the main threats to this species. The proposal is unlikely to directly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

EPBC Act-listed Vulnerable Species

Malleefowl (*Leipoa ocellata*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal will impact up 0.59 ha of potential habitat for the Malleefowl. Although the study area is not at the edge of the species known distribution, nor is the subject site within a priority management area, there are records (*n* = 3) within the 10 km search area. The species is dependent on a dense/diverse herb and shrub layer for foraging purposes, which the subject site lacked. Further, none of their conspicuous breeding mounds were detected. Therefore, is unlikely that the subject site contains an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject site is unlikely critical habitat for the species, see above.
Disrupt the breeding cycle of an important population	It is unlikely that an important population exists at the site, see above.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 0.59 ha of potential habitat for the species. This removal/modification of available habitat is unlikely to cause the species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Interfere with the recovery of the species.	Loss of habitat through land clearing; inappropriate fire regimes; predation by foxes; and disturbance to their breeding mounds are the main threats for this species. The proposal is unlikely to significantly interfere with the recovery of the species within the region.
Conclusion	**Non-significant impact**

Grey Falcon (*Falco hypoleucos*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal will impact up 3.64 ha of potential habitat for the Grey Falcon. The study area is not at the edge of the species known distribution, the subject site is not within a priority management area, and there are no records from within the 10 km search area. Given these considerations, it is very unlikely that the subject site contains an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject site is unlikely critical habitat for the species, see above.
Disrupt the breeding cycle of an important population	It is unlikely that an important population exists at the site, see above.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 3.64 ha of potential habitat for the species. This removal/modification of available habitat is unlikely to cause the species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Interfere with the recovery of the species.	Grazing and clearing; secondary poisoning; and poaching of eggs/young are the main threats for this species. The proposal is unlikely to significantly interfere with the recovery of the species within the region.
Conclusion	**Non-significant impact**

Diamond Firetail (*Stagonopleura guttata*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal will impact up to 4.23 ha of potential habitat for the Diamond Firetail. Although the subject site is not at the edge of the species geographic distribution nor are there records from within the search area, the study area is within a priority management area. Therefore, if Diamond Firetails were present at the subject site, this could potentially constitute an important population. However, the removal of a relatively small amount of habitat (4.23 ha), compared to that which will continue to exist in the surrounding study area, is unlikely to place a local population at risk of extinction. As such, the proposal will not lead to a long-term decline in the size of a population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site given the absence of records. If one were to be present, the removal of 4.23 ha of potential habitat would not significantly reduce the species area of occupancy.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above. If one were to be present, the proposal would not exacerbate issues relating to fragmentation.
Adversely affect habitat critical to the survival of a species	Considering the lack of records within the search area and the subject sites small size, the habitat is unlikely to be critical to the species.
Disrupt the breeding cycle of an important population	It is unlikely that an important population exists at the site, see above. If one were to be present, the absence of nests suggests that no individuals are reproductively active.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will not remove/modify up to 4.23 ha of potential habitat for the species. This removal/modification of available habitat is unlikely to cause the species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Interfere with the recovery of the species.	Clearing and fragmentation of habitat; incursion by exotic weeds; and predation of eggs and nestlings are the main threats for this species. The proposal is unlikely to significantly interfere with the recovery of the species within the region.
Conclusion	**Non-significant impact**

Corben's Long-eared Bat (*Nyctophilus corbeni*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal will impact up to 4.23 ha of potential habitat for Corben's Long-eared Bat. The study area is not at the edge of the species known distribution, the subject site is not within a priority management area, and there are no records from within the 10 km search area. Given these considerations, it is very unlikely that the subject site contains an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	It is unlikely that the habitat at the subject site is critical to the survival of the species.
Disrupt the breeding cycle of an important population	It is unlikely that an important population exists at the site, see above.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will not remove/modify up to 4.23 ha of potential habitat for the species. This removal/modification of available habitat is unlikely to cause the species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Interfere with the recovery of the species.	Loss of woodland habitat and of hollow-bearing trees; inappropriate fire regimes; and disturbance at their roosting sites are the main threats for this species. The proposal is unlikely to significantly interfere with the recovery of the species within the region.
Conclusion	**Non-significant impact**

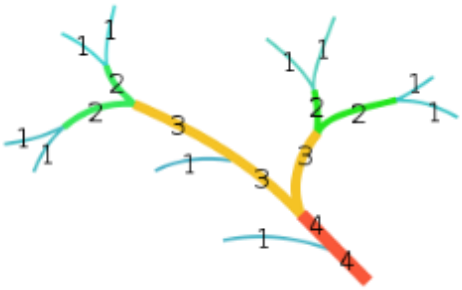
A spear-grass (*Austrostipa metatoris*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal will impact up to 0.12 ha of potential habitat for *A. metatoris* – the remaining area was subject to a targeted survey for this species and it was not detected. Although there are no records from the 10 km search area, nor is the study area within a priority management area for the species, the subject site is at the edge of the species geographic distribution. Therefore, if *A. metatoris* were to be present at the subject site, this could potentially constitute an important population. However, the closest known records to the subject site are 45 km to the northwest, from Yelkin State Forest. Given the distances between the impact footprint and this population, and the absence of any individuals detected during targeted survey, it is doubtful whether any population occupies the subject site. As such, the removal of a relatively insignificant amount of habitat (0.12 ha) compared to that which will continue to exist in the surrounding study area, is unlikely to place a local population at risk of extinction. As such, the proposal will not lead to a long-term decline in the size of a population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site given the absence of records. If one were to be present, the removal of 0.12 ha of potential habitat would not significantly reduce the species area of occupancy.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above. If one were to be present, the proposal would not exacerbate issues relating to fragmentation.
Adversely affect habitat critical to the survival of a species	Considering the lack of records within the search area and the subject sites small size, the habitat is unlikely to be critical to the species.
Disrupt the breeding cycle of an important population	It is unlikely that an important population exists at the site, see above.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will not remove/modify up to 0.12 ha of potential habitat for the species. This removal/modification of available habitat is unlikely to cause the species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 7**).
Interfere with the recovery of the species.	Grazing; habitat degradation; and drought are the main threats for this species. The proposal is unlikely to significantly interfere with the recovery of the species within the region.
Conclusion	**Non-significant impact**

Appendix H: Terms and Abbreviations

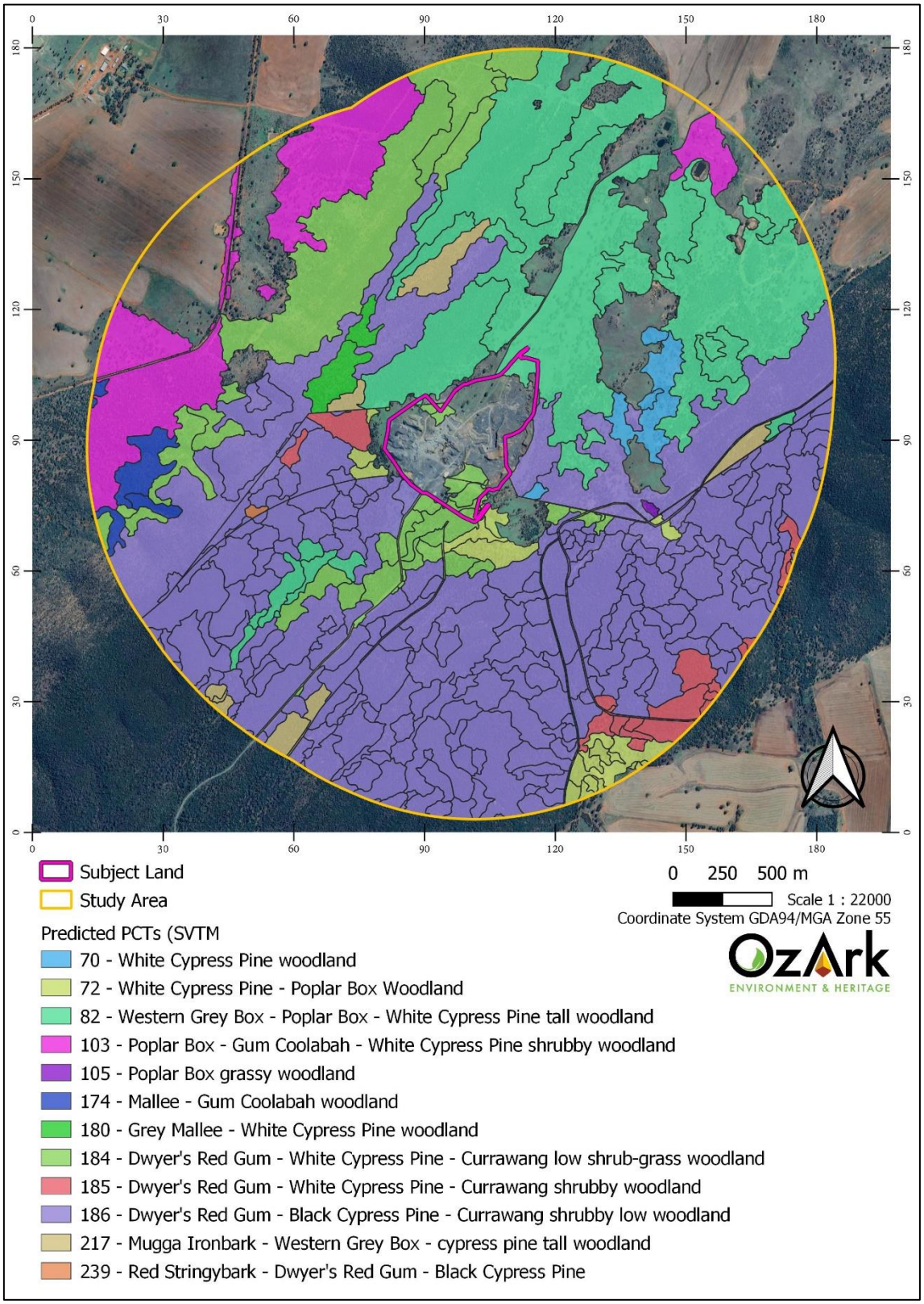
Abbreviation	Terminology	Description
BC Act	Biodiversity Conservation Act 2016 (NSW)	The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. This Act contains schedules relating to the listing of threatened species, populations and communities in NSW. It also outlines the framework regulating development impact assessments in relation to biodiversity.
	Biosecurity Act 2015 (NSW)	The broad objectives for biosecurity in NSW are to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants by Preventing their entry into NSW Quickly finding, containing and eradicating any new entries Effectively minimising the impacts of those pests, diseases, weeds and contaminants that cannot be eradicated through robust management arrangements. The *Biosecurity Act 2015* provides a statutory framework to help achieve these objectives.
CAMBA	China-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with China entered into in 1986. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
	Cumulative impacts	Impacts, when considered together, lead to a stronger impact than any impact in isolation.
	Direct impacts	Directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or development.
DCCEEW	Department of Climate Change, Energy, the Environment and Water	Designs and implements the Australian Government's policies and programs to protect and conserve the environment, water and heritage and promote climate action.
DP	Deposited Plan	A plan of land deposited in Land and Property Information (part of the Land Management Authority) and used for legal identification purposes. They most commonly depict a subdivision of a parcel of land.
EEC	Endangered Ecological Community	An ecological community identified by relevant legislation likely to become extinct or is in immediate danger of extinction.
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW).	Provides the legislative framework for land use planning and development assessment in NSW.
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).	Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
FM Act	Fisheries Management Act 1994 (NSW)	The objects of this Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. This Act protects aquatic habitats and species which are not protected under the BC Act.
IBRA	Interim Biogeographic	The Interim Biogeographic Regionalisation for Australia (IBRA) is a biogeographic regionalisation of Australia developed by the Australian Government's Department of the Environment. Each region is a land

Abbreviation	Terminology	Description
	Regionalisation of Australia	area made up of a group of interacting ecosystems repeated in similar form across the landscape.
	Indirect impacts	Occur when proposal-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development.
JAMBA	Japan-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with Japan entered into in 1974. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
KTP	Key Threatening Process	A key threatening process is defined as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. A requirement of their listing on the TSC Act is that the process adversely affects two or more threatened species, populations or ecological communities, or may cause species, populations or ecological communities not threatened to become threatened.
	Local population (species)	A local population of a threatened plant species comprises those individuals occurring in a defined area or a cluster of individuals extend into habitat adjoining and contiguous with the study area where the individuals could reasonably be expected to cross-pollinate. A local population of fauna species comprises those individuals known or likely to occur in in a defined area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. The local population of migratory or nomadic fauna species comprises those individuals likely to occur in the study area from time to time.
	Local occurrence (EEC)	The ecological community present within the study area. However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of the ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.
	Low condition (vegetation)	Vegetation in low condition means: a) woody native vegetation with native over-storey percent foliage cover less than 50% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and where either: – less than 50% of ground cover vegetation is indigenous species, or – greater than 90% of ground cover vegetation is cleared OR b) native grassland, wetland or herbfield where either: – less than 50% of ground cover vegetation is indigenous species, or – more than 90% of ground cover vegetation is cleared If native vegetation is not in low condition, it is in moderate to good condition. The percentages for the ground cover calculations must be made in a season when the proportion of native ground cover vegetation compared to non-native ground cover vegetation in the area is likely to be at its maximum. NOTE: Clearing the habitat of threatened species, populations or communities for the purposes of reducing its condition prior to assessment under the methodology may be a breach of environmental legislation, including sections 118A and 118D of the *National Parks and Wildlife Act 1974* (NPW Act), the *Native Vegetation Act 2003* (NV Act) and/or the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Abbreviation	Terminology	Description
MNES	Matters of national environmental significance	Refers to the seven matters of national environmental significance outlined under the EPBC Act.
NPW Act	National Parks and Wildlife Act 1974 (NSW)	The objects of this Act are as follows: The conservation of nature, including, but not limited to, the conservation of: habitat, ecosystems and ecosystem processes, and biological diversity at the community, species and genetic levels, and landforms of significance, including geological features and processes, and landscapes and natural features of significance including wilderness and wild rivers, The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to: places, objects and features of significance to Aboriginal people, and places of social value to the people of New South Wales, and places of historic, architectural or scientific significance, Fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation, Providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation. The objects of this Act are to be achieved by applying the principles of ecologically sustainable development.
OEH	Office of Environment and Heritage	The Office of Environment and Heritage (OEH) is a separate agency within the Planning and Environment cluster. OEH was formed on 4 April 2011 and works to protect and conserve the NSW environment, including the natural environment, Aboriginal country, culture and heritage and our built heritage, and manages NSW national parks and reserves. This agency has since been replaced by DCCEEW
RAMSAR	Convention on Wetlands of International Importance	The Ramsar Convention's broad aims are to halt the worldwide loss of wetlands and to conserve, through wise use and management, those remaining. This requires international cooperation, policy making, capacity building and technology transfer.
	Risk of extinction	The likelihood that the local population will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the viability of that population.
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with the Republic of Korea entered into in 2007. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
RF Act	Rural Fires Act 1997	The objects of this Act are to provide: for the prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts, and for the co-ordination of bush firefighting and bush fire prevention throughout the State, and for the protection of persons from injury or death, and property from damage, arising from fires, and for the protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires, and for the protection of the environment by requiring certain activities referred to in paragraphs (a)-(c1) to be carried out having regard to the

Abbreviation	Terminology	Description
		principles of ecologically sustainable development described in section 6 (2) of the *Protection of the Environment Administration Act 1991*.
Significant impact		A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity.
SIS	Species Impact Statement	A document included with an Environmental Impact Statement which details a full description of the action proposed, including its nature, extent, location, timing and layout and, to the fullest extent reasonably practicable, the information referred to in this section. The requirements as to the contents of an SIS for different categories of protected species are given in section 110 of the TSC Act.
Strahler stream order		Strahler stream order and are used to define stream size based on a hierarchy of tributaries. 
TBDC	Threatened Biodiversity Data Collection	The Threatened Biodiversity Profile Data Collection is maintained in the NSW BioNet Atlas database, and includes profiles for threatened species, population and ecological communities that occur in NSW. The profiles contain detailed descriptions, photographs and information related to the distribution, habitat, ecology, threats and management priorities of each threatened entity. The Threatened Entity Profile Data Collection contains essential information used for the assessment of likely impacts of development proposals on threatened entities and in determining the amount of habitat that can be lost and how much must be offset to achieve an "Improve or Maintain" outcome for the affected species, populations or ecological communities.

Appendix I: State Vegetation Type Map C1.1.M1.1



Note: Areas not mapped to any colour are “not classified” and may be native or non-native.

Appendix J: Coverage of SEARs and Other Government Agency Requirements Relevant to this BDAR

Paraphrased Relevant Requirement		Relevant BDAR Section(s)
Coverage of Secretary's Environmental Assessment Requirements in the EIS		
• accurate predictions of any vegetation clearing on site;		**Section 5**
• 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 4.4, 5.1, 5.3, 6, 7, Appendices E, F, G**
• 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.		**Section 7.2**
Coverage of Issues Identified by Other Government Agencies for Consideration in the EIS		
NSW DPI – Agriculture 11 June 2019	Include a biosecurity (pests & weeds) risk assessment outlining the likely plant, animal and community risks.	**Section 5.4 and Section 7.2**
	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.	**Section 7.2**
NSW Office of Environment & Heritage 20 June 2019	include threatened species impact not associated with vegetation communities such as scattered paddock trees or increases in road traffic.	**Section 7.7 and Section 7.8**
	Unless the vegetation can be avoided, the exact nature of the impact should be confirmed by applying the Biodiversity Offset Scheme Entry Threshold tool (BOSET) and a Test of Significance. Any determined impacts must be managed in a Biodiversity Development Assessment Report (BDAR).	**BDAR**
	Where impacts cannot be avoided, the EIS should detail how they will be remedied through biodiversity offsetting, including quantification of impacts and assessments of the value of offset areas, protection mechanisms and associated management regimes of those areas.	**Section 8**
	We recommend the applicant provide evidence that any learning associated with or ancillary to the activity is not likely to significantly affect threatened species, threatened ecological communities or their habitats. At a minimum that evidence should take the form of a Test of Significance according to the Minister's Guidelines.	**Appendices E, F, G**
	Appropriate measures to avoid, minimise and mitigate any impacts on vegetation and threatened species habitat should be set out in the EIS. If impacts on biodiversity are likely to be significant then the applicant ,must mitigate these impacts through the Biodiversity Offset Scheme according to the Biodiversity Conservation Act, namely a Biodiversity Development Assessment Report (BDAR).	**Section 7.2 and BDAR**
	The applicant should also apply the Biodiversity Offset Scheme Entry Threshold tool (BOSET) and submit the report with the application.	**Appendix A**

Paraphrased Relevant Requirement		Relevant BDAR Section(s)
	Where the proposal is likely to significantly affect threatened species within the meaning of Section 7.2 of the Biodiversity Conservation Act 2016, the application for development consent is to be accompanied by a Biodiversity Development Assessment Report, and 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.	**BDAR**
	• 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 7.2**
	• 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.	**Section 8, Appendix D**
	– The number and classes of like-for-like biodiversity credits proposed to be retired.	**Appendix D**
	– The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules.	**Appendix D**
	– Any proposal to fund a biodiversity conservation action.	**N/A**
	– Any proposal to make a payment to the Biodiversity Conservation Fund.	**Section 8.5**
	• 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.	**Section 3.1**

Appendix 8

Aboriginal Cultural Heritage Assessment

prepared by

OzArk Environment and Heritage Management Pty Ltd

(Total No. of pages including blank pages = 251)

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Plotting the location of a NPWS site boundary peg for Site A in 2023 with the quarry in the background.

REVISION 3 ABORIGINAL CULTURAL HERITAGE & HISTORIC HERITAGE ASSESSMENT REPORT

WESTERN RIVERINA QUARRY EXPANSION

RANKINS SPRINGS, NSW

MARCH 2024

Report prepared by

OzArk Environment & Heritage

for R.W. Corkery & Co. Pty Limited

on behalf of E.B. Mawson & Sons Pty Ltd

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Heritage NSW

ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT COVER SHEET

Report Title	Revised Aboriginal cultural heritage & historic heritage assessment report: Western Riverina Quarry Expansion, Rankin Springs, NSW.
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Report prepared for	Company Name: E.B. Mawson & Sons Pty Ltd 141 King George Street Cohuna 3568 (PO Box 66) Victoria, Australia Tel 03 5456 2409 Toll Free 1800 423 456
Date of Report	March 2024
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Ben Churcher

OzArk Principal Archaeologist

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DOCUMENT CONTROLS

Applicant	E.B. Mawson & Sons Pty Ltd
Client	R.W. Corkery & Co. Pty Limited
Document Description	Revision 3 Aboriginal Cultural Heritage and Historic Heritage Assessment Report: Western Riverina Quarry Expansion, Rankins Springs, NSW.
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FINAL V3.0 Final report	V3.0 BC finalises 16/12/21 V3.1–V3.4 BC amendments: 22/2/22–28/5/23 V3.5 BC finalises: 21/6/23 V3.6–3.7: BC amends responding to HNSW RfI: 28/9/23
V4.0: Revised ACHAR	V4.0 BC revises ACHAR following HNSW review (Revision 2): 5/2/24 V4.1: BC amends with client comments 18/2/24 V4.2: Revision 3. BC adds Mark Saddler sites 27/3/24
Prepared for	Prepared by
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Enquiries should be addressed to OzArk Environment & Heritage.

Acknowledgement

OzArk acknowledge the traditional custodians 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.

ABBREVIATIONS AND GLOSSARY

ACHAR	Aboriginal Cultural Heritage Assessment Report. As set out in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*, all developments where harm to Aboriginal objects is likely must be assessed in an ACHAR.
ACHCRs	*Aboriginal Cultural Heritage Consultation Requirements for Proponents.* Guidelines for conducting Aboriginal community consultation for developments where harm to Aboriginal objects is likely.
AHIMS	Aboriginal Heritage Information Management System. Administered by Heritage NSW, AHIMS is the central register of all Aboriginal sites within NSW.
AHIP	Aboriginal Heritage Impact Permit.
Assemblage:	All artefacts recorded at a location. In this report, assemblage refers to stone artefacts as this was the only artefact class recorded.
Code of Practice	*Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* under Part 6 NPW Act. Issued in 2010, the Code of Practice is a set of guidelines that allows limited test excavation without the need to apply for an AHIP.
Debitage:	The term debitage refers to all the waste material produced during lithic reduction and the production of stone tools. Therefore, technically, all artefacts other than reworked tools are debitage. However, in this report debitage is used in its other common meaning being the small flakes and chips produced purely as a by-product of knapping. This distinguishes these small flakes from the larger flakes that were removed (while technically 'debitage', a non-retouched flake can be used as a tool and therefore could have been the intended end point for a knapping event).
DCCEEW	Department of Climate Change, Energy, the Environment and Water. DCCEEW contains the Environment and Heritage group that contains HNSW.
DPE	NSW Department of Planning and Environment. On 1 January 2024, the former DPE was split to form two new departments, the Department of Climate Change, Energy, the Environment and Water DCCEEW) and the Department of Planning, Housing and Infrastructure (DPHI).
DPHI	Department of Planning, Housing and Infrastructure. DPHI contains the planning group.

EIS	Environmental Impact Statement. A required document for major projects documenting all potential impacts to the environment, including heritage, that may arise due to the development.
HNSW	Heritage NSW. Government department tasked with ensuring compliance with the NPW Act. HNSW is advised by the Aboriginal Cultural Heritage Advisory Committee (ACHAC).
NPW Act	*National Parks and Wildlife Act 1974*. Primary legislation governing Aboriginal cultural heritage within NSW.
OEH	Office of the Environment and Heritage. Former government department tasked with ensuring compliance with the NPW Act (now HNSW).
PAD	Potential archaeological deposit. Indicates that a particular location has potential to contain subsurface archaeological deposits, although no Aboriginal objects are visible.
RAP	Registered Aboriginal Party. An individual or group who have indicated through the ACHCR process that they wish to be consulted regarding the proposal.
SEARs	Secretary's Environmental Assessment Requirements issued by the Secretary of DPHI.

EXECUTIVE SUMMARY

OzArk Environment & Heritage (OzArk) has been engaged by R.W. Corkery & Co., on behalf of E.B. Mawson & Sons Pty Ltd (the Applicant) to complete an Aboriginal Cultural Heritage and Historic Heritage Assessment Report (ACHAR) for the proposed expansion of quarry operations at the Western Riverina Quarry (WRQ) (the proposal). The study area (defined in **Section 1.5**) is located inside the Koomaringa Aboriginal Place (AP).

Following review of the original ACHAR (October 2021), Heritage NSW (HNSW) requested further information on 21 June 2022 in the form of a final Koomaringa AP Management Plan and an updated ACHAR that considered the appropriateness of the proposal within the context of the management plan and values of the AP.

The final Koomaringa AP Plan of Management (June 2023) and the updated ACHAR (June 2023) were uploaded to the Concurrence and Referral (CNR) portal on 23 June 2023.

On 24 July 2023, HNSW issued a further request for information. This led to renewed consultation and further details about the potential impacts to the AP were added to the ACHAR. Included in this phase of investigation was a site visit on 11 August 2023 by OzArk Principal Archaeologist, Ben Churcher, to map the 1987 site buffer pegs installed by the National Parks and Wildlife Service in 1987 to ensure that the WRQ had not impacted within this buffer.

A revised ACHAR (October 2023) was produced based on the request for information and submitted to HNSW for review. In November 2023, HNSW received a request from a Registered Aboriginal Party (RAP) about the WRQ proposal and HNSW requested that the Applicant undertake additional consultation to ensure that RAPs understood the nature and extent of the proposal within the AP.

This request for further consultation resulted in three site visits to the WRQ:

- 24 November 2023: OzArk archaeologist, Jordan Henshaw, and three RAPs (Mark Saddler, James Ingram, and Robert Carroll) met on site to discuss management measures to protect the Koomaringa AP
- 5 to 7 December 2023: Three RAPs (Mark Saddler, James Ingram, and Robert Carroll) spend three days at site determining where protective fencing should be placed and investigating the Koomaringa AP surrounding the WRQ
- 20 to 22 December 2023: Three RAPs (Mark Saddler, James Ingram, and Robert Carroll) spend three days at site ensuring the fencing has been correctly installed and further inspecting the Koomaringa AP.

The Revision 2 ACHAR incorporated the results of this further consultation that occurred at the end of 2023.

After the Revision 2 ACHAR was submitted on 5 March 2024, HNSW wrote to the Carrathool Shire Council on 14 March 2023 requesting additional information. The HNSW letter noted that '*during the site inspection (undertaken by stakeholders in December 2023) the stakeholders identified and registered a further 14 sites on AHIMS* (the Aboriginal Heritage Information Management System)*: 42-5-0062 to 42-5-0075. These sites have not been described or mapped in the most recent reports received as the AHIMS search pre-date the registration of these sites. The reports must identify, map, describe and assess all recorded Aboriginal sites in regard to potential impacts from the proposal*'.

The 14 sites were registered by RAP Mark Saddler at a time when OzArk was not present.

Following receipt of the HNSW request for further information, OzArk Principal Archaeologist, Ben Churcher, wrote to Lyndon Patterson, Senior Assessment Officer HNSW, on 14 March 2024 noting '*as OzArk was not there when the sites were recorded, we can certainly map them, describe them based on site card information, and assess them in the context of other sites in the area (or any information on the site card)*'. No response was received from Mr Patterson, and it is assumed that using the information on the site cards is sufficient to 'describe and assess' the 14 sites recorded by Mr Saddler. It is also noted that the 13 March 2024 HNSW letter made no further requests for information beyond incorporating the sites recorded by Mr Saddler into the ACHAR.

This Revision 3 ACHAR incorporates the results of a renewed AHIMS search and the mapping, description, and assessment of the 14 recently registered sites.

Aboriginal cultural heritage

The pedestrian survey was undertaken by Dr Alyce Cameron, OzArk Senior Archaeologist, and Mr Max Harris, a site officer for Griffith Local Aboriginal Land Council (LALC) on Tuesday 8 October to Friday 11 October 2019. The survey included full assessment within the study area where there is no prior disturbance, as well as re-investigating the previously recorded site Site A and Site B that are registered under a single AHIMS registration (see **Section 5.2**).

The survey resulted in 19 Aboriginal sites being recorded, and one previously recorded site was re-investigated. Of the 20 Aboriginal sites recorded or located during the assessment, two sites are located inside the proposed maximum limit of disturbance and may be harmed by the proposal (42-5-0012 [Koomaringa IF-03] and 42-5-0022 [Koomaringa OS-13]). All other 18 sites are outside the maximum limit of disturbance and will not be harmed by the proposal.

In late 2023, RAP Mark Saddler registered an additional 14 sites. All of these sites are located outside the Quarry Site and the maximum limit of disturbance except for 42-5-0064 (Koomaringa Anvil 1) that is located within the maximum limit of disturbance. 42-5-0064 (Koomaringa Anvil 1) is an isolated boulder of vesicular basalt approximately one metre in diameter that has been

described as an ‘anvil’. The remaining 13 sites recorded by Mr Saddler will not be harmed by the proposal.

Therefore, as a result of all previous surveys and site inspections, a total of 34 sites are known to exist in the Koomaringa AP (not including the AHIMS registration for the AP itself). Of these 34 sites, three are likely to be harmed by the proposal (42-5-0012 [Koomaringa IF-03], 42-5-0022 [Koomaringa OS-13], and 42-5-0064 [Koomaringa Anvil 1]) and 31 sites will not be harmed.

A site visit by OzArk Principal Archaeologist, Ben Churcher, on 11 August 2023, demonstrated that the wooden stakes installed by the National Parks and Wildlife Service in 1987 to mark the buffer for the culturally significant Site A and Site B remain in place, albeit often knocked over and/or decayed. This visit determined that the proposed maximum limit of disturbance is entirely outside of the demarcated buffer for Site A and Site B and that the proposal will not directly harm these sites or any land within the established 1987 buffer boundary.

As a result of the assessment, it is determined that the Aboriginal cultural heritage values of the Koomaringa AP will be diminished as three artefacts and a boulder described as an ‘anvil’ will be moved from their current location and placed at another location within the Koomaringa AP where they will not be harmed by the proposal (should an Aboriginal Heritage Impact Permit [AHIP] be approved: see Recommendation 9).

While letters, emails, and a copy of the draft ACHAR were sent to the RAPs for the proposal following the *Aboriginal cultural heritage consultation requirements for proponents* (DECCW 2010b), no feedback at any stage of the consultation process for the ACHAR was received prior to September 2023, apart from that gained from the Griffith LALC during the survey.

In a final effort to gain some feedback, and at the request of HNSW, a further round of consultation was undertaken in September 2023 to allow RAPs to contribute any views they may have in the realisation that the Aboriginal cultural heritage values of the Koomaringa AP will be diminished by the proposal. However, as has been the case for the entire investigation, it proved very difficult to gain feedback from the RAPs, including from the Griffith LALC. However, responses from two Wiradjuri stakeholders (Mt Robert Clegg and Mr Paul Brydon) both stated that they were comfortable with the recommendations made in the ACHAR.

A renewed round of consultation occurred in November and December 2023 that resulted in the Applicant, with the assistance of RAPs, reinstating the boundary fencing for Site A and Site B that was first established by the National Parks and Wildlife Service in 1987. This fencing, undertaken with the advice of the RAPs who were present at the time, ensures the preservation of the culturally significant sites, Site A and Site B, as well as the so-called ‘Site C’; an amalgam of Koomaringa PL-01 (42-5-0023), Koomaringa OS-11 (42-5-0020), and 42-5-0062 (Koomaringa Grind Groove 1 MS) that was also fenced.

As it is acknowledged that the proposed harm to three Aboriginal artefacts and a boulder described as an 'anvil' at the WRQ diminishes the Aboriginal cultural heritage values of the Koomaringa AP, the Applicant agrees to undertake the following initiatives to ensure that the overall Aboriginal cultural heritage values of the Koomaringa AP are enhanced by the proposal:

1. Applicant will monitor the fenced site buffers of Sites A, B, and C that are located at the boundary of the WRQ operational areas on a regular basis and not less than every two years. Monitoring will be undertaken by at least two representatives of the Koomaringa Management Group, where practicable.
2. Photos from the northern, southern, eastern, and western perimeters of the approved Quarry Site boundary will be taken not less than every two years to provide evidence that quarrying activities are within the approved Quarry curtilage. The photos will be made available to the Koomaringa Management Group (see Koomaringa AP Plan of Management).
3. The Applicant will arrange a one-off face-to-face heritage induction for WRQ staff. The content of this induction will then be presented as a training package for later use. Both the face-to-face induction and the provision of a training package will be under an agreed contractual arrangement.
4. The Applicant will fund the installation of heritage signage at the WRQ. The location and wording of any signage will be discussed with the Koomaringa Management Group when it is formed. It is imagined that the signs would recognise the significance of the Aboriginal Place and provide site access details.
5. The Applicant will plant and maintain a tree screen of appropriate native species outside of the archaeological site buffer between Site A and the WRQ. This tree screen will help improve the visual amenity of Site A when looking towards the WRQ. Appropriate species for the tree screen are provided in **Section 9.2.2.1**.
6. To assist with allowing safe access to the Koomaringa AP for the Aboriginal community, the Applicant will undertake to locate and form a gravelled carpark near the location shown on **Figure 9-1**.
7. The Applicant agrees to facilitate an appropriate access protocol as set out in **Section 9.2.1** to allow the Aboriginal community to visit the Koomaringa AP.
8. The Applicant will facilitate and fund the installation of a path, picnic shelter table and seats, and signage leading from the carpark to Site A. The location of these facilities will be on the advice of the Koomaringa Management Group when it is formed and HNSW.

Additional recommendations concerning Aboriginal cultural values within the study area are as follows:

9. The Applicant will apply for an AHIP to impact 42-5-0012 (Koomaringa IF-03), 42-5-0022 (Koomaringa OS-13), and 42-5-0064 (Koomaringa Anvil 1) as per the methodology set out in **Section 9.2.3**, with the AHIP area shown on **Figure 10-1**. Until an AHIP is approved, these sites must be protected with fencing.
10. The Applicant will avoid any inadvertent harm to the remaining 31 Aboriginal sites by following the management and mitigation measures outlined in **Section 9.2.4**.
11. All ground-disturbing activities must be confined to the AHIP area shown on **Figure 10-1**. Should ground disturbing works extend beyond this, then further archaeological assessment and impact assessment may be required.
12. The heritage management protocols of the Koomaringa AP Plan of Management apply to the WRQ as set out in **Section 9.2.5**. The consent approval for the WRQ (DA2022/029) and any applicable AHIPs, if approved, will manage cultural heritage within the WRQ.
13. If skeletal remains are identified during the development and operation of the proposal, the *Unanticipated Skeletal Remains Protocol* (**Appendix 4**) will be followed.
14. If Aboriginal objects are identified outside of the maximum limit of disturbance (AHIP area), all work will cease and the procedures in the *Unanticipated Finds Protocol* (**Appendix 3**) will be followed.
15. Inductions for work crews will include a cultural heritage awareness procedure to ensure they recognise Aboriginal artefacts (see **Appendix 5**) and are aware of the legislative protection of Aboriginal objects under the *National Parks and Wildlife Act 1974* and the contents of the *Unanticipated Finds Protocol, and Unanticipated Skeletal Remains Protocol.*

Historic cultural heritage

The survey did not record any items with significant historic values. As it is unlikely that the proposal will impact historic heritage values, the following general recommendation is made:

16. In the unlikely event that historical relics or deposits are unearthed during the proposed works, the *Historical Heritage Unanticipated Finds Protocol* (**Appendix 7**) will be followed.

CONTENTS

ABBREVIATIONS AND GLOSSARY IV

EXECUTIVE SUMMARY VI

1 INTRODUCTION 1

1.1 Description of the proposal 1

1.2 Background 2

1.3 Versions of this ACHAR 3

1.4 Proposed work 5

1.5 Study area 8

2 LANDSCAPE CONTEXT 10

2.1 Topography 10

2.2 Geology and soils 14

2.3 Hydrology 14

2.4 Vegetation 14

2.5 Climate 15

2.6 Land use history and existing levels of disturbance 15

2.7 Conclusion 17

ABORIGINAL CULTURAL HERITAGE ASSESSMENT 18

3 THE ABORIGINAL ARCHAEOLOGICAL ASSESSMENT 19

3.1 Date of archaeological assessment 19

3.2 OzArk involvement 19

3.2.1 Field assessment 19

3.2.2 Reporting 19

3.3 Relevant legislation 19

3.3.1 State legislation 20

3.3.2 Commonwealth legislation 21

3.3.3 Applicability to the proposal 21

3.4 Assessment approach 21

3.5 Purpose and objectives 23

3.5.1 Aboriginal archaeological assessment objectives 23

3.6 Report compliance with the Code of Practice 23
4 ABORIGINAL COMMUNITY CONSULTATION 26
4.1 Aboriginal community consultation 26
4.1.1 ACHCRs Stage 1 26
4.1.2 ACHCRs Stages 2 & 3 26
4.1.3 ACHCRs Stage 4 27
4.1.4 Project updates 27
4.1.5 Consultation on the Koomaringa Aboriginal Place Plan of Management 27
4.1.6 Site visits during 2023 28
4.2 Aboriginal community involvement in the assessment 28
4.2.1 Comments arising from the assessment 28
4.2.2 Aboriginal community feedback on the ACHAR 30
4.2.3 Aboriginal cultural heritage values of the Koomaringa AP 32
5 ABORIGINAL ARCHAEOLOGY BACKGROUND 33
5.1 Ethno-historic sources of regional Aboriginal culture 33
5.2 Regional archaeological context 34
5.3 Local archaeological context 44
5.3.1 Desktop database searches conducted 44
5.4 Predictive model for site location 51
5.4.1 Settlement strategies 51
5.4.2 Past land use 51
5.4.3 Previous studies 52
5.4.4 Landform modelling 52
5.4.5 Conclusion 52
6 RESULTS OF ABORIGINAL ARCHAEOLOGICAL ASSESSMENT 55
6.1 Sampling strategy and field methods 55
6.2 Project constraints 57
6.3 Effective survey coverage 57
6.4 Aboriginal sites recorded 61
Koomaringa IF-01 (42-5-0010) 63

Koomaringa IF-02 (42-5-0011) 65
Koomaringa IF-03 (42-5-0012) 67
Koomaringa OS-01 (42-5-0013) 69
Koomaringa OS-02 (42-5-0014) 71
Koomaringa OS-03 (42-5-0016) 73
Koomaringa OS-04 (42-5-0015) 73
Koomaringa OS-05 (42-5-0026) 76
Koomaringa OS-06 (42-5-0027) 78
Koomaringa OS-07 (42-5-0028) 78
Koomaringa OS-08 (42-5-0017) 79
Koomaringa OS-09 (42-5-0018) 80
Koomaringa OS-10 (42-5-0019) 82
Koomaringa OS-11 (42-5-0020) 82
Koomaringa OS-12 (42-5-0021) 85
Koomaringa OS-13 (42-5-0022) 85
Koomaringa PL-01 (42-5-0023) 88
Koomaringa PL-02 (42-5-0025) 88
Koomaringa ST-01 (42-5-0024) 91
6.5 Previously recorded Aboriginal sites located 94
Site A (42-5-0004) 94
Site B (42-5-0004) 98
6.6 Sites recorded in 2023 101
7 DISCUSSION 104
7.1 Discussion of survey results 104
7.1.1 Summary of survey results 104
7.1.2 Discussion 104
8 SIGNIFICANCE AND IMPACT ASSESSMENT 106
8.1 Assessment of significance 106
8.1.1 Introduction 106
8.2 Assessed significance of the sites recorded by OzArk 107

8.3 Assessed significance of sites recorded in 2023 109
8.4 Avoiding and minimising harm 110
8.4.1 Conserving significant Aboriginal cultural heritage 110
8.4.2 Ecologically sustainable development principles 111
8.5 Likely impacts to Aboriginal heritage from the proposal 113
9 MANAGEMENT OF ABORIGINAL CULTURAL HERITAGE SITES 119
9.1 General management principles 119
9.2 Management and mitigation of recorded Aboriginal sites 119
9.2.1 Mitigation of direct harm to the Koomaringa AP 119
9.2.2 Management of indirect harm to the Koomaringa AP 122
9.2.3 Management of Aboriginal sites within the maximum limit of disturbance 126
9.2.4 Management of Aboriginal sites outside the maximum limit of disturbance 128
9.2.5 Koomaringa Plan of Management 130
10 AHIP APPLICATION DETAILS 132
10.1 Cadastral details 132
10.2 AHIP area 132
10.2.1 Movement only of certain Aboriginal objects 136
10.2.2 Treatment of objects from surface artefact collection 136
10.2.3 Harm to certain Aboriginal objects through the proposed works 136
10.2.4 Areas where Aboriginal objects will not be harmed 136
10.2.5 Heritage contingency protocols for unanticipated finds 137
HISTORIC HERITAGE ASSESSMENT 138
11 HISTORIC HERITAGE ASSESSMENT: INTRODUCTION 140
11.1 Brief description of the proposal 140
11.2 Relevant legislation 140
11.2.1 State legislation 140
11.2.2 Commonwealth legislation 140
11.2.3 Applicability to the proposal 140
11.3 Historic heritage assessment objectives 141
11.4 Date of historic heritage assessment 141

11.5 OzArk involvement 141
12 HISTORIC HERITAGE ASSESSMENT: BACKGROUND 142
12.1 Brief history of Rankins Springs 142
13 HISTORIC HERITAGE ASSESSMENT 144
13.1 Desktop database searches conducted 144
13.2 Survey methodology 144
13.3 Project constraints 144
13.4 Results of Historic Heritage Assessment 144
13.5 Discussion of results 144
13.6 General principles for the management of historic sites 145
14 RECOMMENDATIONS 146
14.1 Aboriginal cultural heritage 146
14.2 Historic heritage 148
REFERENCES 149
APPENDIX 1: ABORIGINAL COMMUNITY CONSULTATION 151
APPENDIX 2: AHIMS EXTENSIVE SEARCHES 212
APPENDIX 3: ABORIGINAL HERITAGE: UNANTICIPATED FINDS PROTOCOL 219
APPENDIX 4: UNANTICIPATED SKELETAL REMAINS PROTOCOL 220
APPENDIX 5: ABORIGINAL HERITAGE: ARTEFACT IDENTIFICATION 221
APPENDIX 6: ARTEFACT CATALOGUE 222
APPENDIX 7: HISTORIC HERITAGE: UNANTICIPATED FINDS PROTOCOL 227

FIGURES

Figure 1-1: Map showing the location of the proposal. 1
Figure 1-2: Map of rock extraction Area A and Area B at Koomaringa (Pearce 1986:25). 3
Figure 1-3: Proposed work showing impact footprint. 7
Figure 1-4: Aerial showing the study area, previous disturbance, and the maximum limit of disturbance. 9
Figure 2-1: 3D model of the study area (red line) viewed north. 11
Figure 2-2: Landform units of the study area. 12
Figure 2-3: Landform types inside the study area. 13
Figure 2-4: Drainage lines in and near the study area. 15
Figure 2-5: 1966 aerial with the study area (source: NSW SS 2021). 16
Figure 2-6: 1991 aerial with the study area (source: NSW SS 2021). 17
Figure 5-1: Predictive model of sites in the Murrumbidgee east province (source: Pardoe and Martin 2011: 104). 35
Figure 5-2: Area 'A' felsite extraction zone showing location of buffer zone (source: Byrne 1987: 33). 38
Figure 5-3: Area 'B' felsite extraction area showing buffer zone east of creek bed (source: Byrne 1987: 31). 41
Figure 5-4: Detail showing area of felsite bedrock exposures at Area 'B' (source: Byrne 1987: 32). 42
Figure 5-5: Location of previously recorded AHIMS sites in relation to the study area (2021). . 47
Figure 5-6: Location of previously recorded AHIMS sites in relation to the study area (2023). . 48
Figure 5-7 Location of previously recorded AHIMS sites in relation to the Koomaringa AP (2024). 49
Figure 5-8: Detail of sites recorded in the Koomaringa AP at the south of the Quarry Site. 50
Figure 6-1: Pedestrian transects and survey areas. 56
Figure 6-2: Pedestrian transects and landforms. 60
Figure 6-3: OzArk recorded site locations and landforms. 62
Figure 6-4: Koomaringa IF-01. View of site and recorded artefact. 63
Figure 6-5: Koomaringa IF-01 & OS-03. Site map. 64
Figure 6-6: Koomaringa IF-02. View of site and recorded artefact. 65
Figure 6-7: Koomaringa IF-02. Site map. 66
Figure 6-8: Koomaringa IF-03. View of site and recorded artefact. 67
Figure 6-9: Koomaringa IF-03 & OS-12. Site map. 68
Figure 6-10: Koomaringa OS-01. View of site and selection of recorded artefacts. 69
Figure 6-11: Koomaringa OS-01 & OS-10. Site map. 70
Figure 6-12: Koomaringa OS-02. View of site and selection of recorded artefacts. 71

Figure 6-13: Koomaringa OS-02, OS-06 & OS-07. Site map. 72
Figure 6-14: Koomaringa OS-03. View of site and selection of recorded artefacts. 73
Figure 6-15: Koomaringa OS-04. View of site and a recorded artefact. 74
Figure 6-16: Koomaringa OS-04. Site map. 75
Figure 6-17: Koomaringa OS-05. View of site and selection of recorded artefacts. 76
Figure 6-18: Koomaringa OS-05 & OS-08. Site map. 77
Figure 6-19: Koomaringa OS-06. View of site and selection of recorded artefacts. 78
Figure 6-20: Koomaringa OS-07. View of site and selection of recorded artefacts. 79
Figure 6-21: Koomaringa OS-08. View of site and selection of recorded artefacts. 80
Figure 6-22: Koomaringa OS-09. View of site and selection of recorded artefacts. 80
Figure 6-23: Koomaringa OS-09. Site map. 81
Figure 6-24: Koomaringa OS-10. View of site and selection of recorded artefacts. 82
Figure 6-25: Koomaringa OS-11. View of site and selection of recorded artefacts. 83
Figure 6-26: Koomaringa OS-11 & PL-01. Site map. 84
Figure 6-27: Koomaringa OS-12. View of site and selection of recorded artefacts. 85
Figure 6-28: Koomaringa OS-13. View of site and selection of recorded artefacts. 86
Figure 6-29: Koomaringa OS-13. Site map. 87
Figure 6-30: Koomaringa PL-01. View of site and selection of recorded artefacts. 88
Figure 6-31: Koomaringa PL-02. View of site and selection of recorded artefacts. 89
Figure 6-32: Koomaringa PL-02. Site map. 90
Figure 6-33: Koomaringa ST-01. View of site and selection of recorded artefacts. 91
Figure 6-34: Koomaringa ST-01. Site map. 93
Figure 6-35: Site A. View of site, procurement locations and recorded artefacts. 95
Figure 6-36: Site A. Site map. 97
Figure 6-37: Site B. View of site, procurement locations and recorded artefacts. 99
Figure 6-38: Site B. Site map. 100
Figure 6-39: View of 42-5-0064 taken from the site card. 102
Figure 6-40: Location of sites recorded in 2023. 103
Figure 8-1: Recorded sites in relation to impacts from the proposal. 116
Figure 8-2: Sites that may be harmed by the proposal. 117
Figure 8-3: Map showing mapped site extents of Site A and Site B and the current protective fencing. 118
Figure 9-1: Aerial showing the potential location of a car park. 122
Figure 9-2: Aerial showing the photo points taken from Site A and Site B. 123
Figure 9-3: Views towards the WRQ from Site A and Site B. 124
Figure 9-4: Example of signage. 129
Figure 10-1: The AHIP area. 134
Figure 10-2: The AHIP area with sites. 135

Figure 12-1: Extract of the 1903 NSW Pastoral Stations Map with the general location of the study area marked in red (source: SLNSW 2021)..... 143

APPENDIX FIGURES

Appendix 1 Figure 1: Consultation Log. 151
Appendix 1 Figure 2: Stage 1 advertisement..... 157
Appendix 1 Figure 3: Stage 1 letters to agencies. 158
Appendix 1 Figure 4: Stage 1 replies from agencies. 160
Appendix 1 Figure 5: Stage 2/3 letters to RAPs with assessment methodology. 163
Appendix 1 Figure 6: Stage 4 letter sent to RAPs. 173
Appendix 1 Figure 7: Project updates sent to RAPs. 174
Appendix 1 Figure 8: Email from Robert Carroll, 14 November 2023. 182
Appendix 1 Figure 9: Email record of site visit, 24 November 2023. 182
Appendix 1 Figure 10: Letter from Mark Saddler (Bundyi Culture), 26 November 2023..... 183
Appendix 1 Figure 11: Letter from Robert Carroll (Miyagan Culture and Heritage), 29 November 2023..... 196
Appendix 1 Figure 12: Letter from Mark Saddler (Bundyi Culture), 29 November 2023..... 198
Appendix 1 Figure 13. Letter from Mark Saddler 3 January 2024. 201
Appendix 1 Figure 14: OzArk response to RAP submissions. 204

Appendix 2 Figure 1: 12/09/2019 AHIMS search..... 212
Appendix 2 Figure 2: 09/08/2021 AHIMS search..... 213
Appendix 2 Figure 3: 24/05/2023 AHIMS search..... 215
Appendix 2 Figure 4: 23/03/2024 AHIMS search..... 217

TABLES

Table 2-1: Landform units inside study area. 11
Table 3-1: Technical assessment (heritage) related SEARs..... 22
Table 3-2: Agency project specific assessment recommendations. 22
Table 3-3: Report compliance with the Code of Practice. 24
Table 5-1: Field Notes – Area 'A' (reproduced from Byrne 1987: 21–23)..... 39
Table 5-2: Field Notes – Area 'B' (reproduced from Byrne 1987: 18–21)..... 43
Table 5-3: Aboriginal cultural heritage: desktop-database search results. 45
Table 5-4: Site types and frequencies of AHIMS sites near the study area (2019). 46
Table 6-1: Effective survey coverage within the study area. 58
Table 6-2: Effective survey coverage and incidences of site recording..... 58

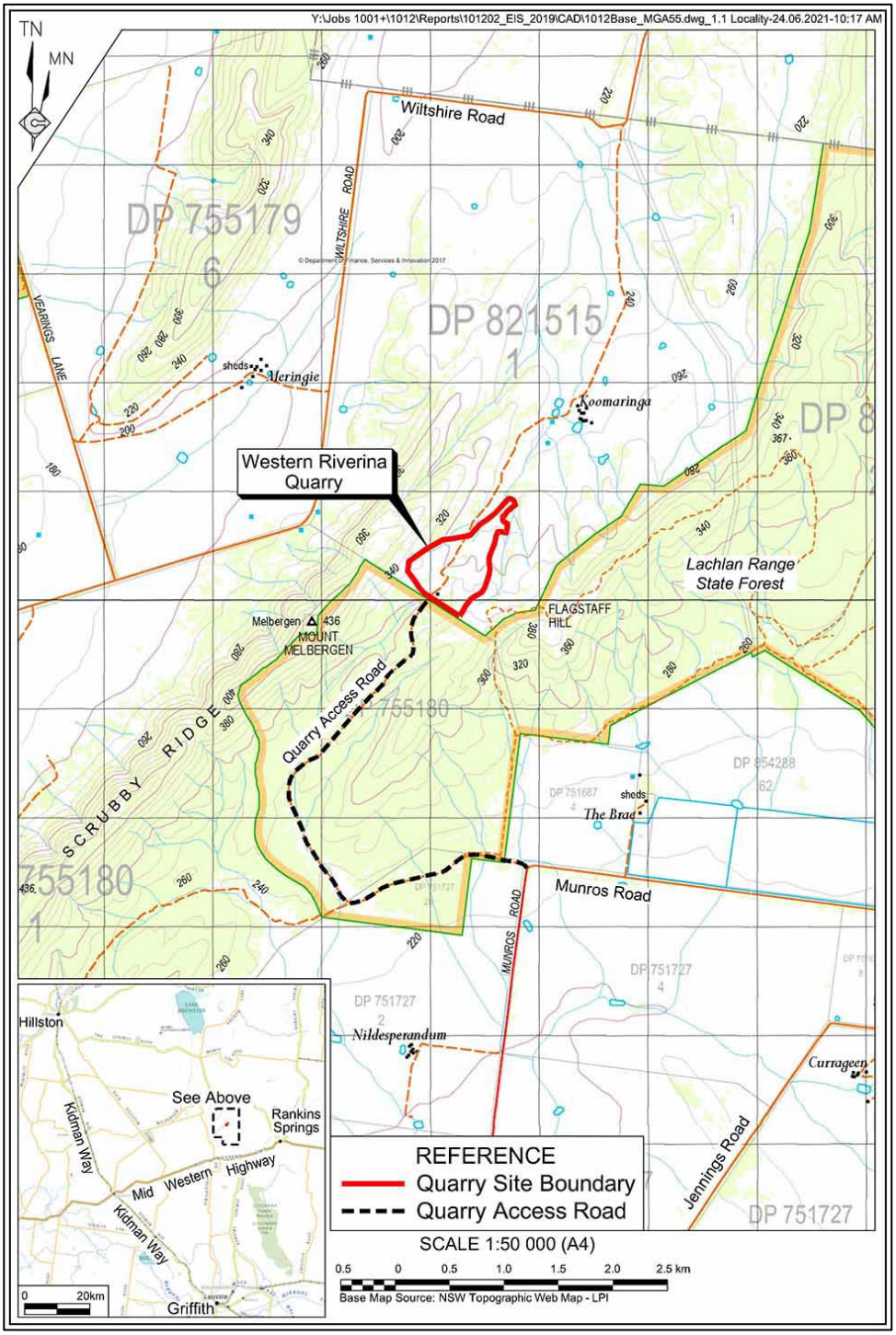
Table 6-3: Aboriginal cultural heritage sites recorded by OzArk during the survey. 61
Table 6-4: Sites recorded in 2023. 101
Table 8-1: Aboriginal cultural heritage: significance assessment of sites recorded by OzArk. 109
Table 8-2: Aboriginal cultural heritage: significance assessment of sites recorded in 2023. ... 110
Table 8-3: Application of ESD principles to the proposal. 112
Table 8-4: Aboriginal cultural heritage: impact assessment. 114
Table 10-1: Cadastral details for the AHIP area. 132
Table 10-2: AHIP area boundary points. 133
Table 13-1: Historic heritage: desktop-database search results. 144

1 INTRODUCTION

1.1 DESCRIPTION OF THE PROPOSAL

OzArk Environment & Heritage (OzArk) has been engaged by R.W. Corkery & Co., on behalf of E.B. Mawson & Sons Pty Ltd (the Applicant) to complete an Aboriginal Cultural Heritage and Historic Heritage Assessment Report (ACHAR) for the proposed expansion of quarry operations at the Western Riverina Quarry (WRQ) (the proposal). The proposal is in the Carrathool Local Government Area (LGA) (**Figure 1-1**).

Figure 1-1: Map showing the location of the proposal.



1.2 BACKGROUND

The study area (defined in **Section 1.5**) is located inside the curtilage for Koomaringa Aboriginal Place (AP). Koomaringa AP is located approximately 55.5 kilometres (km) north of Griffith and 17 km northwest of Rankins Springs, NSW. Koomaringa AP covers approximately 430 hectares (ha) of Lot 12 DP1286927 and is surrounded by the Lachlan Range State Forest to the south and east, Wiltshire Road to the west, and the Koomaringa Homestead to the north. Koomaringa AP was gazetted as an Aboriginal Place in 1991.

WRQ, previously known as Koomaringa Quarry, was originally granted development consent by the Carrathool Shire Council on 25 May 1987. The Quarry currently operates under DA2/91 which was issued by Carrathool Shire Council on 19 July 1991. Prior to operations commencing, three archaeological assessments were undertaken.

The Aboriginal site of Koomaringa was first officially recorded by R. Williams and D. Ingram as AHIMS #42-5-0004 in 1987. This site card details that the site is located approximately 500–1000 metres (m) south of the Koomaringa Homestead. The GPS coordinates provided on this card place the site towards the northern boundary of the curtilage for the AP. Unfortunately, there is no map or photographs provided with the site card. The site is recorded as a stone tool extraction and working/knapping area and is in a creek bed.

AHIMS registration (#42-5-0005) is not a formal site card but contains the gazette notice for Koomaringa AP, and a map showing the AP boundaries. The GPS coordinates for #42-5-0005 are near the north-eastern corner of the AP boundary.

Witter (1987) undertook a heritage assessment of WRQ and Koomaringa AP to supplement an Environmental Impact Statement (EIS) developed in 1986 by Terry Pearce for the Koomaringa Quarry. Witter's report stated there were two locations proposed for rock extraction by the quarry ('Area A' and 'Area B'). A map is provided in the EIS (Pearce 1986) which shows the two proposed extraction areas (see **Figure 1-2**).

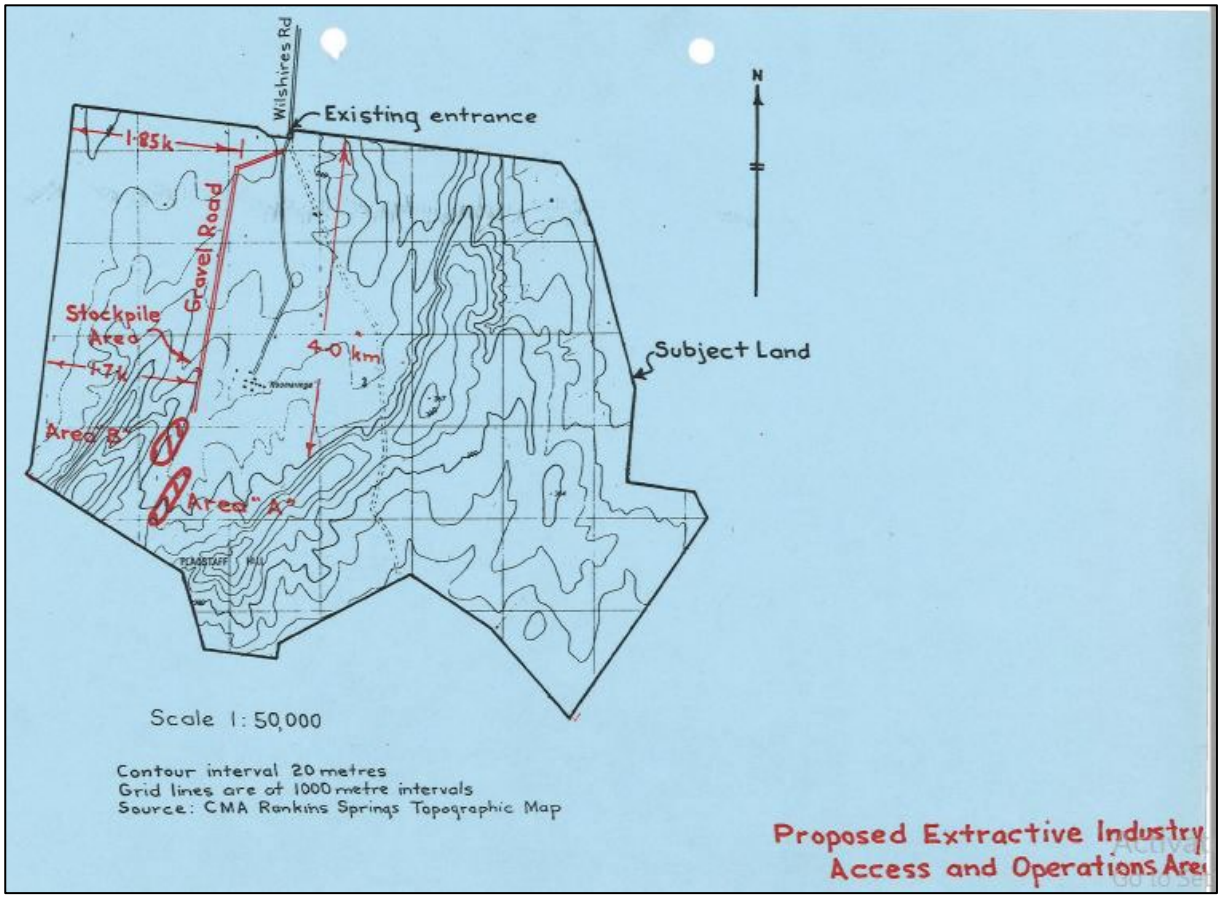
The land west of Area B (**Figure 1-2**) was referred to as the 'western felsite zone' by Witter and described as having "*abundant flaked stone as waste from the process of breaking out core. The breaking out was done by hurling great blocks of stone against the bedrock in order to detach large spalls. These spalls then could be used as core blanks*" (Witter 1987:2). The bedrock anvils and workshop areas are also mentioned as being present in this western felsite zone. The 'eastern felsite zone', described as being adjacent to the east of Area A (**Figure 1-2**), is recorded as being an outcrop upslope of the basalt location, with a variety of flaked stone as well as bedrock anvils.

Witter states that the Koomaringa Aboriginal stone quarry is an "*outstanding example of its kind*" (1987:3), and has been heavily worked, likely due to the rarity of felsite in the area. The felsite is also described as being highly distinctive with red, yellow, and orange colour variations.

Byrne (1987) also assessed the Aboriginal sites at Koomaringa to further supplement the EIS by Pearce (1986). Byrne's main objective was to map the extent of the archaeological evidence of Aboriginal felsite extraction. Furthermore, Byrne also considered approximate 'buffer zones' between the proposed blue-stone extraction and the Aboriginal sites. As part of Byrne's assessment, steel star-pickets were installed as barrier fences as recommended by Witter (1987). These star pickets were placed at 50 m intervals, with a single strand of wire to stop vehicle passage but allow stock movement.

The information provided about Koomaringa AP from the NSW State Heritage Inventory states that the most significant areas of the Aboriginal sites are cordoned off and protected from mining (OEH 2019).

Figure 1-2: Map of rock extraction Area A and Area B at Koomaringa (Pearce 1986:25).



1.3 VERSIONS OF THIS ACHAR

Following review of the original ACHAR (October 2021), Heritage NSW (HNSW) requested further information on 21 June 2022 in the form of a final Koomaringa AP Management Plan and an updated ACHAR that considered the appropriateness of the proposal within the context of the management plan and values of the AP.

The final Koomaringa AP Plan of Management (June 2023) and the updated ACHAR (June 2023) were uploaded to the Concurrence and Referral (CNR) portal on 23 June 2023.

On 24 July 2023, HNSW issued a further request for information. This led to renewed consultation and further details about the potential impacts to the AP were added to the Revised ACHAR. Included in this phase of investigation was a site visit on 11 August 2023 by OzArk Principal Archaeologist, Ben Churcher, to map the 1987 site buffer pegs installed by the National Parks and Wildlife Service in 1987 to ensure that the WRQ had not impacted within this buffer.

A revised ACHAR (October 2023) was produced based on the request for information and submitted to HNSW for review. In November 2023, HNSW received a request from a Registered Aboriginal Party (RAP) about the WRQ proposal and HNSW requested that the Applicant undertake additional consultation to ensure that RAPs understood the nature and extent of the proposal within the AP.

This request for further consultation resulted in three site visits to the WRQ:

- 24 November 2023: OzArk archaeologist, Jordan Henshaw, and three RAPs (Mark Saddler, James Ingram, and Robert Carroll) met on site to discuss management measures to protect the Koomaringa AP
- 5 to 7 December 2023: Three RAPs (Mark Saddler, James Ingram, and Robert Carroll) spend three days at site determining where protective fencing should be placed and investigating the Koomaringa AP surrounding the WRQ
- 20 to 22 December 2023: Three RAPs (Mark Saddler, James Ingram, and Robert Carroll) spend three days at site ensuring the fencing has been correctly installed and further inspecting the Koomaringa AP.

The Revision 2 ACHAR incorporated the results of this further consultation that occurred at the end of 2023.

After the Revision 2 ACHAR was submitted on 5 March 2024, HNSW wrote to the Carrathool Shire Council on 14 March 2023 requesting additional information. The HNSW letter noted that '*during the site inspection (undertaken by stakeholders in December 2023) the stakeholders identified and registered a further 14 sites on AHIMS: 42-5-0062 to 42-5-0075. These sites have not been described or mapped in the most recent reports received as the AHIMS search pre-date the registration of these sites. The reports must identify, map, describe and assess all recorded Aboriginal sites in regard to potential impacts from the proposal*'.

The 14 sites were registered my RAP Mark Saddler at a time when OzArk was not present.

Following receipt of the HNSW request for further information, OzArk Principal Archaeologist, Ben Churcher, wrote to Lyndon Patterson, Senior Assessment Officer HNSW, on 14 March 2024 noting '*as OzArk was not there when the sites were recorded, we can certainly map them, describe them based on site card information, and assess them in the context of other sites in the area (or any information on the site card)*'. No response was received from Mr Patterson, and

it is assumed that using the information on the site cards is sufficient to 'describe and assess' the 14 sites recorded by Mr Saddler.

This Revision 3 ACHAR incorporates the results of a renewed AHIMS search and the mapping, description, and assessment of the 14 recently registered sites.

1.4 PROPOSED WORK

WRQ currently has consent to extract 5,000 cubic metres (m^3), approximately 13,000 tonnes of basalt per year, although the subsequent issuance of Environment Protection Licence (EPL) 3767 allows extraction of between >50,000 tonnes per annum (tpa) and 100,000tpa. Basalt material is extracted from the extraction area using drill and blast techniques with approximately six blasts undertaken per year. The fragmented basalt is loaded and hauled to a fixed crushing and screening plant for processing prior to stockpiling and product despatch. It is noted that some aggregates are pre-coated within the processing area prior to despatch.

The Applicant has identified a further 4.9 million tonnes of resource adjacent to and beneath the current approved extraction area which they propose to extract (the proposal). The activities for which the Applicant is seeking development consent would involve the following:

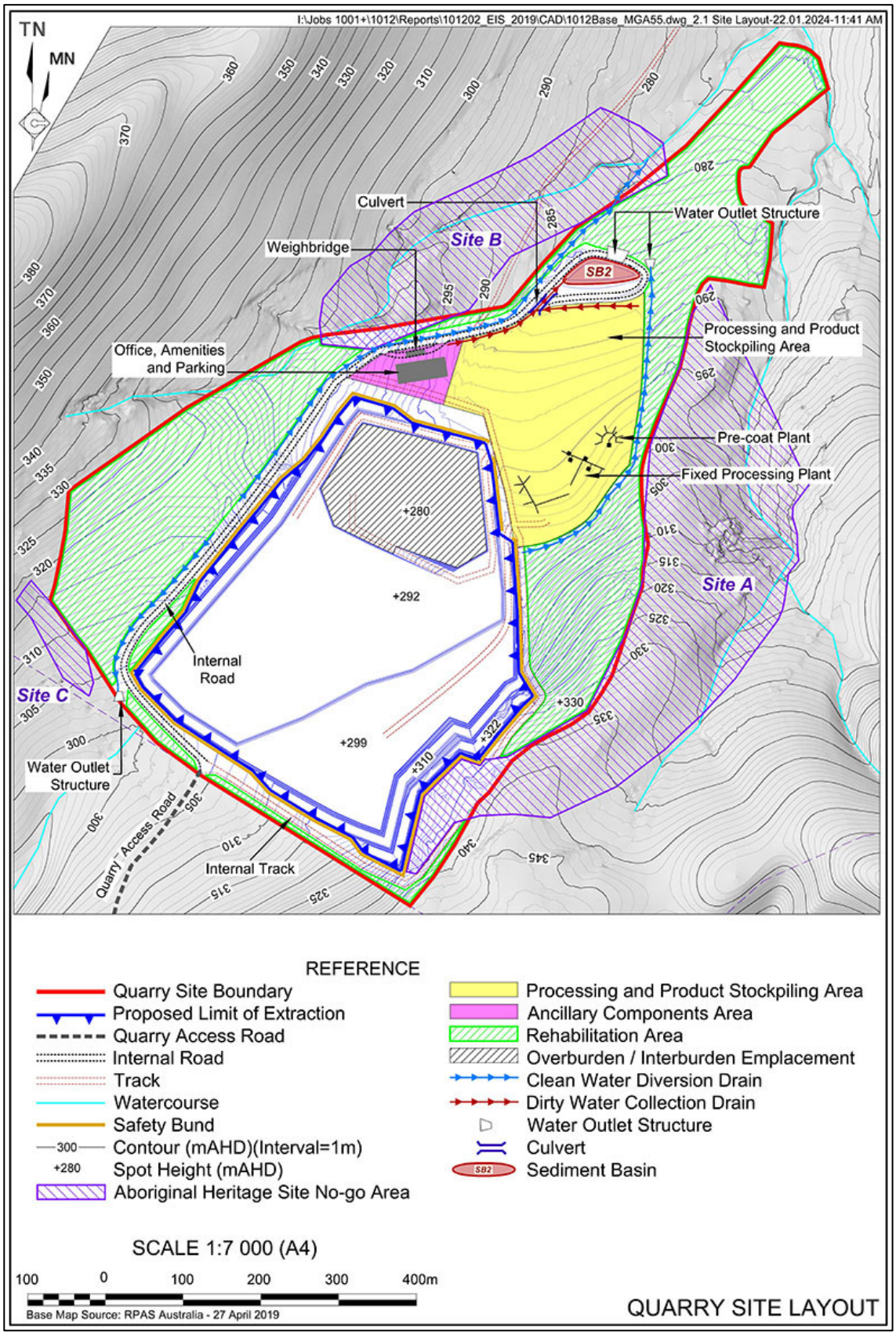
- Extraction of basalt and quartzite from within the proposed extraction area to produce up to 250,000 tonnes per annum (tpa) of quarry products
- Importation of up to 1,500tpa of concrete washout and other construction materials for recycling and incorporation in products produced within the Quarry
- Crushing and screening of fragmented rock and imported materials on site using a fixed processing plant
- Pre-coating of up to 20,000tpa of aggregates
- Transportation of up to 250,000tpa Quarry products to end points of use within the Carrathool LGA and the broader Riverina Region
- Ongoing employment of local personnel
- Progressive and final rehabilitation of the Quarry to develop a final landform suitable for grazing and passive biodiversity conservation.

Figure 1-3 shows the proposed work and impact footprint, which includes the following existing and proposed components within WRQ:

- Extraction Area (18.1 ha): the extraction area would be centred on the targeted hard rock resource
- Processing and Product Stockpiling Area (5.5 ha): this area would include the fixed processing and screening plant, pre-coat plant, pugmill and dedicated areas for stockpiling quarry products and imported material

- Ancillary Components Area (0.7 ha): this area would be located to the west of the processing and product stockpiling area and would comprise the Quarry office, amenities, light vehicle parking, weighbridge, and workshop
- Rehabilitation Areas (15.4 ha): designated areas would be progressively rehabilitated throughout the life of the proposal
- Operational Disturbance Area (40.5 ha – inclusive of all Quarry components and associated areas of disturbance): areas would be cleared of vegetation around the extraction area and other Quarry components to allow for the construction of safety bunds, internal roads / tracks and erosion and sediment control infrastructure
- Quarry Access Road (5.2 km): the existing Quarry Access Road, which extends from Munros Road to the Quarry Site, would be retained to provide ongoing access to the Quarry Site for both heavy and light vehicles.

Figure 1-3: Proposed work showing impact footprint.



1.5 STUDY AREA

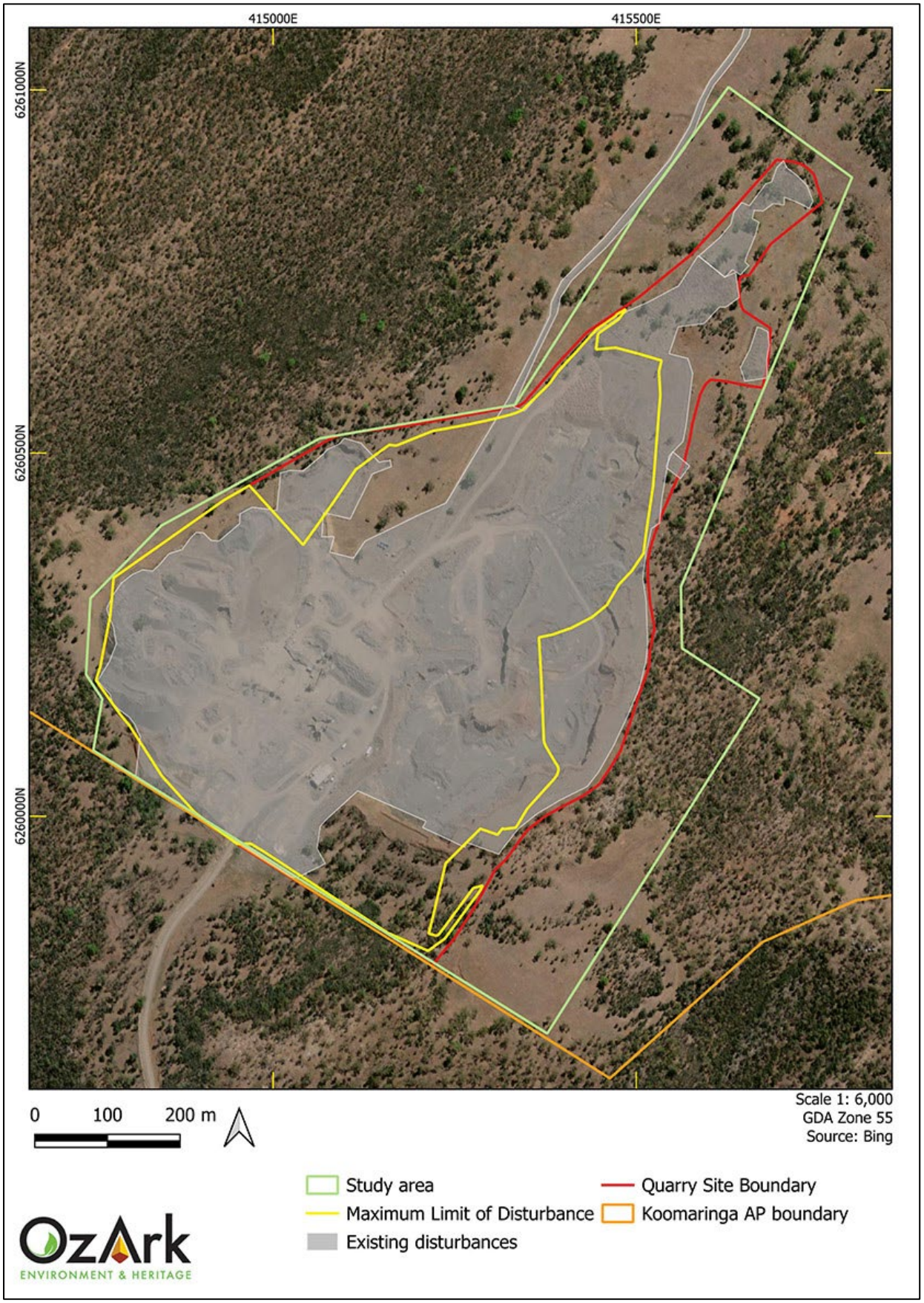
The study area is 63.8 ha in size and includes the maximum limit of disturbance (35.5 ha). The study area extends to the Quarry Site boundary as shown on **Figure 1-3**.

As WRQ is an operating quarry, most of the 35.5 ha maximum limit of disturbance has been previously disturbed, through either open cut extraction methods, construction of roads and benches, or locations used to place overburden piles from the extraction.

The archaeological assessment focused on currently undisturbed areas inside the study area, or where the natural ground surface was visible (i.e., not under overburden piles). Also included in this assessment was a re-recording of the sites originally recorded at Koomaringa AP, Site A and Site B (see **Section 1.2** and **Section 5.3**).

Figure 1-4 shows an aerial of WRQ with the locations of existing disturbance, the proposed maximum limit of disturbance, and the study area boundary used for the assessment.

Figure 1-4: Aerial showing the study area, previous disturbance, and the maximum limit of disturbance.



2 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.

2.1 TOPOGRAPHY

The study area is in the bioregion of Cobar Peneplain and sub-bioregion of the Lachlan Plains. The Cobar Peneplain extends from south of Bourke to just north of Griffith. The Lachlan River traverses the bioregion in the south with many minor runoff drainage lines and smaller streams. The Cobar Peneplain has a topographic landscape consisting of rolling downs and flat plains, with stony ridges and ranges. The Lachlan Plains sub-bioregion is characterised by strike ridges of resistant rocks following fold patterns, as well as low rounded hills of granite with sparse outcrops and wide short valleys which connect to Lachlan floodplains (NPWS 2003).

The study area is also located in the Cocoparra Ranges and Footslopes as characterised by Mitchell (2002). Mitchell describes this landform unit as having steep crested ranges, ridges and hills and an overall relief up to 260 m (Mitchell 2002:36).

The study area is situated in a small valley between two ridges to the west and east. The ridge located to the west of the study area is Scrubby Ridge. Mount Melbergen, part of this ridgeline, is located 900 m southwest of the study area, while Flagstaff hill is 580 m southeast. **Figure 2-1** shows a 3D map of the study area and its surrounds.

There are four landform units present inside the study area: drainage lines and banks, ridgelines and elevated rocky knolls, slopes, and flats, or gently rolling slopes. In addition, there is a large amount of disturbance across the study area. **Table 2-1** outlines the total area of each landform, as well as the final areas of landforms when existing disturbances are considered. **Figure 2-2** shows representative photographs of these landform units inside the study area and **Figure 2-3** shows the location of the landform units within the study area.

Figure 2-1: 3D model of the study area (red line) viewed north.

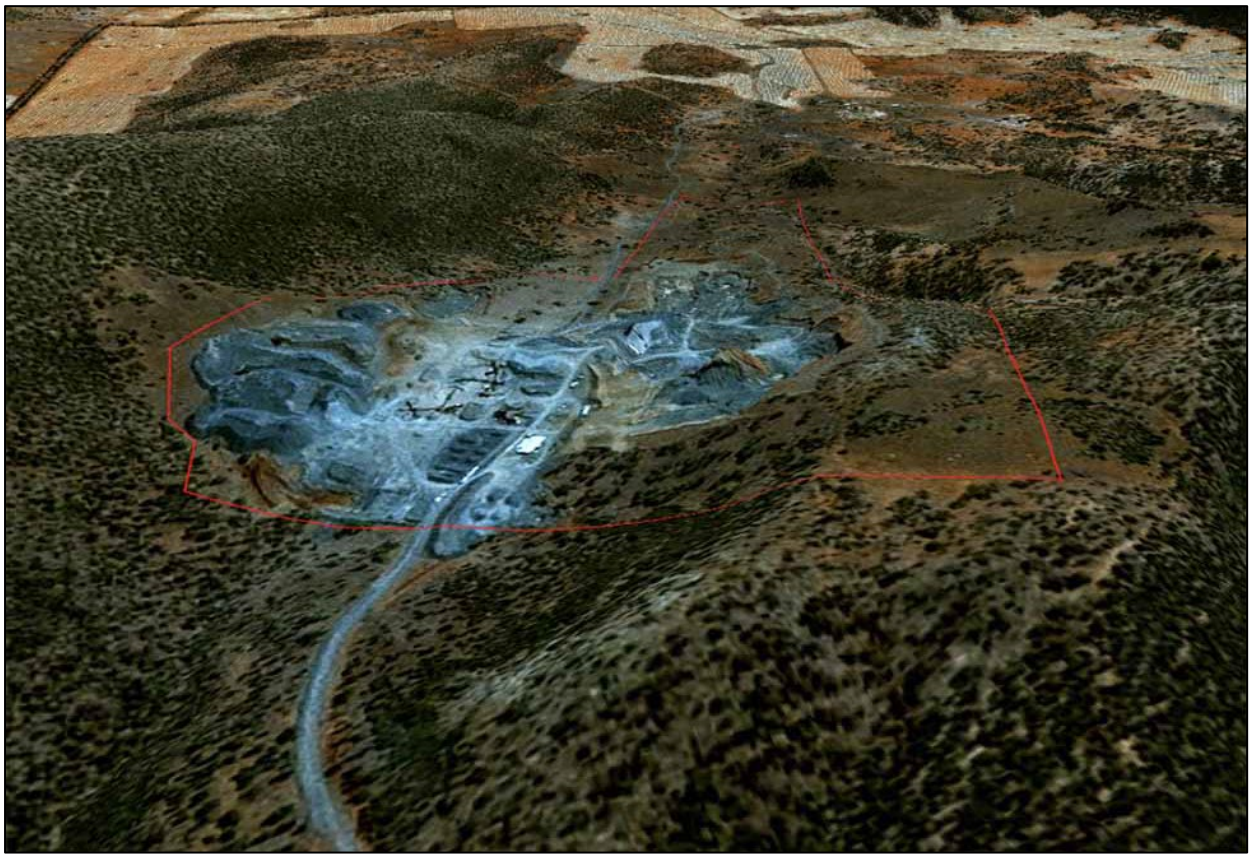


Table 2-1: Landform units inside study area.

Landform unit	Total area (ha)	Excluding existing disturbances (ha)
Drainage lines and banks	8.4	6.3
Ridgelines and elevated rocky knolls	2.2	2.2
Slopes	48.9	15.1
Flats or gently rolling slopes	4.3	2.8
Existing disturbance		37.4
Total study area	**63.8**	**63.8**

Figure 2-2: Landform units of the study area.

1. View of slopes landform unit with the study area.

2. View of a drainage line and bank within the study area.

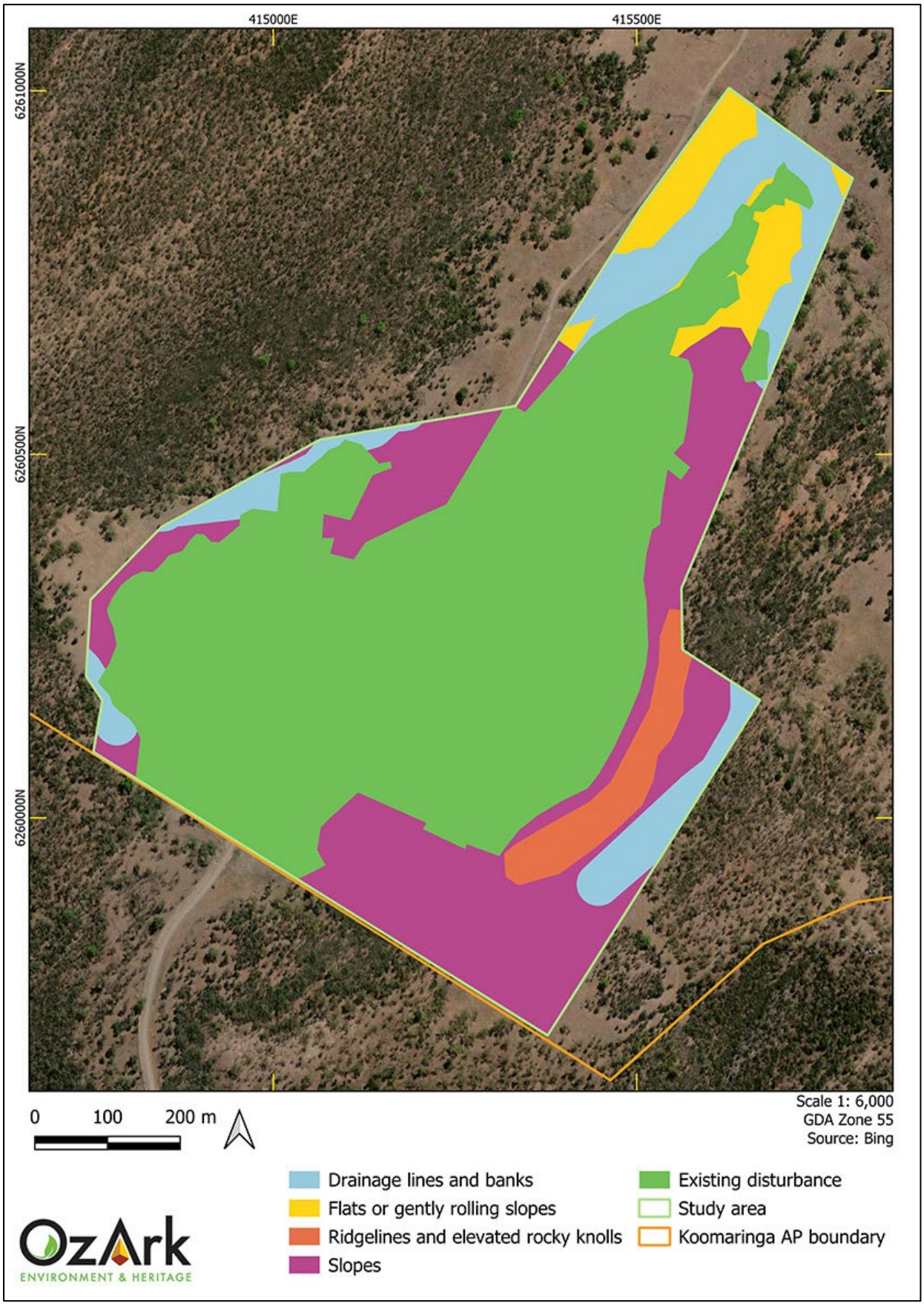
3. View of a flat or gently rolling slopes within the study area.

4. View north across top of a ridgeline within the study area.

5. View west of existing disturbance and current extraction operations within the study area.

6. View southeast of existing disturbance and current extraction operations within the study area.

Figure 2-3: Landform types inside the study area.



2.2 GEOLOGY AND SOILS

The geology of the Lachlan Plains is characterised by Devonian quartz sandstone and conglomerate, with small areas of granite, as well as Quaternary colluvial slope mantles and alluvium (NPWS 2003). Mitchell characterises the geology of the Cocoparra Ranges and Footslopes as boulder hill slopes with extensive rock outcrops (Mitchell 2002).

Soils in the Cobar Peneplain relate closely to topographic position and local geology. Thin, stony, and well-drained red loams are found on ridge crests. Soil thickens into a colluvial mantle downslope, with usually a large amount of stone and increasing texture contrast between topsoil and subsoil. The elevated areas of the Cobar Peneplain are characterised by shallow red soils and aeolian sands. The aeolian sands are associated with the Darling River and Murray Basin mantle in lower areas in the west and south of the bio-region. On the lower slopes in the bioregion, the amount of stone decreases, and yellow subsoils increase along with carbonate levels, and soil drainage is impeded. Brown clays are more prevalent in drainage lines, while red and earthy sands are widespread; however, there are few areas of sandplain and dune field (NPWS 2003).

The study area is situated on one of the areas of basalt suitable for quarrying as blue metal. Prior to the existing extraction a basalt flow was located through the study area. According to Witter (1987), the east and west sides of this basalt flow resulted in contact metamorphism of Devonian quartzite which caused the quartzite to heat and cool slowly into felsite. Outcrops, presumed to be felsite[1], are located throughout the immediate vicinity of the study area.

2.3 HYDROLOGY

There are numerous minor drainage lines surrounding the study area. Some of these drainage lines traverse along the outer western and eastern boundaries of the study area (see **Figure 2-4**). All these drainage lines are ephemeral and would only have running water after rainfall.

The closest named creeks to the study area consist of Naradhan Creek (18 km northeast), Cocoparra Creek (20 km southeast), and Begargo Creek (30 km north).

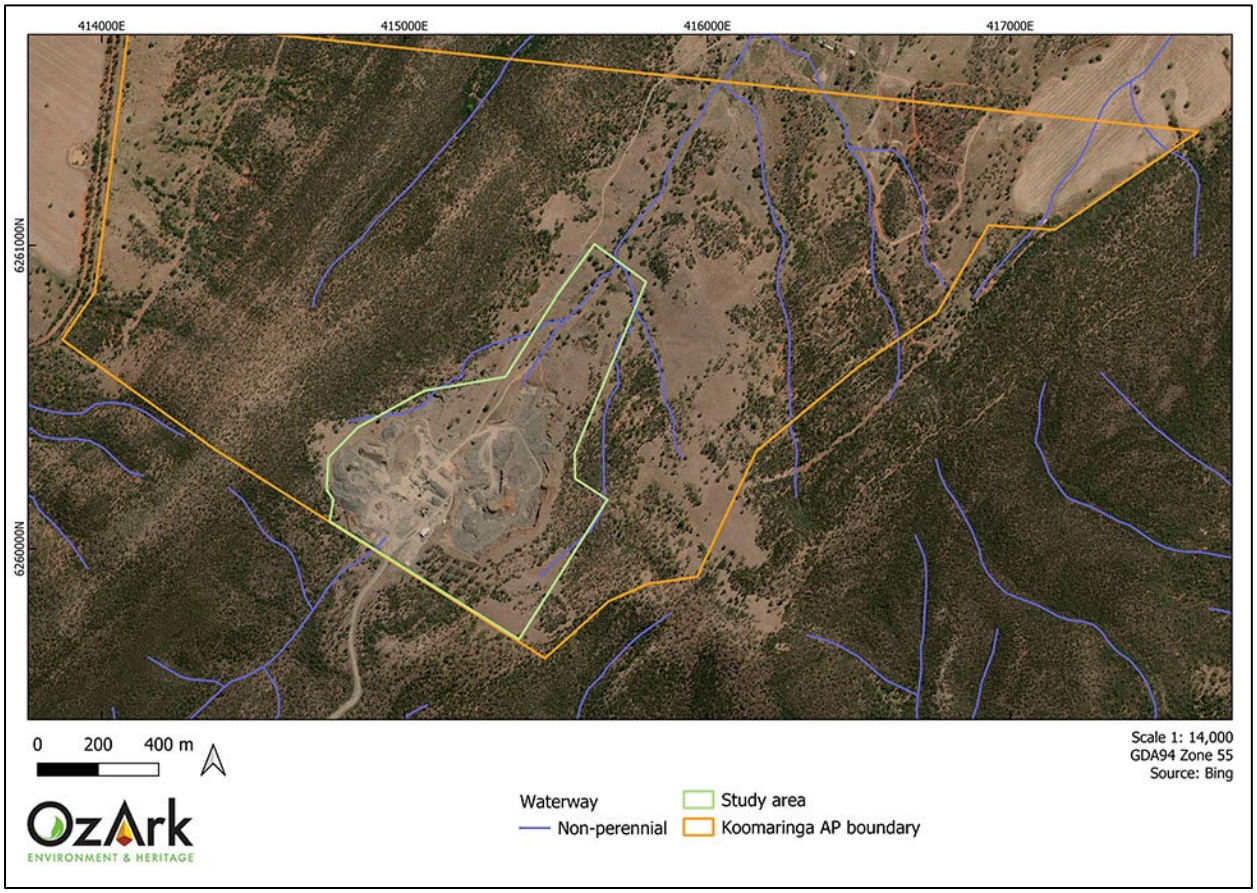
2.4 VEGETATION

Vegetation across the study area and surrounding area has been partly modified by land clearance since European settlement for the purposes of agriculture, and vegetation is, in the main, currently comprised of exotic cereals and weeds. Isolated stands of remnant native vegetation are present around the current extent of WRQ and its surrounds, with areas of greater vegetation density along the road corridors and in remnant groups of vegetation within paddocks.

[1] It is noted that felsite is not a metamorphic rock, and like the basalt flow, probably has an igneous source rather than originating from metamorphosed quartzite.

Native vegetation remaining within the investigation area includes grey box, white cypress pine, and kurrajongs.

Figure 2-4: Drainage lines in and near the study area.



2.5 CLIMATE

In general, the climate for the study area region is temperate with warmer summers and cool winters. Climate statistics from the Naradhan (Uralba) site, approximately 27 km northeast of the study area and the closest Bureau of Meteorology (BOM) weather station to the study area, indicate that temperatures range from a mean maximum temperature of 32.8 degrees Celsius (°C) in January and a mean minimum temperature of 2.8°C in July. Mean annual rainfall is 427 millimetres (mm), with rainfall distributed relatively evenly throughout the year with no distinct dry season. Mean monthly rainfall varies between a maximum of 43.1 mm in June and a minimum of 27.9 mm in February.

2.6 LAND USE HISTORY AND EXISTING LEVELS OF DISTURBANCE

The study area prior to 1987 was used for pastoral purposes to graze sheep (Pearce 1986). **Figure 2-5** shows that the location of WRQ was open or cleared grasslands in 1966. By 1991, there had been little change in the study area except for the creation of several dirt tracks and the beginning of the quarrying (**Figure 2-6**).

Following 1987 when the first development consent for quarrying was granted, most of the study area has since been disturbed in relation to the quarrying. Currently, there are two open cut rock extraction areas: one along the east side of the current operations, and a smaller one along the western boundary. A crushing and screen plant is in the centre-south of the study area and there are large piles of overburden throughout the northern, southern, and western edges of the current operations. There are also several tracks throughout the current operation as well as one which extends north towards to Koomaringa Homestead along the northern section of the western boundary, and a less maintained track which circles around the outer upper edge of the eastern open cut area.

Overall, inside where the existing quarry is operating, there is a large amount of disturbance. Areas outside this have generally been undisturbed. See **Figure 1-4** for the extent of the existing disturbance within the study area.

Figure 2-5: 1966 aerial with the study area (source: NSW SS 2021).

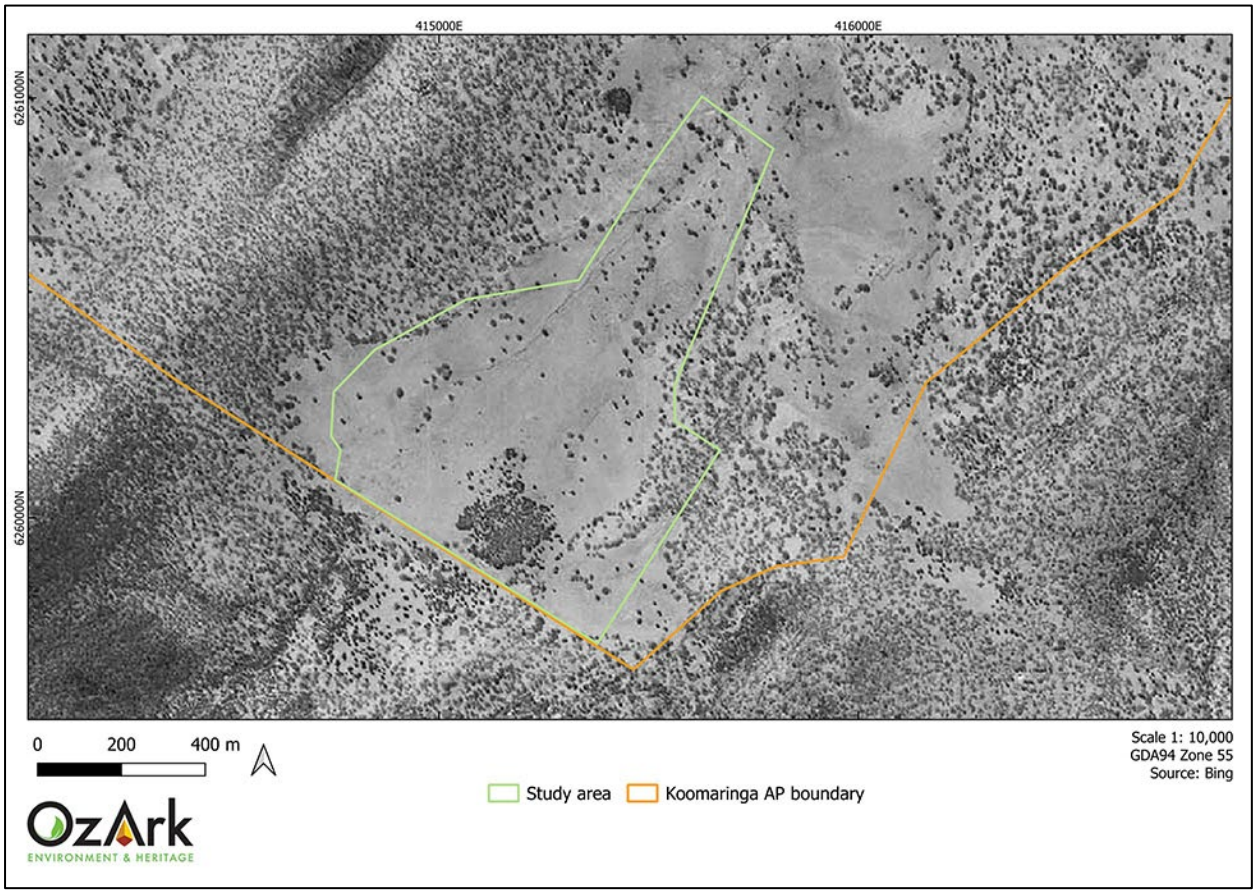


Figure 2-6: 1991 aerial with the study area (source: NSW SS 2021).

2.7 CONCLUSION

The ephemeral drainage lines and lack of a permanent water source in proximity to the study area indicates that occupation by Aboriginals would have likely been short-term and sporadic, depending partly on rainfall and run off from the surrounding ridgelines to provide water. The presence of felsite, a raw material with good flaking properties, means that occupation of the study area would have likely been due to specific visits to source and quarry the felsite. When water was available in the drainage lines it is likely that occupation areas were along the banks of the drainage lines as opposed to the rocky areas where quarrying occurred. There is erosion along the banks of some drainage lines. Considering the high level of disturbance caused by existing quarry operations, it is unlikely any Aboriginal objects or features (such as hearths) remain intact inside the areas of disturbance had they ever existed prior to quarrying operations commencing.

ABORIGINAL CULTURAL HERITAGE ASSESSMENT

3 THE ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

3.1 DATE OF ARCHAEOLOGICAL ASSESSMENT

The fieldwork component of this assessment was undertaken by OzArk between Tuesday 8 October and Friday 11 October 2019.

A site inspection to locate the wooden stakes installed in 1987 to mark the buffer of Site A and Site B was undertaken on Friday 11 August 2023.

A site inspection with RAPs to discuss the appropriate buffer of Site A and Site B was undertaken on Friday 24 November 2023.

3.2 OZARK INVOLVEMENT

3.2.1 Field assessment

The fieldwork component of the heritage assessment was undertaken by:

- Fieldwork Director: Dr Alyce Cameron (OzArk Senior Archaeologist, BA [Hons] and PhD [Archaeology & palaeoanthropology] Australian National University)
- The site inspection on 11 August 2023 was conducted by Ben Churcher (OzArk Principal Archaeologist; BA [Hons], Dip Ed)
- The site inspection on 24 November 2023 was conducted by Jordan Henshaw (OzArk Archaeologist; B. Ancient History, Macquarie University).

3.2.2 Reporting

The reporting component of the heritage assessment was undertaken by:

- Report author: Dr Alyce Cameron with contributions by Ben Churcher
- Reviewer: Ben Churcher.

3.3 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.

3.3.1 State legislation

Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes 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

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (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.

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 Planning, Housing and Infrastructure (DPHI) 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 HNSW.

3.3.2 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act, administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water, 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.

3.3.3 Applicability to the proposal

The current proposal will be assessed under Part 4 of the EP&A Act.

Any Aboriginal sites within the study area are afforded legislative protection under the NPW Act.

The proposal is within the Koomaringa AP that is protected under the NPW Act.

The development application will be accompanied by an EIS as the proposal is classified as "Designated Development" given it is categorised as "Extractive Industries", under Schedule 3, Part 1(19) of the *Environmental Planning & Assessment Regulation 2000* (EP&A Reg).

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.

3.4 ASSESSMENT APPROACH

The ACHAR has been prepared following the appropriate guidelines, policies, and industry requirements:

- *Aboriginal cultural heritage consultation requirements for proponents* (ACHCRs, DECCW 2010b)
- *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (Code of Practice; DECCW 2010).

- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (the Guide; OEH 2011).

This assessment has been prepared in accordance with DPHI's Secretary's Environmental Assessment Requirements (SEARs) for the proposal, issued on 8 July 2019. The SEARs identify matters which must be addressed in the EIS and essentially form its terms of reference. **Table 3-1** lists individual requirements relevant to this Aboriginal cultural heritage and historic heritage impact assessment and where they are addressed in this report.

Table 3-1: Technical assessment (heritage) related SEARs.

Requirement	Section addressed
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	**Section 3** to **Section 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 11** to **Section 13**

To inform the preparation of the SEARs, DPHI invited other government agencies to recommend matters to be addressed in the EIS. These matters were considered by the Secretary for DPHI when preparing the SEARs. Copies of the government agencies' advice to DPHI were attached to the SEARs.

Heritage Council of New South Wales and HNSW (then the Office of Environment and Heritage [OEH]) raised matters relevant to the Aboriginal cultural heritage assessment. The matters raised concerning Aboriginal cultural heritage are listed in **Table 3-2** and have been considered in preparing this assessment, as indicated in the table. No agency specific assessment recommendations regarding historic heritage were provided.

Table 3-2: Agency project specific assessment recommendations.

Requirement	Section addressed
Aboriginal cultural heritage	
A detailed Aboriginal cultural heritage assessment in accordance with the *Guide to Investigation, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* and *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DEECW 2010).	**Section 3.4**
The EIS must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the proposal. This may include the need for surface survey and test excavation.	**Section 4** and **Section 8**
The identification of cultural heritage values must be conducted in accordance with the *Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW* (OEH 2010), and should be guided by the *Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2011) and consultation with OEH regional branch officers.	**Section 6**
Where Aboriginal cultural heritage values are identified, consultation with Aboriginal people must be undertaken and documented in accordance with the Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW). The significance of	**Section 4**

Requirement	Section addressed
cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the EIS.	
Impacts on Aboriginal cultural heritage values are to be assessed and documented in the EIS. The EIS must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.	**Section 8.5** and **Section 9**
The assessment of cultural heritage values must include a surface survey undertaken by a qualified archaeologist in areas with potential for subsurface Aboriginal deposits. The result of the surface survey is to inform the need for targeted test excavation to better assess the integrity, extent, distribution, nature and overall significance of the archaeological record. The results of surface surveys and test excavations are to be documented in the EIS.	**Section 6**
Where harm to an Aboriginal object or declared Aboriginal place cannot be avoided, an Aboriginal Heritage Impact Permit (AHIP) will be required from OEH under the *National Parks and Wildlife Act 1974*. You must apply to OEH for an AHIP prior to commencing works that will directly or indirectly harm an Aboriginal object or a declared Aboriginal place	**Section 9** and **Section 10**
The EIS must outline procedures to be followed in the event Aboriginal burials or skeletal material is uncovered during construction to formulate appropriate measures to manage the impacts to this material.	**Appendix 4**
The EIS must outline procedures to be followed if Aboriginal objects are found at any stage of the life of the development to formulate appropriate measures to manage unforeseen impacts.	**Appendix 3**

3.5 PURPOSE AND OBJECTIVES

The purpose of the current study is to identify and assess heritage constraints relevant to the proposed works.

3.5.1 Aboriginal archaeological assessment objectives

The current assessment will apply the ACHCRs, the Code of Practice, and the Guide 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/cultural values

Objective Three: Assess the likely impacts of the proposed work to Aboriginal cultural heritage and provide management recommendations.

Objective Four: To determine, in consultation with the RAPs what harm the proposal may have on the cultural heritage values of the Koomaringa AP.

3.6 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 3-3** tabulates the compliance of this report with the requirements established by the Code of Practice.

Table 3-3: 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 subheadings below*
Requirement 1a	Previous archaeological work	**Section 5.2**
Requirement 1b	AHIMS searches	**Section 5.3**
Requirement 2	Review the landscape context	**Section 2**
Requirement 3	Summarise and discuss the local and regional character of Aboriginal land use and its material traces	**Section 5.4.5**
Requirement 4	Predict the nature and distribution of evidence	*See subheadings below*
Requirement 4a	Predictive model	**Section 5.4**
Requirement 4b	Predictive model results	**Section 5.4.5**
Requirement 5	Archaeological survey	*See subheadings below*
Requirement 5a	Survey sampling strategy	**Section 6.1**
Requirement 5b	Survey requirements	This Requirement was fulfilled during the undertaking of the survey
Requirement 5c	Survey units	**Section 6.3**
Requirement 6	Site definition	**Section 5.4.5**
Requirement 7	Site recording	*See subheadings below*
Requirement 7a	Information to be recorded	The recording of sites adhered to this requirement.
Requirement 7b	Scales for photography	All artefact photographs employed a centimetre scale bar.
Requirement 8	Location information and geographic reporting	*See subheadings below*
Requirement 8a	Geospatial information	All artefact 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 6.3**
Requirement 10	Analyse survey coverage	**Section 6.3**
Requirement 11	Archaeological Report content and format	This report adheres to this Requirement.
Requirement 12	Records	OzArk undertakes to maintain all survey records for at least five years.
Requirement 13	Notifying OEH and reporting	*See subheadings 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	Not applicable as test excavation has not taken place.
Requirement 15	Pre-conditions to carrying out test excavation	*See subheadings below*
Requirement 15a	Consultation	Consultation has included the ACHCRs, see **Section 4**.
Requirement 15b	Test excavation sampling strategy	Not applicable as test excavation was not required.
Requirement 15c	Notification	Not applicable
Requirement 16	Test excavation that can be carried out in accordance with this Code	*See subheadings below*
Requirement 16a	Test excavations	Not applicable

Code of Practice Requirement	Context of the Requirement	Concordance in this report
Requirement 16b	Objects recovered during test excavations	Not applicable
Requirement 17	When to stop test excavations	Not applicable
Requirements 18–20	Artefact recording	These requirements were met during the field survey.

4 ABORIGINAL COMMUNITY CONSULTATION

4.1 ABORIGINAL COMMUNITY CONSULTATION

The Aboriginal cultural heritage assessment of the proposal has followed the ACHCRs (DECCW 2010b). A log and copies of correspondence with Aboriginal community stakeholders is presented in **Appendix 1 Figure 1**.

The ACHCRs include four main stages, and these will be detailed in the following sections.

4.1.1 ACHCRs Stage 1

The aim of Stage 1 is to identify the Registered Aboriginal Parties (RAPs) who wish to be consulted about the proposal.

An advertisement was placed in the *Area News* on 21 August 2019 to solicit expressions of interest (**Appendix 1 Figure 2**).

A letter seeking information from various agencies was sent on 21 August 2019 (**Appendix 1 Figure 3**). These agencies were: Office of the Registrar; Biodiversity and Conservation Division (BCD, now HNSW); National Native Title Tribunal; NTSCORP; Griffith Local Aboriginal Land Council (LALC), Carrathool Shire Council, and the Riverina Local Land Services. Replies from government agencies are provided in **Appendix 1 Figure 4**.

By the closing date for registration concerning this proposal, as well as with late registrations, five groups or individuals registered to be consulted as RAPs:

- Griffith LALC
- James Ingram (Bidya Marra) (late registration 3.1.24)
- Judy Johnson
- Mark Saddler (Bundyi Culture) (late registration 3.1.24)
- Robert Carroll & Neerim Carroll (Miyagan Culture & Heritage).

4.1.2 ACHCRs Stages 2 & 3

The aim of Stages 2 and 3 is to provide information about the proposal to the RAPs and to acquire information regarding Aboriginal cultural values associated with the proposal either through consultation and/or field work. Often these two stages are run together, and the detailed project information is provided in the assessment methodology that is issued to all RAPs for their consideration.

On 26 September 2019 all RAPs were sent an information package including the development overview and proposed assessment methodology (**Appendix 1 Figure 5**). No feedback was provided by RAPs on the survey methodology.

4.1.3 ACHCRs Stage 4

Stage 4 involves the production of a draft ACHAR that is issued to all RAPs for their consideration. The ACHAR documented the results of the assessment, outlined opportunities for the conservation of Aboriginal cultural values, and suggested recommendations for the management of Aboriginal objects should harm to these objects be unavoidable.

The draft ACHAR was sent on 08 October 2021 to all RAPs. A 28-day review period was provided closing on 05 November 2021 (**Appendix 1 Figure 6**).

No comments on the draft ACHAR were received from the RAPs.

The project update letter sent on 06 September 2023 (**Section 4.1.4**) was in response to a recommendation from HNSW to seek further consultation with RAPs about their views regarding potential harm to Koomaringa AP. The project update letter was followed with an email on 13 September 2023 to gain feedback from the RAPs. This email was followed by telephone calls, particularly to the Griffith LALC, on 19 and 20 September 2023. While OzArk was not able to get a response from the Griffith LALC (see **Appendix 1 Figure 1**), two responses were received from Mr Robert Clegg and Mr Paul Brydon. These responses are detailed further in **Section 4.2.2**).

4.1.4 Project updates

Project update letters were sent to the RAPs while the proposal was on hold between the field survey and the drafting of the report. These letters were sent on 7 July 2020, 8 December 2020, and 18 August 2021 and presented in **Appendix 1 Figure 7**. On 29 May 2023, a further project update letter was sent to RAPs explaining the delay in the progress of the project due to the need to complete the Plan of Management for the Koomaringa AP (**Appendix 1 Figure 7**).

On 6 September 2023, a further project update letter was sent to the RAPs seeking feedback on any concerns they may have about potential impact to the Koomaringa AP because of the proposal (**Appendix 1 Figure 7**).

4.1.5 Consultation on the Koomaringa Aboriginal Place Plan of Management

Consultation has also occurred with the RAPs during the development of the Koomaringa Aboriginal Place Plan of Management that has taken place at the same time as the ACHCRs.

Major stages of this consultation consisted of:

- 30.08.2021. OzArk sends letter and questionnaire. No responses to the questionnaire were received
- 28.4.2023. OzArk sends draft Koomaringa Aboriginal Place Plan of Management to RAPs for review. Following the close of the review period (19 May 2023) feedback about the draft Plan of Management was received from Mr Peter Ingram. Mr Ingram's response was comprehensive and relevant portions of the response have been noted in this ACHAR (**Section 4.2.3**).

4.1.6 Site visits during 2023

Because of a request from HNSW to seek further consultation on RAP views regarding the possible harm to the Koomaringa AP from the proposal, a series of site visits occurred during late 2023. Specifically, these were:

- 11 August 2023: OzArk Principal Archaeologist Ben Churcher visits site to map the 1987 site buffer pegs installed by the National Parks and Wildlife Service in 1987
- 24 November 2023: OzArk archaeologist, Jordan Henshaw, and three RAPs (Mark Saddler, James Ingram, and Robert Carroll) met on site to discuss management measures to protect the Koomaringa AP
- 5 to 7 December 2023: Three RAPs (Mark Saddler, James Ingram, and Robert Carroll) spend three days at site determining where protective fencing should be placed and investigating the Koomaringa AP surrounding the WRQ
- 20 to 22 December 2023: Three RAPs (Mark Saddler, James Ingram, and Robert Carroll) spend three days at site ensuring the fencing has been correctly installed and further inspecting the Koomaringa AP. During this site visit Mr Mark Saddler recorded an additional 14 sites. All sites, except one (42-5-0064), are outside the maximum limit of disturbance and the Quarry Site (see **Section 5.3.1**).

4.2 ABORIGINAL COMMUNITY INVOLVEMENT IN THE ASSESSMENT

The field survey was undertaken 8–11 October 2019. The following RAP or representative of RAPs participated in the fieldwork as a site officer:

- Max Harris (Griffith LALC).

In addition, Stephen Collins (Griffith LALC), participated on Friday 11 October 2019 as a volunteer.

From 5 to 7 December 2023 and from 20 to 22 December 2023, RAPs Mark Saddler, James Ingram, and Robert Carroll spent a total of six days on site to acquaint themselves with the study area, to inspect areas within the Koomaringa AP adjacent to the WRQ, and to determine the appropriate location of fencing to protect Site A and Site B. The second site visit (20 to 22 December 2023) was to confirm that the Applicant had placed the fencing at the correct location.

4.2.1 Comments arising from the assessment

During the field survey the site officer, Max Harris, shared information about the Aboriginal occupation and archaeology in the region. This information has been summarised below:

- Mr Harris has seen artefacts made from the same felsite being quarried at Koomaringa AP in several surrounding regions including the Hay Plains and along the Lachlan and Murrumbidgee Rivers. He said that the white/cream/grey felsite was what he had seen the most

- Canoes were often called ‘drag-alongs’ due to being used by resting one knee inside the canoe and pushing along with the other leg
- Many of the trees in the study area have signs of ring-barking. Mr Harris postulated that this may have been done by a group of Chinese immigrants in the early 1900s. According to Mr Harris, there is also a mass grave of Chinese ring-barkers in the general area of Rankins Springs, who accidently ate poisoned flour left out by pastoralists to poison local Aboriginal people. This event cannot be confirmed by other sources
- Sim’s Gap was also talked about by Mr Harris who mentioned it was named after a cattle hustler who died in the vicinity. According to Mr Harris, there is also an Aboriginal site at Sim’s Gap and the locality is a source of sandstone slabs good for grinding stones.

Based on comments from the Griffith LALC site officers in the field during the 2019 survey, the Koomaringa AP that includes the WRQ has high social and cultural value. On 25 January 2019 Mr Ethan Williams, on behalf of the Griffith Local Aboriginal Land Council, wrote:

> *This unique Wiradjuri Aboriginal quarry is of enormous spiritual and cultural significance to many Aboriginal groups and communities throughout this Region, and needs to be afforded the cultural respect, appreciation and protection it deserves.*

On 26 November 2023 RAP Mark Saddler wrote about his values attached to the Koomaringa AP that includes the WRQ (**Appendix 1 Figure 10**):

> *Koomaringa is a very spiritual place for my Wiradjuri people and as such has many special places, songlines and dreaming places that my people have cared for and continue to have connection to for over 80,000 + years.*

In a letter to the Applicant on 29 November 2023, RAP Robert Carroll, referring to the values of the Koomaringa AP that includes the WRQ, wrote (**Appendix 1 Figure 11**):

> *What astounded Roley, I and everyone else who has ever visited the site was its overall size, which included A & western Cultural B tool making sites and the sheer numbers of mounds of worked felsite debitage or tailing’s, artefacts, bedrock anvils and the percussion scars that are clearly visible on the remaining felsite vein which were created by ancient Wiradjuri tool makers smashing larger basalt blocks into it to gather core material for further working.*

It is very clear from these responses that the Aboriginal community have deep cultural values attached to the Koomaringa AP that includes the WRQ. While the values are primarily attached to the quarry features and other sites in the Koomaringa AP, these values also extend across the WRQ.

4.2.2 Aboriginal community feedback on the ACHAR

On 06 September 2023, OzArk sent a project update letter to all RAPs and Wiradjuri stakeholders for the Koomaringa AP (**Appendix 1 Figure 7**). This was followed up by an email on 13 September 2023 that asked several questions to help frame the Aboriginal community's feeling towards the potential harm associated with the proposal both on individual Aboriginal objects and on the Aboriginal cultural values of the Koomaringa AP.

These questions were:

1. Are you aware that the WRQ is inside the Koomaringa AP?
2. Are you aware that DA2022/029 will encroach on and directly impact Aboriginal sites within the AP?
3. The activities proposed in DA2022/029 include recommendations to salvage two sites (an isolated find and a low density artefact scatter of two artefacts)[2]. Aboriginal objects are proposed to be moved from the location where they are found to a place of safe-keeping nearby. The relocation spot will be decided in consultation with the RAPs. As salvage of these objects will also harm the overall values of the AP, do you have any views on the salvage of these objects as part of DA2022/029?
4. In your opinion, how will this impact harm the significance of the AP?
5. The project update letter mentioned a couple of initiatives to improve the values of the Koomaringa AP such as tree screening and the provision of a car park to help community access the AP. Do you feel these initiatives will improve the cultural values of the AP?
6. Are there other initiatives that could be explored to improve the cultural values of the AP? For example, land rehabilitation and vegetation management within the Koomaringa AP that will result in enhancing the values of the AP?

Two responses were received from Mr Robert Clegg and Mr Paul Brydon.

Mr Brydon told OzArk that he is '*happy with the project*' and did not have further comment (19 September 2023, see **Appendix 1 Figure 1**).

Mr Clegg provided answers to the questions in a phone call on 19 September 2023 (**Appendix 1 Figure 1**). Mr Clegg's responses were captured by OzArk's community consultation officer (Catherine Burrowes) and are reproduced below, highlighted in red.

1. Are you aware that the WRQ is inside the Koomaringa AP? Yes
2. Are you aware that DA2022/029 will encroach on and directly impact Aboriginal sites within the AP? Yes
3. The activities proposed in DA2022/029 include recommendations to salvage two sites (an isolated find and a low density artefact scatter of two artefacts). Aboriginal objects are proposed to be moved from the location where they are found to a place of safe-keeping nearby. The relocation spot will be decided in consultation with the RAPs. As salvage of these objects will also harm the overall values of the AP, do you have any views on the

[2] This was written prior to the recording of an additional site in the maximum limit of disturbance.

salvage of these objects as part of DA2022/029? Won't harm value as long as placed near scar tree at base with signage needed.

4. In your opinion, how will this impact harm the significance of the AP? No it won't
5. The project update letter mentioned a couple of initiatives to improve the values of the Koomaringa AP such as tree screening and the provision of a car park to help community access the AP. Do you feel these initiatives will improve the cultural values of the AP? Tree screening yes, car park – edge is fine, if inside will need to fenced
6. Are there other initiatives that could be explored to improve the cultural values of the AP? For example, land rehabilitation and vegetation management within the Koomaringa AP that will result in enhancing the values of the AP? Yes, vegetation management is needed.

In conclusion, the two Wiradjuri stakeholders who responded to OzArk felt that the harm proposed by the proposal is manageable and would not materially impact the Aboriginal cultural values of the Koomaringa AP.

Following this round of consultation, OzArk was contacted by RAP Robert Carroll requesting a site visit for himself and two other RAPs, Mark Saddler and James Ingram (**Appendix 1 Figure 8**). The Applicant agreed to facilitate this request, and on 24 November 2023, OzArk Archaeologist, Jordan Henshaw, and three RAPs (Mark Saddler, James Ingram, and Robert Carroll) met on site to discuss management measures to protect the Koomaringa AP (**Appendix 1 Figure 9**).

On 26 November 2023 (**Appendix 1 Figure 10**) and on 29 November 2023, the Applicant received letters from both Robert Carroll (**Appendix 1 Figure 11**) and Mark Saddler (**Appendix 1 Figure 12**). While these letters mainly dealt with the management within the Koomaringa AP Plan of Management, the comments remain pertinent to the WRQ ACHAR.

Following further conversations with the Applicant, three RAPs (Mark Saddler, James Ingram, and Robert Carroll) were invited to spend three days on site (5 to 7 December 2023). This visit to site was to determine where protective fencing should be placed and investigating the Koomaringa AP surrounding the WRQ.

Following the site visit, the Applicant installed fencing at the agreed location and on 20 to 22 December 2023 the three RAPs (Mark Saddler, James Ingram, and Robert Carroll) again spent three days at site ensuring the fencing has been correctly installed and further inspecting the Koomaringa AP. During this visit, the RAPs recorded a further 14 sites within the Koomaringa AP (**Section 6.6**).

In a phone call to the Applicant on 22 December 2023, Robert Carroll stated that he felt the installed fencing was sufficient to prevent harm to Sites A, B, and C.

On 18 February 2024, OzArk sent responses to the RAPs who had submitted suggestions and recommendations based on the December 2023 site visits. Where appropriate, the RAP input led

to additional recommendations being added to this ACHAR (Recommendations 1, 3, and 4) (**Appendix 1 Figure 14**).

4.2.3 Aboriginal cultural heritage values of the Koomaringa AP

As part of the development of the Koomaringa AP Plan of Management, Wiradjuri stakeholder Mr Peter Ingram volunteered his cultural values for the Koomaringa AP that includes the WRQ. Mr Ingram's cultural values are repeated below as they are also applicable to the WRQ.

> *The Rankins Springs ACH stone quarry is a important significant area wiradjuri people. the silcrete stone is only found in that area Miles around and would have been accessed, traded and utilised over the lower Murrumbidgee to the lower Lachlan river area. now Rankin Springs stone quarry is not just important because of the resources of stone. The local area was inhabited seasonal by all local mob/people for ceremony/lore and sustainable resource able living. there's are fresh water Rockwell's/water springs (only meter away from the AP site) certain diverse vegetation and Verity native animals species that call that place home. Very significant area. (a large quandong tree near the homestead).*
>
> Mr Peter Ingram. 31 May 2023.

As noted in **Section 4.2.1**, RAPs Robert Carroll and Mark Saddler also regard the Koomaringa AP to be a place of high cultural and scientific value.

5 ABORIGINAL ARCHAEOLOGY BACKGROUND

5.1 ETHNO-HISTORIC SOURCES OF REGIONAL ABORIGINAL CULTURE

The study area is located within the south-eastern extent of the Wiradjuri tribal and linguistic group (Tindale 1974). The Wiradjuri tribal area is in the Murray Darling Basin and traverses three general physiographic regions: the highlands or central tablelands in the east, riverine plains in the west and the transitional western slope zone in between (White and Cane 1986). The Wiradjuri is one of the largest language groups in New South Wales, extending across the districts of Mudgee, Bathurst, Dubbo, Parks, West Wyalong, Forbes, Orange, Junee, Cowra, Young, Holbrook, Wagga Wagga, Narrandera, Griffith, and Mossgiel (Tindale 1974). Although the area is considered to have a single language, various dialects were found throughout the region (Tindale 2000).

At the beginning of the nineteenth century the Wiradjuri group occupied the area to the south of the Murrumbidgee River and east of the Lachlan River (Kass 2003: 10). The woodland communities of the region provided habitat for possums (used for meat and fur), reptiles and birds (Kabaila 1995). The Murrumbidgee River was a source of mussels and fish, including the Murray cod (Heritage Office 1996: 132). The country between the rivers provided seasonal plants, tubers, nuts, seeds, and daisy yams. Larger game such as kangaroos and emus were hunted, contributing to an overall nutritious and varied diet (Heritage Office 1996: 132). Small groups moved around regularly according to seasonal resource fluctuations and ritual obligations (Kass 2003). A relatively large number of carved trees are associated with important sites marked out by clans, including burial sites (Kass 2003: 10).

Wiradjuri social organisation appears to have been based upon extended kinship networks involving totemic designations and associations. The kinship system governed and controlled marriage and determined ceremonial obligations. Individual identity and clan affiliations were expressed partly through skin cloaks and elaborate carvings on wooden implements (White and Cane 1986: 61).

Common areas favoured by the local Wiradjuri (river and plains) also attracted colonial settlers and the frontier of colonial settler expansion swept into Wiradjuri country over the 1830s and 1840s at breakneck pace (Kabaila 1995: 12). Diseases spread along the river systems decimating Aboriginal populations. By the time the British settlers arrived, the fabric of traditional Aboriginal life was no longer intact. A variety of locally contingent Aboriginal responses rose from this, including resistance, economic hardship, and opportunism. In the 1880s a mission called the Warangesda Mission was established by Reverend John Gribble at Darlington Point.

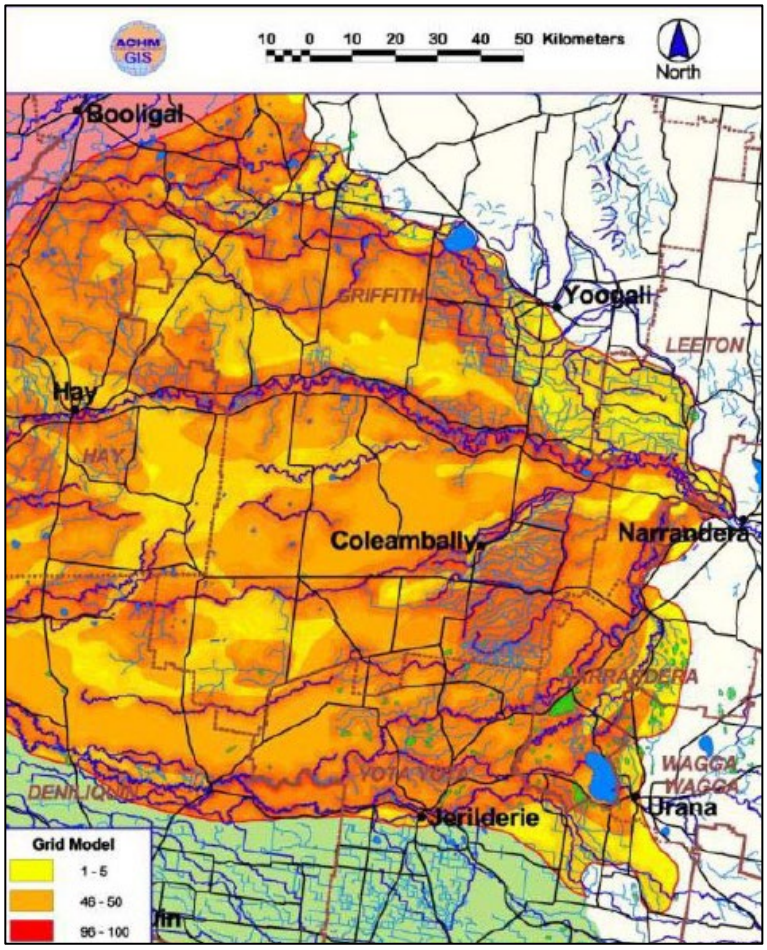
5.2 REGIONAL ARCHAEOLOGICAL CONTEXT

There are few archaeological assessments in the general region of Koomaringa AP. As such, it is necessary to use assessments from surrounding areas to help provide some archaeological context.

Pardoe and Martin (2011) undertook an Aboriginal cultural heritage study of the Murrumbidgee province. Though their study covered the Murrumbidgee province, which at its closest is approximately 38 km to the south and west of Koomaringa AP, the detailed analysis of the cultural landscape and archaeological sites is still useful, especially the predictive model of the eastern half of their area. **Figure 5-1** shows a predictive model of sites in the Murrumbidgee east province, which shows the likelihood of sites on a scale of 0–100, where yellow is low, orange is moderate, and red is high. Pardoe and Martin correlated the AHIMS site register and fieldwork, as well as environmental contexts, such as landform, soils, and water sources in formulating the predictive model. The map on **Figure 5-1** shows the likelihood of finding a site in a one-hectare area based on environmental features of the land in that hectare, as well as the density of Aboriginal sites in a particular area. Pardoe and Martin (2011: 119) conclude that "*occupation decreases markedly and systematically as one moves away from the water source*". There is also a list of 'nodes' which are major concentrations of occupation provided for further research. Though the study area is distant from a permanent source of water, the presence of a raw material suitable for artefact manufacture would categorise the study area as a 'node' and having a high likelihood of further Aboriginal sites. However, Pardoe and Martin also mention that there are some site types which differentiate from this generalisation, in particular mounds and burials.

> *While a large amount of variation in site distribution can be explained by reference to environmental patterns and resource availability, there are other patterns that may only be explained with reference to considerations of social organization. The distribution of stone artefact assemblages and the aforementioned nodes of occupation are probably in this category. These features may, for instance, reflect relationships between groups.* (Pardoe and Martin 2011: 119)

Figure 5-1: Predictive model of sites in the Murrumbidgee east province (source: Pardoe and Martin 2011: 104).



Of the three prior assessments conducted within or near the study area, only two have a formal report available. These were done by Witter in 1987 and Byrne in 1987 prior to the existing WRQ starting operations.

Witter (1987), as an NPWS archaeologist, conducted an inspection of the study area, prior to it being originally developed as a quarry in 1987. Two sites were examined during the inspection, Site A and Site B, where, according to Witter, intense contact metamorphism between basalt and Devonian quartzite has resulted in felsite being present, although as previously noted (footnote 1) felsite is not a metamorphic rock and probably has an igneous source.

Site A was recorded by Witter as being an outcrop of felsite up-slope of the basalt which had a variety of flaked stone as well as bedrock anvils. It was noted that Site A was not used as heavily as Site B, perhaps due to the felsite being mostly coarser grained. Site A also has a large amount of colluvially deposited thermally fractured felsite overlying the nearby basalt.

Site B is located along the western boundary of the study area. Witter describes it as being "*largely exposed by a gully which runs down along the contact*" (Witter 1987: 1). It was noted that Site B had a large amount of flaked stone as waste from the process of breaking out cores from the felsite bedrock exposed in the drainage line. There were indications of Aboriginal quarrying

occurring by using the bedrock as anvils, as well as using large rocks to detach spalls from the bedrock which could then be used as core blanks. Witter also noted Hertzian cones in several of the felsite outcrops, as well as workshop areas which he postulates are "*trimming areas where the blanks were flaked to reduce unnecessary weight. These prepared cores would then be ready for transport to sites away from the quarry*" (Witter 1987: 2), as well as areas of implement manufacturing including retouched flake tools.

The felsite recorded at Site A and Site B includes red, yellow, and orange colour variations, as well as the more common white / grey colour type. Witter notes that this was due to changes in iron oxidation due to the heat from the basalt dykes.

In terms of significance, Witter states:

> *The Koomaringa Aboriginal stone quarry is an outstanding example of its kind. It is heavily worked, and it is unlikely that many similar quarries are present in the area…The main prehistoric use of this quarry was probably from about 5,000 to 2,000 years ago… The techniques used were highly sophisticated and required stone materials with the best flaking qualities… However, people of earlier and later periods probably also made a point of utilising such a fine stone source. The earliest date of use is conjectural, but could exceed 40,000 years ago.* (Witter 1987: 2–3)[3]

A series of management recommendations were outlined by Witter for Site A and Site B:

- A site map of both Site A and Site B should be produced showing the location and distribution of the cultural resource.
    - A large base map showing gullies and indicating hills and ridges to place the sites in context
    - Plotting archaeological material, such as bed rock anvils, extents of flaked debris, and other items with flake removal or retouch
- The archaeological sites should be marked out using white topped star pickets to avoid any impact by the rock extraction mining.
- A barrier fence should be installed to include a 50 m buffer zone in the basalt for the protection of the archaeological sites to prevent heavy equipment from crossing it or other mining activities straying onto the site.

Byrne (1987) also conducted a detailed assessment of Site A and Site B. The primary aim of Byrne's assessment was to spatially record the sites through mapping to determine the site extents and appropriate buffers to use for protecting the sites from the rock extraction activities.

[3] While Witter states that these dates are conjectural, there is no evidence available that suggests such an early date for the site.

Byrne recorded Site A as consisting of:

> *Surface exposures of felsite bedrock in a zone c. 50 metres wide along the spine of a low ridge for a distance of one kilometre.*
>
> *The bedrock exposures are surrounded by percussion material occupying a zone varying from about 50 to 100 metres wide. This material is mostly located on the flat to gently sloping top of the ridge. Downslope to the west a colluvial screen of mostly thermal felsite extends up to 150 metres from the ridge spine. This colluvium overlies the basalt. Further downslope towards the creek bed the scree is predominately basalt. A small amount of thermal felsite occurs in the creek bed. West of the creek the ridge slope is exclusively basalt.*
>
> *For the most part the north felsite occurrences on the ridge spine appear not to have been intensively used. Anvil areas are present but rare, no Hertzian cones were observed, and the density of percussion material is low (varying between about 1: 2–50 m^2).*
>
> *The southern end of the ridge spine (i.e., c. 300 m from vehicle track) has been more intensively used. Several anvil areas with Hertzian cones were observed. Workshop areas in this vicinity have densities of percussion material up to 20: 1 m^2. Several Hertzian cones are present on the bedrock exposures here.* (Byrne 1987: 7–8)

Figure 5-2 shows the site map Byrne produced for Site A. The numbers on the map represent Byrne's fieldnotes and are reproduced in **Table 5-1**.

Figure 5-2: Area 'A' felsite extraction zone showing location of buffer zone (source: Byrne 1987: 33).

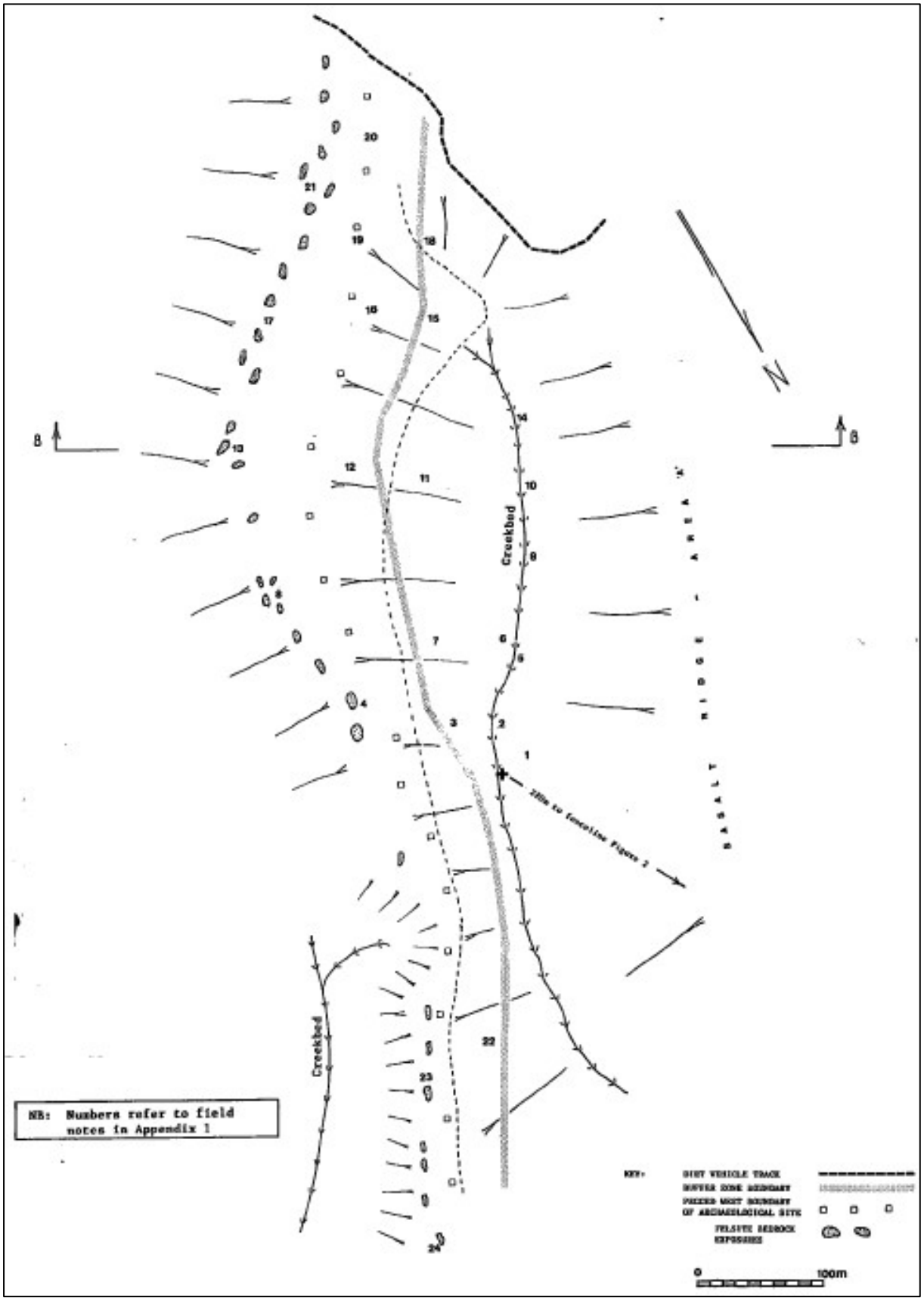


Table 5-1: Field Notes – Area 'A' (reproduced from Byrne 1987: 21–23).

Number on map	Field notes
1	Gentle slope on east side of creek. Basalt scree. Low density of felsite. Mostly thermal. No felsite artefacts observed.
2	Creek bed. Exposures of basalt bedrock. Some thermal felsite in creek bed. Bed 1.5 m wide. No banks. Gentle slope either side.
3	Basalt and felsite scree. Felsite mostly has thermal fractures. Thin dry pasture – ground visibility 40%. No artefacts observed.
4	Spine of ridge with felsite bedrock exposures. Non-artefactual felsite larger than downslope. No anvil areas observed on bedrock. Low density of artefacts – flakes and core to 8 cm. Artefact density 1: 2 m^2. Zone of bedrock and artefacts c. 20 m wide along the ridge spine at this point. Zone of bedrock and artefacts c. 30 m wide along the ridge spine at this point.
5	Creek bed 1.5 m wide, no banks. No felsite observed in basalt screen slope no west side.
6	Basalt scree with some felsite, mostly thermal.
7	Roughly equal proportions of basalt and felsite in scree. One felsite core, multi-platform 9 cm.
8	Felsite bedrock exposures as for 4. Felsite more coarse-grained than 4. Felsite bedrock exfoliating thermally. Mostly cobble-sized felsite. Very low density of felsite artefacts 1: 50 m^2. No anvil areas observed.
9	Creek bed. Basalt screen slopes on both sides. Some thermal felsite in creek bed. No artefacts observed.
10	Creek bed ill-defined. Basalt screen slopes on both sides. Some thermal felsite in bed. No artefacts.
11	Basalt scree slope. No felsite.
12	Mixed basalt-felsite scree. Coarse-grained felsite, mostly thermal. No artefacts observed.
13	Felsite bedrock exposures on ridge spine. Zone of bedrock and artefacts about 50 m wide at this point. Artefact density 2: 1 m^2. A few negative flake scars on felsite bedrock. Bedrock a few centimetres above ground surface. Some of felsite here quite fine-grained. Blade flakes mostly in 2–4 cm size range. No cores observed here.
14	Creek bed ill-defined. Some thermal felsite in bed. No artefacts observed.
15	Felsite scree. No artefacts observed.
16	As for 15.
17	Bedrock exposure as for 13. A few possible anvil areas. No Hertzian cones.
18	Basalt scree with some thermal felsite. No artefacts.
19	Felsite scree. No artefacts observed.
20	As for 19.
21	Felsite bedrock exposures along ridge spine. Anvil areas and Hertzian cones. Artefact density surrounding anvil areas up to 20: 1 m^2. Mostly flakes and flaked pieces. Artefact density here considerably higher than anywhere to the north along the ridge. Thin dry pasture with visibility 40%. Negative flake scars on bedrock. Some artefacts (flakes and flaked pieces) have retouch.
22	Basalt scree. No artefacts observed.
23	Felsite bedrock exposures. No Hertzian cones or negative scars observed on bedrock. But artefacts present at density of about 2: 1 m^2.
24	Northern most felsite bedrock exposure on ridge spine. Exposures quite small. Low density of artefacts in association. No Hertzian cones.

Site B was also recorded and mapped by Byrne:

> *…the felsite bedrock exposures are confined to two stretches of creek bed of 50 and 70 metres in length in addition to a small number of small exposures on the slope west of the creek. Felsite artefacts and thermal material, however, occur in the creek bed in sizes ranging from pebbles to boulders at least as far north as the creek junction.*
>
> *East of the creek bed is the low basalt ridge which is the subject of the Area 'B' basalt quarry proposal. The west side of this ridge takes the form of a relatively steep scree*

slope leading directly to the bank of the creek bed. No felsite was found on this slope. Evidently the Aboriginal activity associated with felsite extraction and processing was confined to the creek bed and the gentle slope on the west side of the bed.

…The bedrock exposures in the creek bed bear scars resulting from block-on-block percussion and removal, by percussion, of projections. Numerous Hertzian cones are present. It is clear that much of the debitage associated with extraction here has been washed downstream. There remain, however, scatters of percussion material in the bed at densities up to 5: 1 m^2. These occur amongst thermal felsite pebbles and cobbles and basalt rocks in a variety of sizes.

West of the creek bed the density of percussion material falls off rapidly from around 1: 1 m2 within 20 metres of the bed to 1: 5m2 100 metres west of the bed. The slope at the time of the investigation was covered with dry pasture which reduced ground visibility to less than 30% in most places.

A number of areas on the slope has densities of percussion material indicative of workshop activity. These were particularly associated with the small exposures of the bedrock on the slope.

As with Area 'A', considerable amounts of thermal felsite scree occur on the slope.

The felsite percussion material ceases to occur about 150 m south of the southernmost of the two creek bed felsite occurrences. At the northern end of the site the percussion material is mostly confined to the creek bed. Between the vehicle track crossing and the creek junction felsite percussion material was observed in the alluvial banks of the creek which are up to 2m high here.

…Most of the felsite percussion material seen in Area 'B' was relatively small by quarry standards. The largest core was 30 cm and no flakes or flaked-piecers were larger than 20 cm, most of them well below 10 cm. The scarcity of large items may be due to the high quality of the stone and the extent to which the raw material extracted from the exposures was reduced before rejection or removal from the site. (Byrne 1987: 8–9)

The site map of Site B produced by Byrne is shown on **Figure 5-3** and **Figure 5-4**, while the fieldnotes relating to the numbers on the maps is reproduced in **Table 5-2**.

Figure 5-3: Area 'B' felsite extraction area showing buffer zone east of creek bed (source: Byrne 1987: 31).

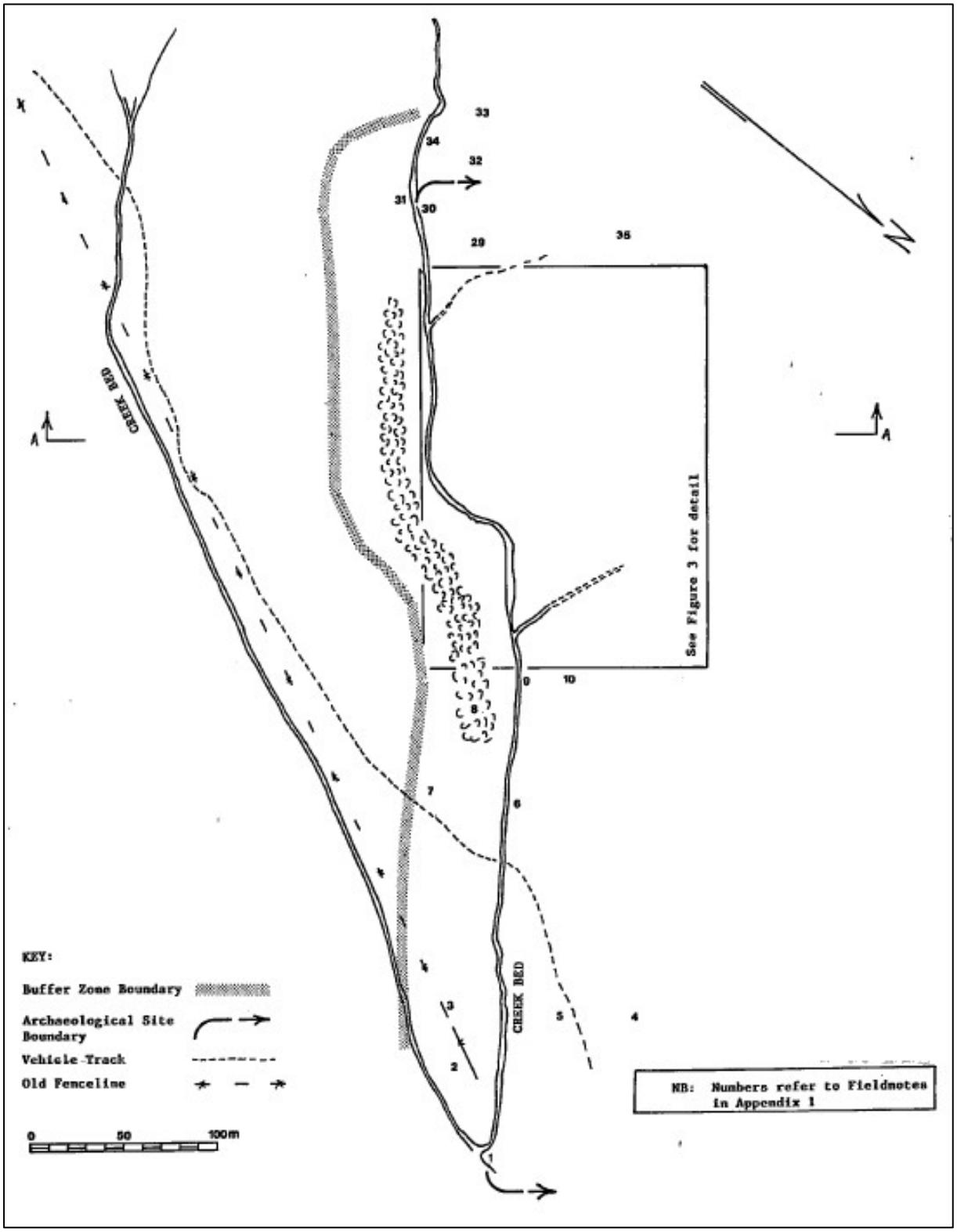


Figure 5-4: Detail showing area of felsite bedrock exposures at Area 'B' (source: Byrne 1987: 32).

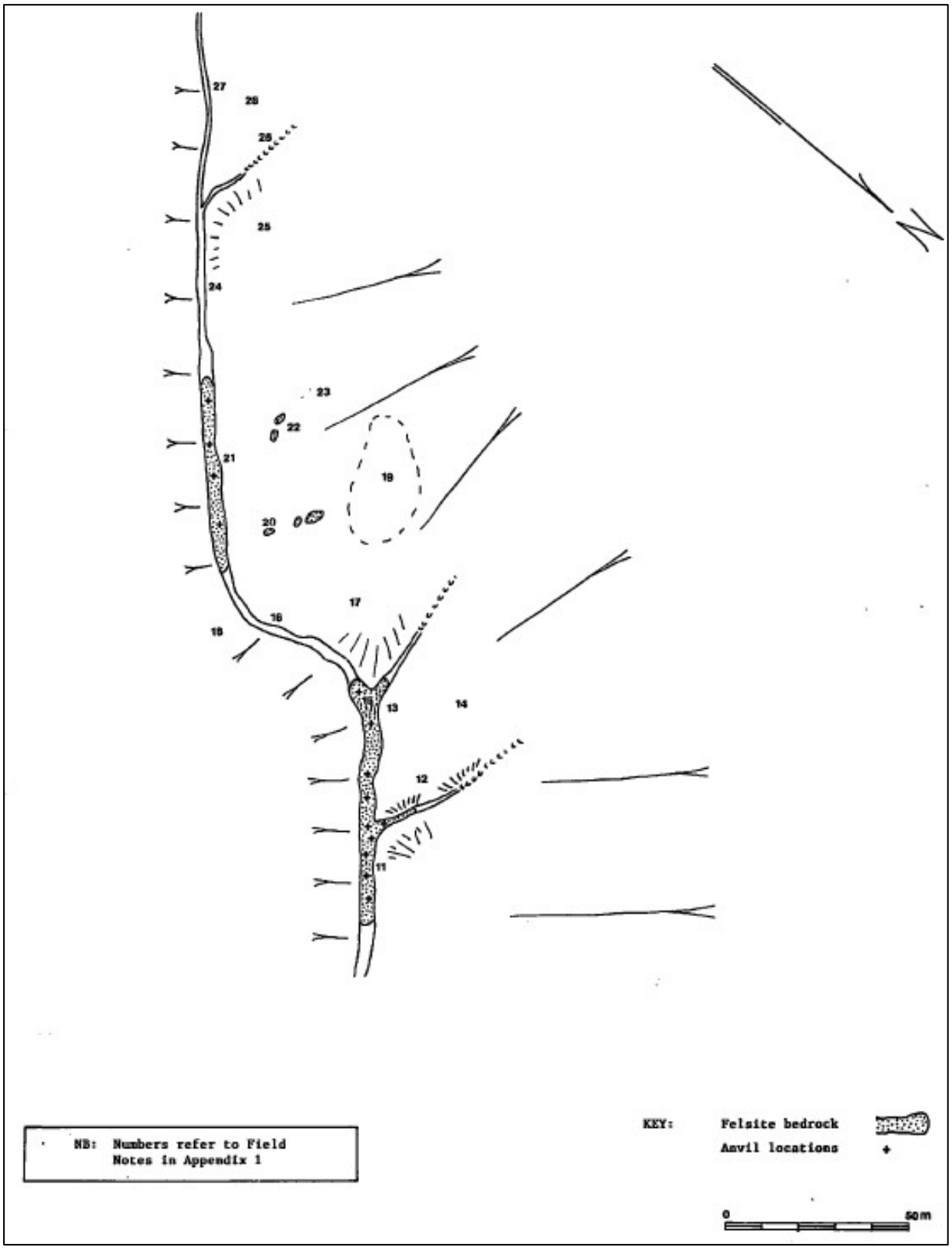


Table 5-2: Field Notes – Area 'B' (reproduced from Byrne 1987: 18–21).

Number on map	Field notes
1	Creek junction. Felsite cobbles and pebbles in creek bed. Also, low-density scatter of artefacts in bed material (1: 1 m^2). Banks up to 2 m high. Some artefacts exposed in bank alluvium.
2	Dry pasture. Ground visibility 10%. No artefacts or felsite pebbles, etc.
3	Rabbit warren surrounded by dry pasture. Ground visibility on warren 70%. Mixture of basalt and felsite rocks on surface. Felsite cores and flakes – low density (1: 1 m^2). Some thermal felsite.
4	Gentle slope with dry pasture. Visibility 10–20% with some more exposed patches. Low-density thermal felsite. No artefacts observed.
5	Gentle slope. Visibility as 4. Low-density thermal felsite (pebble size) plus low-density felsite artefacts 1: 1 m^2 increasing downslope to about 2: 1 m^2.
6	Creek bed. No banks. Mixture of basalt and felsite pebbles and cobbles. Bed 2 m wide. Artefacts 2: 1 m^2 in 2–10 cm size range.
7	Dry pasture. Ground visibility 10%. A few felsite rocks. No artefacts observed.
8	Basalt screen slope. No artefacts observed.
9	Exposure of felsite bedrock in creek bed. Floor of creek bed c. 3 m wide – bed entirely occupied by bedrock. Hertzian cones and other block-on-block percussion attributes present. Small amount of loose stone lying on bedrock – includes flakes and flaked pieces (mostly smaller than 5 cm). The south-east side of the creek consists of a basalt scree slope descending steeply to the bank of the creek which is 2 m high. Low density of felsite artefacts on north-west creek margin (1: 1 m^2).
10	Gentle slope with dry pasture. Felsite scree of pebble-sized stones. Mostly thermal. Artefact density c. 1: 5 m^2.
11	Creek bed felsite bedrock exposure. Felsite thermal material to cobble size. A small proportion of percussion artefacts – c. 5%. Artefact density up to 5: 1 m^2. No felsite on basalt screen slope.
12	Felsite screen slope on south side of small dry channel. Includes artefacts at 1: 1m^2 density. Flakes and flaked pieces – no cores observed here.
13	Gentle slope with 20% ground visibility. Artefact density up to 5: 1 m^2. Core up to 10 cm. In context of felsite scree.
14	Felsite thermal scree with low density artefacts – 1: 1 m^2. Ground visibility 10–20%.
15	Exposed felsite bedrock in creek bed. Anvil areas. Some shallow alluvium overlying bedrock in places. Artefact density 5: 1 m^2. Felsite flakes and flake pieces.
16	No felsite bedrock in creek bed. Basalt and felsite pebbles, cobbles. Artefact density 1–5: 1 m^2. Low basalt scree slope on south-east side – no artefacts.
17	Gentle slope with ground visibility 30%. Artefact density 2: 1 m^2 Flakes and flaked pieces, some with retouch. Low density of multi-platform cores to 6 cm.
18	Rabbit warren area – 100% ground visibility. Artefact density 1: 1 m^2. Flakes and flaked pieces to 10 cm. Some retouched. Cores to 10 cm.
19	Small bedrock exposures on gentle slope. Bedrock only a few centimetres above surrounding land surface. Possible anvil areas. No Hertzian cones. Artefact density in surrounding area only c. 1: 1 m^2.
20	Bedrock exposure as for 19. 4 m^2 area. Anvil area – also negative flake scars. Artefact concentration up to 50: 1 m^2. These on bedrock and immediate area – total coverage 6 m^2. Mostly flakes – high proportion with retouch/utilisation. Low density of core up to 20 cm.
21	Felsite bedrock exposure in creek bed as further downstream – e.g. 9. Bare areas of flat felsite and areas covered by felsite and basalt cobbles. Possible anvil areas – several negative flake scars on bedrock.
22	Small felsite bedrock exposures on gentle slope. Also, felsite boulders. Boulders have thermal fractures only. Flakes and flaked pieces in adjacent area 5: 1 m^2 – mostly small (1–3 cm).
23	Slope has low density felsite artefact scatter at 1: 5 m^2 against background on felsite thermal scree. Ground visibility c. 10%.
24	Creek bed narrows to 1.5 m wide. No felsite bedrock exposure. Bed consists of basalt and felsite pebbles and cobbles. Felsite artefact density 1: 2–5 m^2. South-west bank on 1 m high.
25	Gentle slope. Dry pasture with ground visibility 20%. Felsite artefact density 1: 5–10 m^2. No felsite bedrock or boulders.
26	Dry channel has low eroded slope on south side. Some felsite scree, mostly thermal. Artefacts on scree and in channel 1: 2 m^2 – flakes and flaked pieces.
27	Creek bed 1.5 m wide. Banks 2–3 m high on both sides. No felsite bedrock. Low density artefacts 1: 10 m^2.
28	Gentle slope. No felsite bedrock or boulders. Low density thermal scree. Ground visibility 20%. Artefact density 1: 10 m^2.

Number on map	Field notes
29	Eroded area on gentle slope (sheet erosion). Ground visibility 60%. Area c. 40 m^2. Artefact density 1: 1 m^2. Mostly flakes and flakes pieces. No retouched items observed. Small cores to 5 cm.
30	Creek bed partly grassed. Visibility only 30% in bed. Basalt and felsite pebbles and cobbles. Low density felsite artefacts – 1: 10 m^2.
31	Basalt scree slope.
32	Thick dry pasture on gentle slope. Ground visibility 0–5%. No felsite bedrock or boulders. Low density thermal felsite scree. No artefacts observed.
33	Exposed ground at base of tree. Some thermal felsite. No artefacts observed.
34	Mostly basalt cobbles in creek bed. No felsite artefacts observed.
35	Medium slope with tick pasture. Isolated felsite artefacts c. 1: 50 m^2. Flakes and flaked pieces. Ground visibility 5%.

Due to the scarcity of rock extraction sites in the immediate vicinity of Koomaringa AP, Byrne (1987) likens Site A and Site B at the Koomaringa AP to several Aboriginal silcrete extraction sites in the Lightning Ridge region, NSW. At these sites (#9-2-0018, #9-2-0019 and #9-2-0021) the rock extraction locations tended to be associated with camp sites, with stone obtained from the silcrete outcrops widely disseminated and the material being predominate in flaked-stone artefact assemblages at open sites in the area.

The significance of Site A and Site B at Koomaringa AP was determined by Byrne to be high. This is in part to the considerable research potential of these sites, and that many sites in the surrounding area are likely to contain felsite artefacts derived from the Koomaringa AP stone sources. In addition to mapping and recording Site A and Site B, Byrne was also present when steel star-pickets and wooden stakes were placed along the outer edge of the buffer area. The locations of these star-pickets and wooden pegs in relation to Site A is detailed on the site map (see **Figure 5-2**), while Site B was apparently not pegged out due to using the basalt screen slope east of the site as a boundary (Byrne 1987: 14). The 11 August 2023 site inspection, however, also located wooden stakes along the eastern boundary of the Site B buffer area which are now included within the fenced area for Site B.

Byrne also noted that there are various locations throughout the Koomaringa property where felsite artefactual material has been noted, mostly along vehicle tracks (Byrne 1987: 14). These locations were not recorded, and specifics are unknown.

5.3 LOCAL ARCHAEOLOGICAL CONTEXT

5.3.1 Desktop database searches conducted

A desktop search was conducted on the following databases to identify any potential previously recorded heritage values within the study area. The results of this search are summarised in **Table 5-3** and presented in detail in **Appendix 2**.

Table 5-3: Aboriginal cultural heritage: desktop-database search results.

Name of Database Searched	Date of Search	Type of Search	Comment
Commonwealth Heritage Listings	3/10/2019	Carrathool LGA	No places listed on either the National or Commonwealth Heritage lists are located within the study area
National Native Title Claims Search	3/10/2019	NSW	No Native Title Claims cover the study area.
AHIMS	12/09/2019	20 x 20 km centred on the study area	Seven sites within the search area.
AHIMS	09/08/2021	20 x 20 km centred on the study area	26 sites within the search area.
AHIMS	24/05/2023	20 x 20 km centred on the study area	36 sites within the search area
AHIMS	21/03/2024	20 x 20 km centred on the study area	50 sites within the search area
Local Environmental Plan (LEP)	3/10/2019	Carrathool LEP of 2012	None of the Aboriginal places noted occur near the study area.

A search of the AHIMS database on the 12 September 2019 returned five records for Aboriginal heritage sites within the designated 20 km by 20 km search area centred on the study area (eastings: 394689–435771, northings: 6239688–6281025, Zone 55) (**Appendix 2 Figure 1**). Of the five sites, three are modified trees, one is a quarry, and one is an Aboriginal Place. The quarry (AHIMS #42-5-0004) is recorded inside the gazetted boundaries of Koomaringa AP (AHIMS #42-5-0005). As mentioned in **Section 1.2**, the GPS coordinates provided for #42-5-0004 are outdated and place this site 590 m north of the study area, while the GPS coordinates for #42-5-0005 are 1.4 km northeast of the study area but still within the boundary of the Koomaringa AP.

OzArk submitted a site card update on 28 May 2023 for site #42-5-0004 to change the location to GDA Zone 55 415300E, 6260684N; a location within the assessed site extent of Site B associated with the #42-5-0004 recording. The coordinates for #42-5-0005 were unaltered as the AHIMS location still falls within the boundary of the Koomaringa AP.

An updated AHIMS search was conducted on 09 August 2021 which returned 26 records for Aboriginal heritage sites using the same search criteria as the above (**Appendix 2 Figure 2**). Nineteen of the records are for sites recorded during this assessment (42-5-0010 to 42-5-0028) and have been excluded from further analysis here (see **Section 6.4** for details on these sites). Of the seven remaining records, two include Site A and B, and the Koomaringa AP listing (42-5-0004 and 42-5-0005 respectively), and three are the sites returned in the original search (see above; 42-5-0001, 42-5-0002, and 42-5-0006). Two additional sites have been recorded at Sims Gap (42-5-0008 and 42-5-0009; a modified tree and a potential archaeological deposit [PAD] respectively) since the initial search was conducted. **Figure 5-5** shows the location of the AHIMS sites that had been recorded near the study area in 2021 and **Table 5-4** shows the frequency of site types in the region.

On 24 May 2023, a further AHIMS search was undertaken to ensure that no sites had been recorded in or near the Quarry Site following the 2021 AHIMS search. The results of the search are presented in **Appendix 2 Figure 3**. This search was identical to the 2021 search except for an additional 10 sites recorded by Ms. Jessica Murphy approximately 17 km to the east-northeast of the study area (**Figure 5-6**). These sites consist of a hearth, eight isolated finds, and one artefact scatter consisting of two artefacts. These sites appear to have been recorded for an assessment of a fire trail within the Jimberoo National Park. As there are no new recordings within or near the Quarry Site apart from those known before the 2019 survey and those recorded for this assessment, the 2023 AHIMS search does not alter the findings of this report.

On 23 March 2024, a fourth AHIMS site search was undertaken (**Appendix 2 Figure 4**) following a HNSW review of the Revision 2 ACHAR and OzArk being informed that Mr Mark Saddler had recorded a number of sites in late December 2023. The 2024 search returned 50 sites in the search area. These include the 36 sites included in the 2023 site search and the 14 sites recorded by Mr Mark Saddler (**Figure 5-7**).

OzArk was not present at the recording of these sites in late December 2023 and has relied on the information provided in the site cards. All sites except one are outside the maximum limit of disturbance and the Quarry Site. One site, 42-5-0064 (Koomaringa Anvil 1), a single basalt boulder described as an anvil, is within the maximum limit of disturbance and will be discussed further in **Section 6.6** (**Figure 5-8**).

Overall, the most frequent site types located in the vicinity of the study area at the time of the 2019 survey were modified trees (57%), with a quarry (14%), Aboriginal Place (14%) and PAD (14%) also present.

Table 5-4: Site types and frequencies of AHIMS sites near the study area (2019).

Site Type	Number	% Frequency
Modified tree	4	57.1
Quarry	1	14.3
Aboriginal Place	1	14.3
PAD	1	14.3
Total	**7**	**100**

Figure 5-5: Location of previously recorded AHIMS sites in relation to the study area (2021).

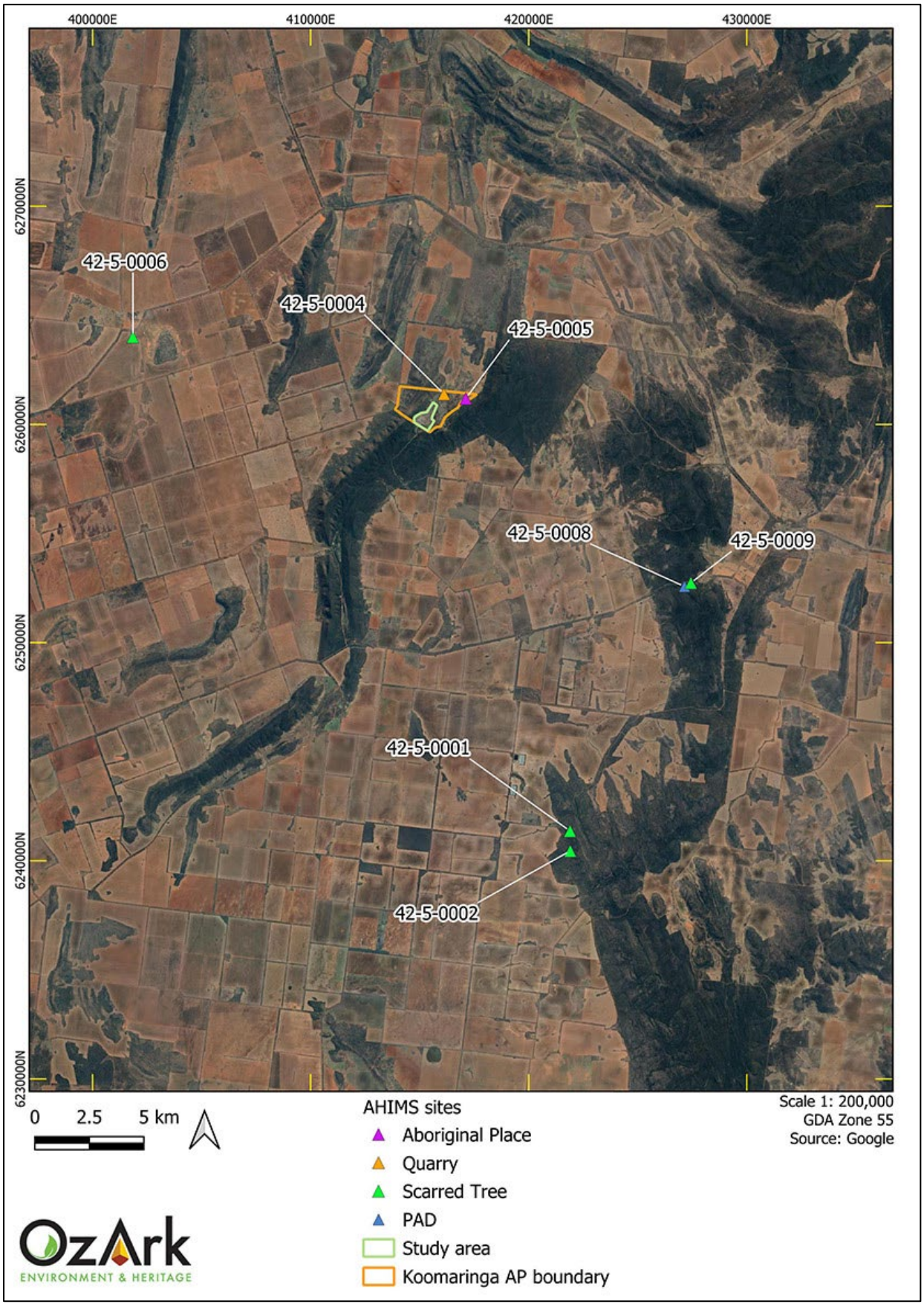


Figure 5-6: Location of previously recorded AHIMS sites in relation to the study area (2023).

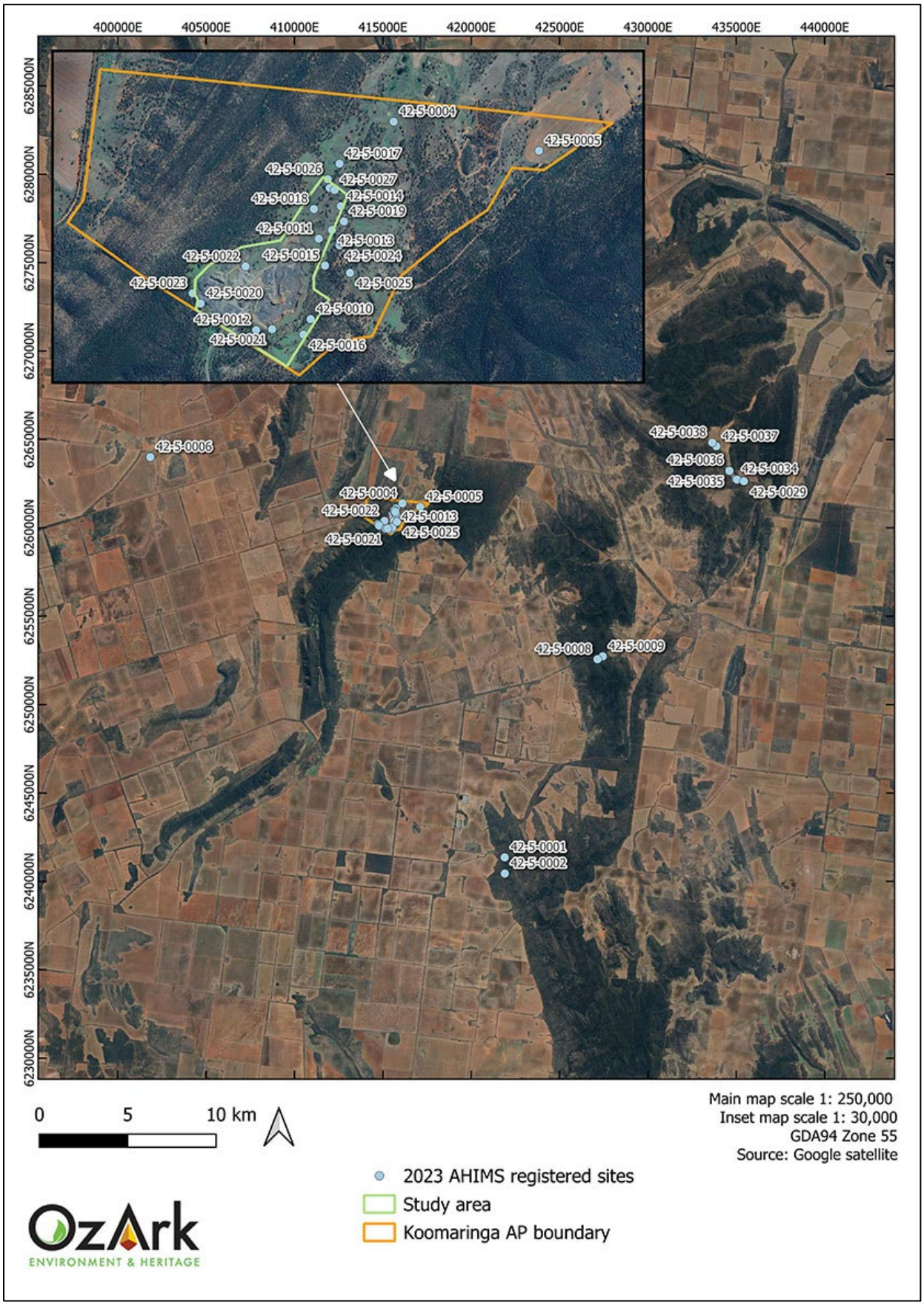


Figure 5-7 Location of previously recorded AHIMS sites in relation to the Koomaringa AP (2024).

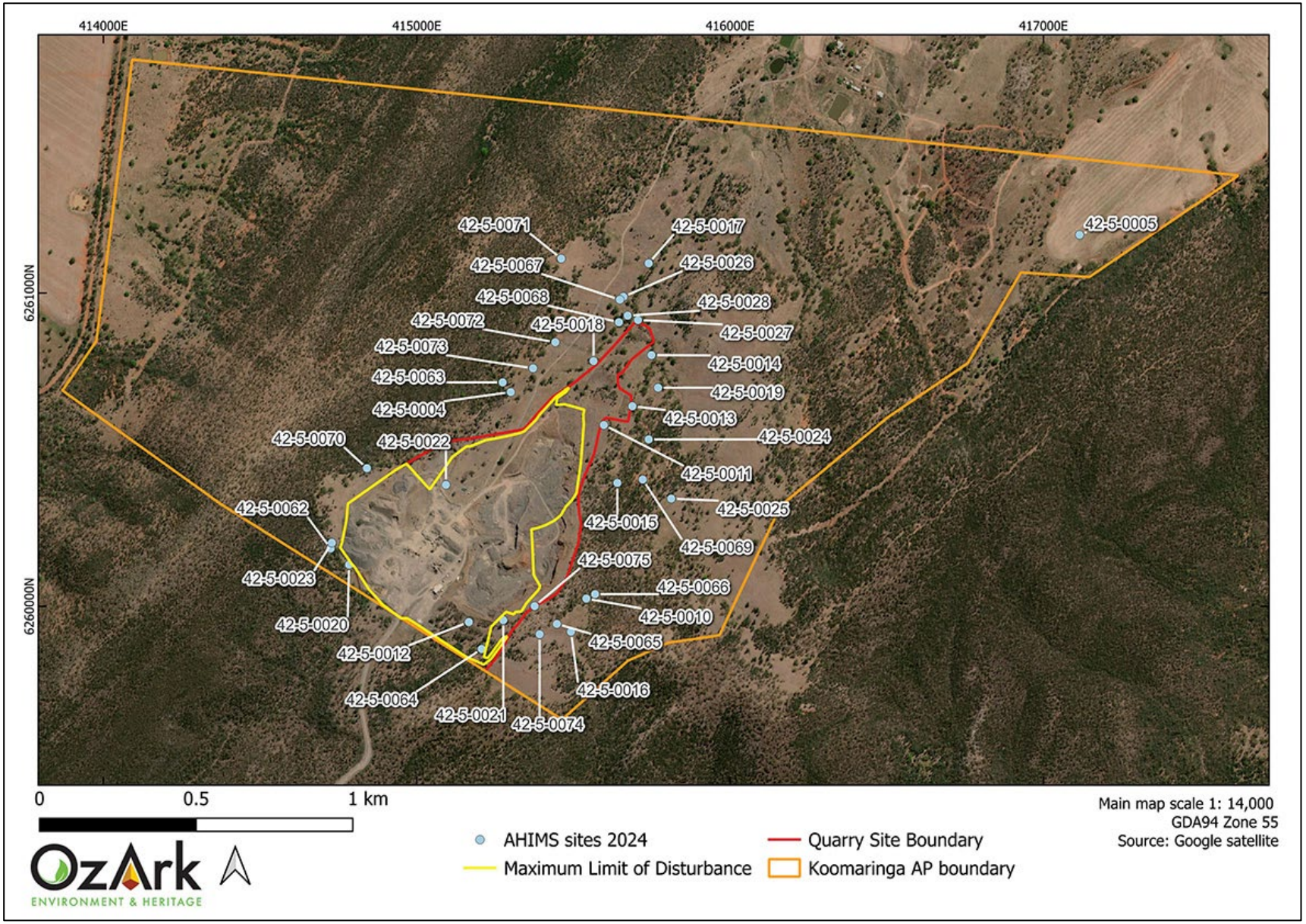
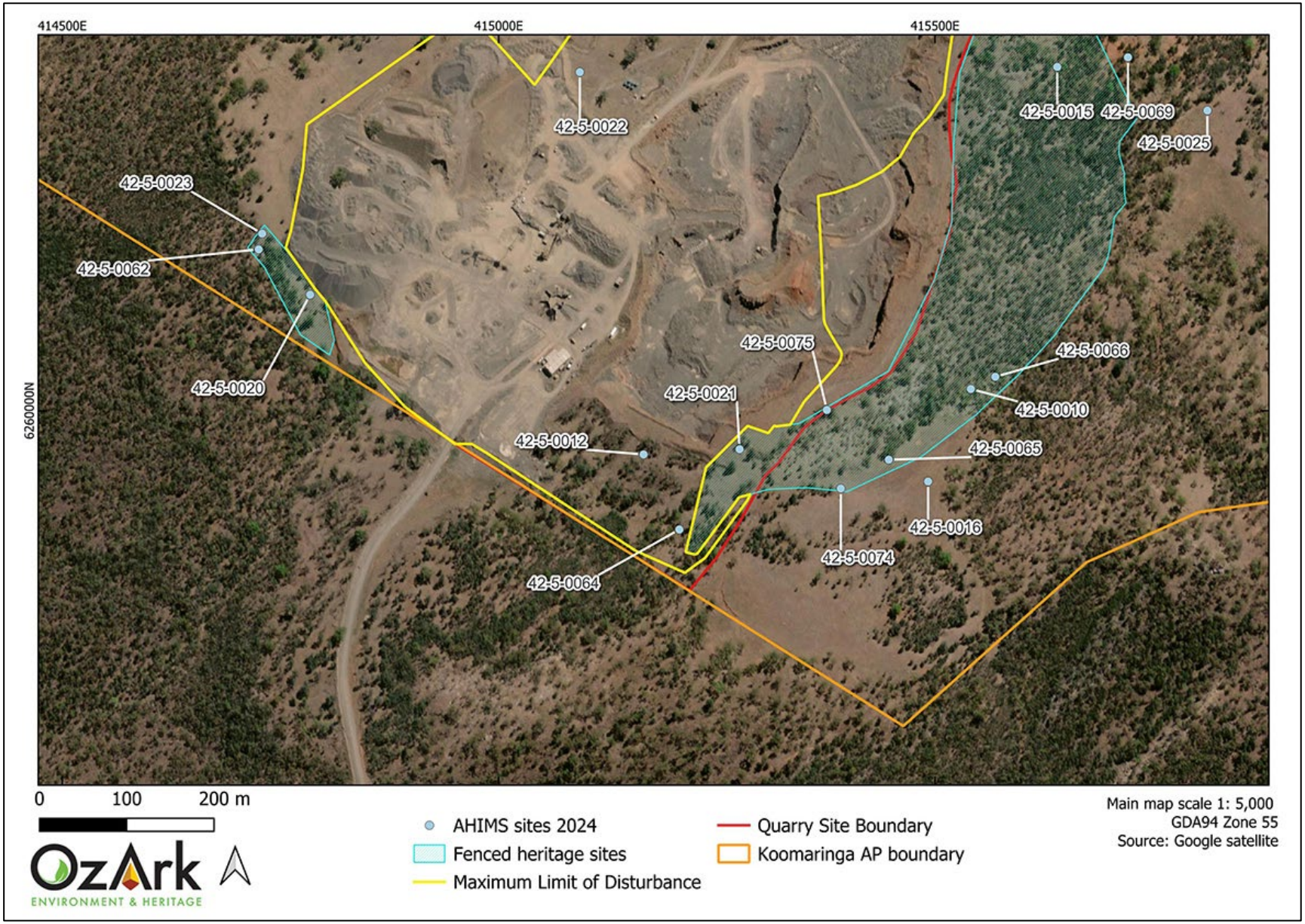


Figure 5-8: Detail of sites recorded in the Koomaringa AP at the south of the Quarry Site.



5.4 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.

5.4.1 Settlement strategies

The two archaeological studies undertaken near the study area provide information to obtain some understanding of the nature and distribution of archaeological sites within the area. Although there is some conjecture about the relationship between stream order, site numbers and densities, the general pattern is that most sites are present close to watercourses, especially regarding open camp sites seen partly in the archaeological record as stone artefact scatters. As the water sources in or close to the study area would have been based on the amount of rainfall and wash down from the surrounding ridgelines, occupation of the study area was likely to have been sporadic and for short periods of time. As Pardoe and Martin (2011) suggest, the study area is likely to have been a ‘node’ in the landscape due to the abundance of suitable raw materials for stone tools, which would have attracted visitation to the area, if not long-term occupation.

5.4.2 Past land use

Crucial for the preservation of archaeological deposits is the history of past land use in an area. Site A and Site B at Koomaringa AP, located along the western and eastern edges of WRQ have not been impacted by the ongoing quarry operations due to previous management

recommendations. However, due to the high level of disturbance by quarrying operations, it is unlikely that any substantive Aboriginal archaeological sites would be present inside the study area where disturbance has already occurred. If any sites are present inside previous disturbed locations, these are likely to be in a secondary context and not be associated with intact subsurface deposits.

Preservation of sites outside the study area and previous locations of disturbance are more likely, especially on flat slightly elevated terraces and banks adjacent to the drainage lines throughout the remainder of Koomaringa AP.

5.4.3 Previous studies

Previous archaeological studies indicate that the following site types will possibly be recorded within the study area: rock extraction locations where felsite bedrock has been quarried; open artefact scatters and / or isolated artefacts perhaps indicating temporary camp sites; and workshop areas surrounding the quarried bedrock of felsite.

The results of past archaeological investigations in the study area indicate that the most common site type will be either Aboriginal stone extraction sites and / or open artefact scatters consisting primarily of flakes or flaked pieces from initial reduction of extracted spalls.

5.4.4 Landform modelling

A consideration of the landforms within the study area enables a prediction regarding the type and distribution of sites to be made. Extraction sites are most likely to occur where there are sources of fine-grained felsite available for quarrying. Such sites usually occur inside drainage lines or along the top of ridges in the study area, and are likely to be associated with flakes, flaked pieces, and workshop areas. Artefact scatters are also likely to be present along the edges of larger drainage lines where there are flat banks and topsoil. Such scatters are likely to include primary, secondary, and possibly tertiary reduction waste debitage, as well as retouched stone tools which have been discarded or left behind.

5.4.5 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.

- Applicability to the study area. As isolated finds can occur anywhere, particularly within disturbed contexts, it is predicted that this site type is likely to 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.

- Applicability to the study area. Although most of the study area is within sloping landforms and distant to permanent water, this site type is predicted to be frequent. The flat banks of drainage lines and ridge landforms are possible locations for this site type to be present in the study area. The previously recorded quarry sites, Site A and Site B, inside and adjacent to the study area, and located in relation to drainage and ridgeline landforms, mean that primary reduction of quarried stone material would have occurred close by and that there is a high likelihood of workshop floors and associated debitage to be present nearby.

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.

- Applicability to the study area. The AHIMS search indicates that scarred trees have been recorded in the region. There is remnant native vegetation in and near the study area, so it is possible this site type will be present.

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.

- Applicability to the study area. This site type has already been recorded inside and adjacent to the study area (Site A and Site B, see **Section 5.2** and **Section 5.3**). As such, it is highly likely there are further sources of felsite available that may have been used as a source of material are present in or around the study area.

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.

- Applicability to the study area. Although it is possible that this site type could be found within the study area, it is considered a rare site type especially given the disturbance that has occurred within the study area and the types of landforms present that are not normally associated with burials.

6 RESULTS OF ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

6.1 SAMPLING STRATEGY AND FIELD METHODS

Standard archaeological field survey and recording methods were employed in this study (Burke and Smith 2004). The Aboriginal cultural heritage assessment of the investigation area followed the Code of Practice, as well as the Guide.

The survey included full assessment within the study area where there is no prior disturbance. In addition, several locations such as previously recorded sites (Site A and Site B, see **Section 5.2**) were also included. Additional areas outside and adjacent to the study area were also surveyed to help inform the forthcoming Plan of Management for Koomaringa AP.

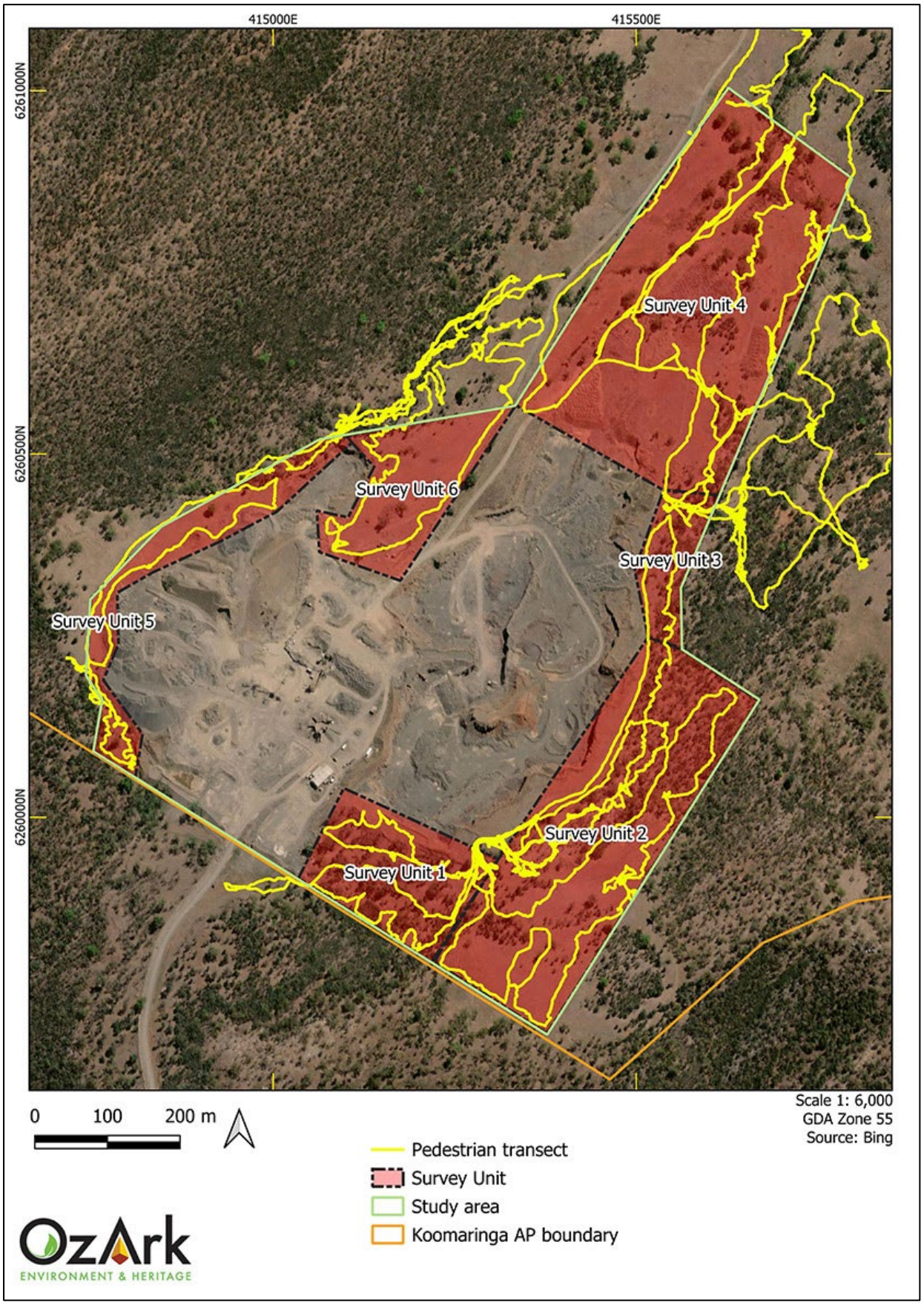
In general, due to the prior disturbances inside the study area, straight transects were not consistently possible in some survey areas. However, care was taken to ensure that the two surveyors were spaced approximately 10–25 m to ensure adequate coverage. There were six areas surveyed during the assessment. These survey areas are based on locations inside the study area, but outside of the existing disturbance footprint and cover the range of different landform types present in the study area. The landforms in each of the survey areas shown on **Figure 6-1** is detailed in **Table 6-1**. **Figure 6-1** also shows the pedestrian line of one surveyor.

When recording a site, the following details were noted:

- GPS location/s of site features (i.e., stone artefact locations, etc.)
- Site type
- Site extent
- Landform and context of site
- Details for each artefact, or a sample of artefacts (size, type, raw material, etc.), or the feature being recorded (i.e., scarred tree, procurement location)
- Whether site had potential for PAD
- Notes on discussion from RAPs regarding their views about the site.

These details were used to register sites on AHIMS and compile the information in **Section 6.4**.

Figure 6-1: Pedestrian transects and survey areas.



6.2 PROJECT CONSTRAINTS

Ground surface visibility (GSV) was the only constraint during the field survey. Due to the dense short grasses and weeds which are prevalent across the study area, the ground surface was sometimes obscured. However, there are large areas of exposures where GSV was higher throughout much of the survey areas, affording at least moderate visibility across the study area as a whole.

6.3 EFFECTIVE SURVEY COVERAGE

Two of the key factors influencing the effectiveness of archaeological survey are 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 6-1 calculates the effective survey coverage within the study area. Some areas outside the study area were included in the survey, and sites were recorded during this. However, these sites (Koomaringa OS-04, OS-08, OS-10, PL-01, PL-02 and ST-01) have been excluded from **Table 6-1** and **Table 6-2** as these six sites are completely outside the boundary of the study area.

In general, **Table 6-1** presents an approximation of the amount of ground surface able to be seen at any location within particular landform units. For example, at any one location within the drainage line landforms of the study area approximately 40% of the ground surface could be seen. Exposures in these landforms were generally confined to erosions along the edges of drainage line banks. The amount of visible ground increased across the ridgelines as these generally had less ground cover compared with the flat or gently sloping landforms. Visibility

within ridgeline landforms was hampered by gravels, basalt scree, and naturally shattered felsite scree. Sloping landforms had variable visibility, with lower visibility where basalt or felsite scree was present. Exposures in this landform unit were derived from sheet wash erosion.

Table 6-1: Effective survey coverage within the study area.

Survey Unit	Main Landform/s	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	Slopes	34522	20	40	2762	8
2a	Slopes	54514	30	40	6542	12
2b	Ridgeline	20987	40	50	4197	20
2c	Drainage line	23194	40	60	5567	24
3	Slopes	13789	20	40	1103	8
4a	Slopes	21544	40	50	4309	20
4b	Flats	73028	40	40	11684	16
4c	Drainage lines	40025	30	70	8405	21
5a	Slopes	16268	30	50	2440	15
5b	Drainage lines	10977	30	70	2305	21
6	Slopes	31363	50	40	6273	20

Table 6-2 demonstrates that although the survey efficacy was lowest on the sloping landforms, a number of sites were still recorded. The highest number of sites are recorded along drainage lines (n=10), and these were predominately stone artefact scatters recorded in exposures along the banks. Though the flats or gently rolling slope landforms had the highest amount effectively surveyed (42%) the number of sites (and artefacts / features) recorded was the lowest. This is likely due to the lack of erosion exposures across this landform unit. These results indicate that variable GSV and GSE was not a factor in the recording of sites and that the distribution of sites shown in **Table 6-2** are a true reflection of the potential for different landform units to contain Aboriginal sites. Therefore, there is confidence in the assumption that sites are more numerous in either drainage or ridgeline landscape units.

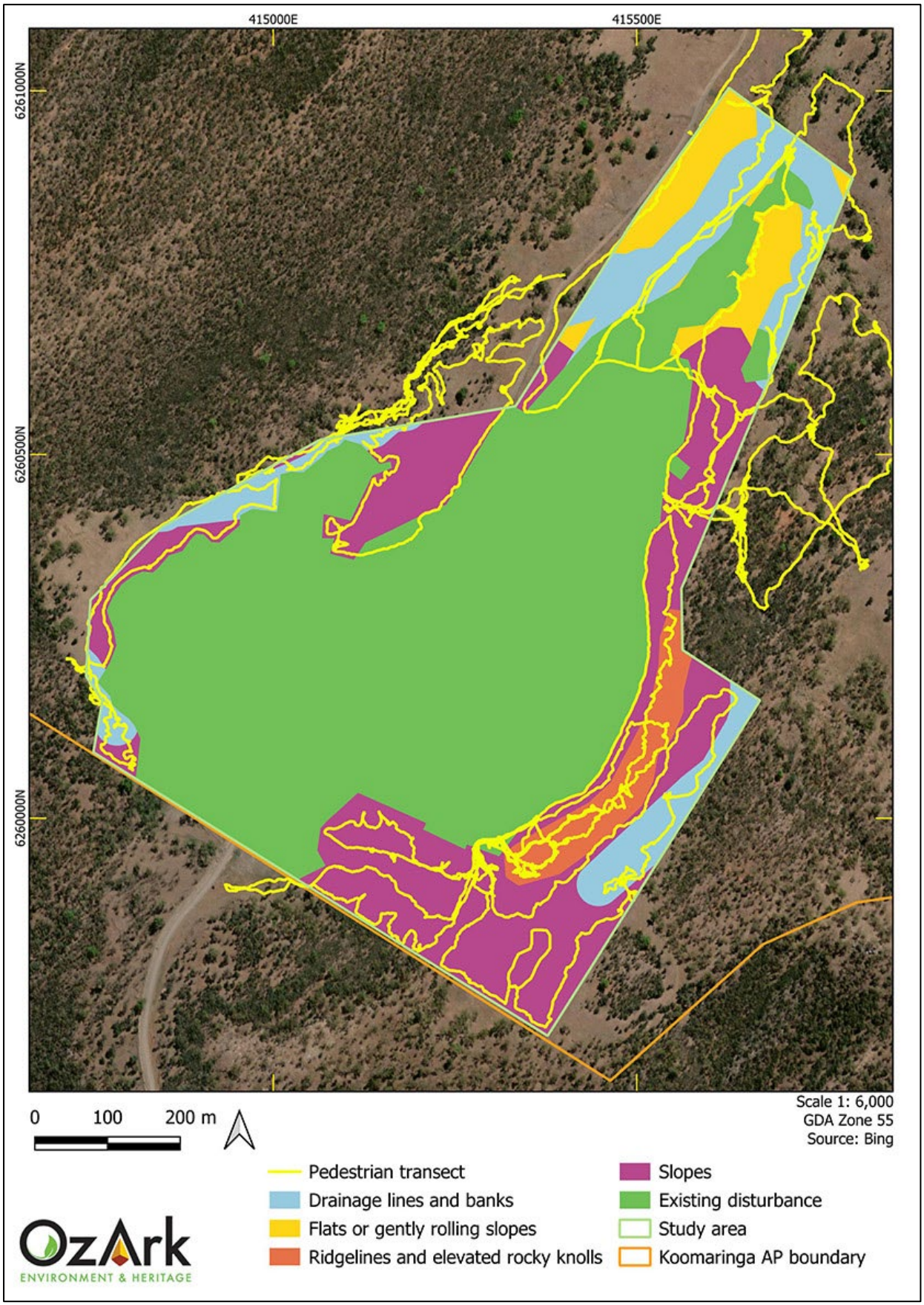
Figure 6-2 demonstrates that all landform units were adequately assessed providing further confidence that the distribution of sites across landform units shown in **Table 6-2** is an accurate reflection of the study area.

Table 6-2: 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	Number of Artefacts or Features
Drainage lines and banks	63000	16277	26	9	58

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	Number of Artefacts or Features
Ridgelines and elevated rocky knolls	22000	4197	19	1	24
Slopes	151000	23428	16	4	8
Flats or gently rolling slopes	28000	11684	42	1	8

Figure 6-2: Pedestrian transects and landforms.



6.4 ABORIGINAL SITES RECORDED

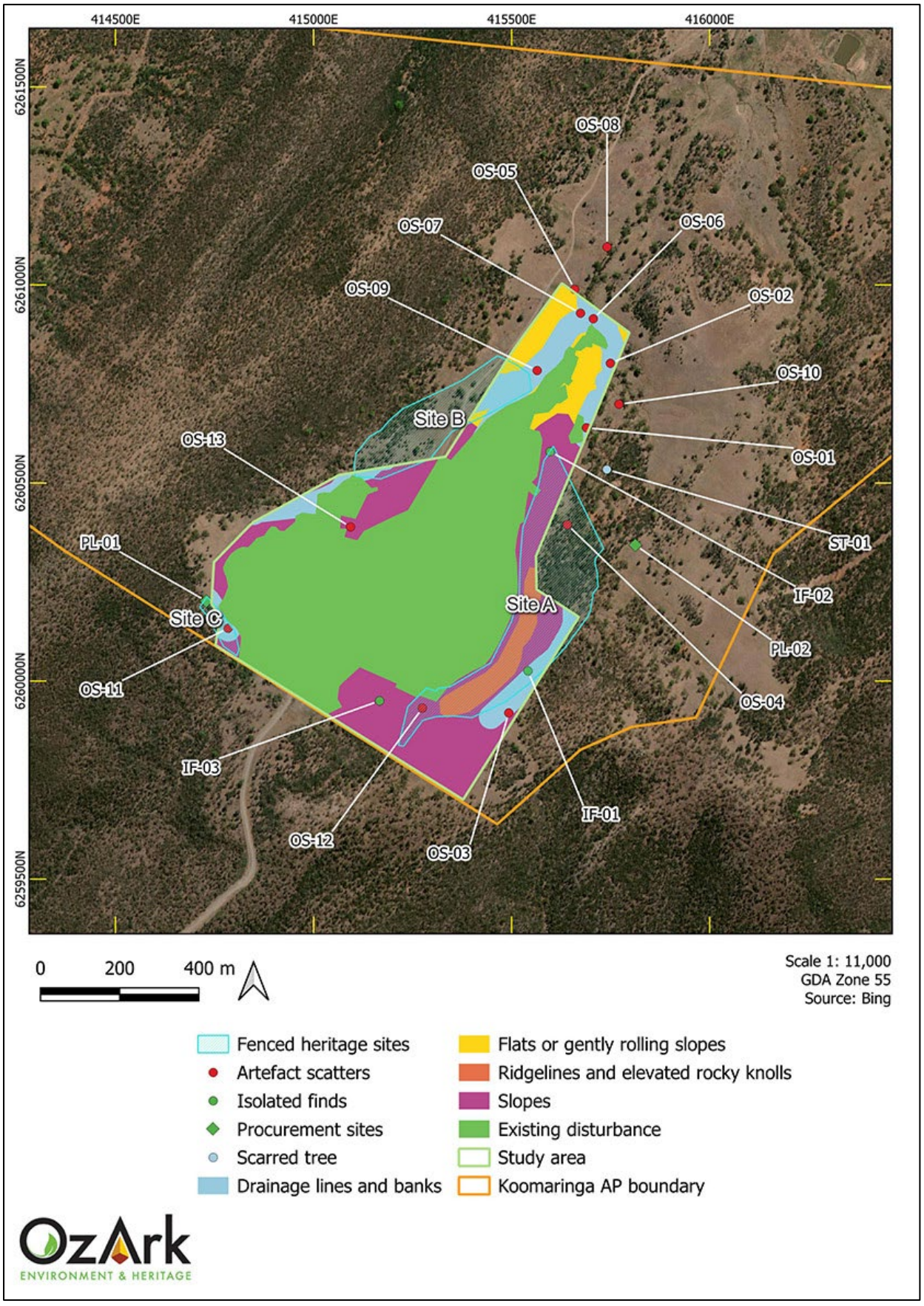
Table 6-3 summarises the Aboriginal cultural heritage sites recorded during the survey of the study area. Please note that some sites detailed in this section are completely outside the current study area boundary. A full artefact catalogue with the details of the artefacts recorded in detail is provided in **Appendix 6**. **Figure 6-3** shows the location of each site in relation to the study area. Further details on each site follows.

Previously recorded sites, Site A and Site B, are discussed in **Section 6.5**.

Table 6-3: Aboriginal cultural heritage sites recorded by OzArk during the survey.

AHIMS ID	Site Name	Feature(s)	Survey Unit	Landform
42-5-0010	Koomaringa IF-01	Isolated find	2	Drainage line and banks
42-5-0011	Koomaringa IF-02	Isolated find	2	Slopes
42-5-0012	Koomaringa IF-03	Isolated find	6	Drainage line and banks
42-5-0013	Koomaringa OS-01	Artefact scatter	4	Drainage line and banks
42-5-0014	Koomaringa OS-02	Artefact scatter & PAD	4	Drainage line and banks
42-5-0016	Koomaringa OS-03	Artefact scatter	2	Drainage line and banks
42-5-0015	Koomaringa OS-04	Artefact scatter	Outside study area	Drainage line and banks
42-5-0026	Koomaringa OS-05	Artefact scatter & PAD	Outside study area	Drainage line and banks & flats and gentle slope
42-5-0027	Koomaringa OS-06	Artefact scatter & PAD	4	Drainage line and banks
42-5-0028	Koomaringa OS-07	Artefact scatter & PAD	4	Drainage line and banks
42-5-0017	Koomaringa OS-08	Artefact scatter & PAD	Outside study area	Drainage line and banks & flats and gentle slope
42-5-0018	Koomaringa OS-09	Artefact scatter	4	Drainage line and banks
42-5-0019	Koomaringa OS-10	Artefact scatter & PAD	Outside study area	Drainage line and banks & flats and gentle slope
42-5-0020	Koomaringa OS-11	Artefact scatter	5	Drainage line & slopes
42-5-0021	Koomaringa OS-12	Artefact Scatter	1	Slopes
42-5-0022	Koomaringa OS-13	Artefact scatter	6	Slopes
42-5-0023	Koomaringa PL-01	Procurement location (quarried felsite bedrock)	Outside study area	Drainage line and banks
42-5-0025	Koomaringa PL-02	Procurement location (quarried felsite bedrock)	Outside study area	Slopes
42-5-0024	Koomaringa ST-01	Scarred tree	Outside study area	Slopes

Figure 6-3: OzArk recorded site locations and landforms.



Koomaringa IF-01 (42-5-0010)

Site Type: Isolated find

GPS Coordinates: 415541 E / 6260025 N

Location of Site: The site is located northwest of a small drainage line inside the Koomaringa AP. It is located at the base of a slope declining west towards the drainage line (**Figure 6-3**). It is approximately 460 m east of the WRQ site office.

Description of Site: The site is situated between the base of a slope with basalt scree to the west and a small drainage line to the east (**Figure 6-5**). The artefact is located along a narrow animal track with moderate visibility (**Figure 6-4**). The site location is surrounded by native trees, dead branches, leaf litter and short dry grasses. The soil is red/brown loam with some gravels present. The site consists of a single proximal flake made from white felsite. It is 32 mm in length, 35 mm in width and 10 mm thickness. The artefact has retouch along the right lateral margin. There is little potential for *in situ* subsurface deposits at the site location.

Figure 6-4: Koomaringa IF-01. View of site and recorded artefact.

1. View south of Koomaringa IF-01.

2. Artefact at Koomaringa IF-01 (A23).

Figure 6-5: Koomaringa IF-01 & OS-03. Site map.

Koomaringa IF-02 (42-5-0011)

Site Type: Isolated find

GPS Coordinates: 415597 E / 6260579 N

Location of Site: The site is located 20 m east of an access track of the WRQ. The site is located on the lower slope declining south towards north (**Figure 6-3**, **Figure 6-7**). The site is approximately 730 m northeast of the WRQ site office.

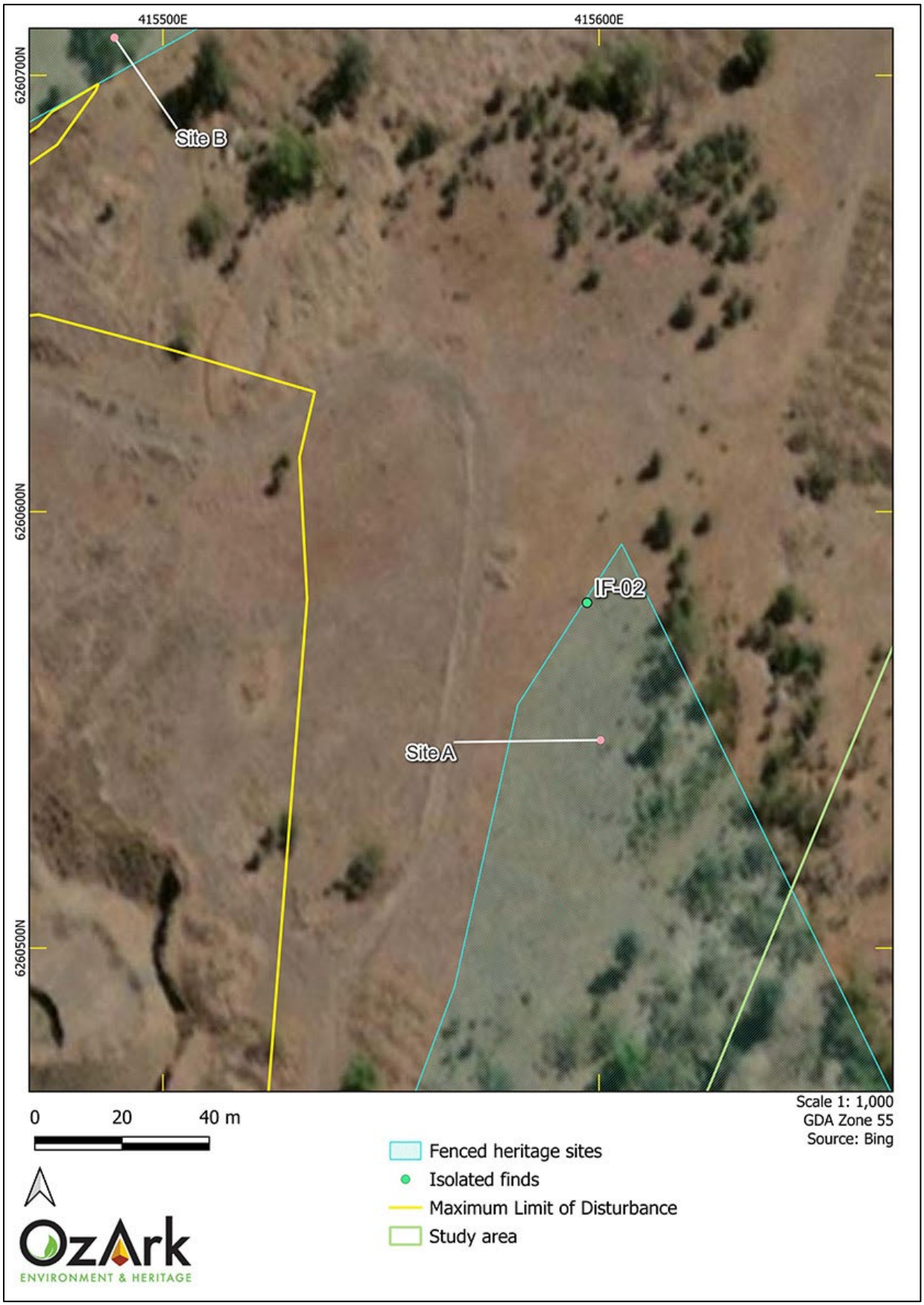
Description of Site: The site is located directly south of a stand of dead trees which have been ringbarked. The area is covered with short dead grasses and some medium sized basalt rocks. The site consists of single grey felsite core (**Figure 6-6**). The core is 81 mm in length, 70 mm in width and 75 mm in thickness. The bladelet core with eight flake scars is at a tertiary stage of reduction and is unidirectional. There is little potential for *in situ* subsurface deposits at the site location.

Figure 6-6: Koomaringa IF-02. View of site and recorded artefact.

1. View southeast of Koomaringa IF-02.

2. Artefact at Koomaringa IF-02 (A24).

Figure 6-7: Koomaringa IF-02. Site map.



Koomaringa IF-03 (42-5-0012)

Site Type: Isolated find

GPS Coordinates: 415166 E / 6259950 N

Location of Site: The site is located approximately 130 m southeast of the WRQ site office. It is located mid slope of a partially cleared area. The site is inside the Koomaringa AP (**Figure 6-3**; **Figure 6-9**).

Description of Site: The site is located mid slope of a cleared easement approximately 20 m wide. It is in an area of scalding on mid-brown loam surrounded by remnant native vegetation. The site consists of a single white felsite core at a secondary stage of reduction with approximately 40% cortex (**Figure 6-8**). The multidirectional core with nine flake scars is 50 mm in length, 50 mm in width, and 20 mm in thickness. The site is in a disturbed / secondary context. There is little potential for *in situ* subsurface deposits at the site location.

Figure 6-8: Koomaringa IF-03. View of site and recorded artefact.

1. View east of Koomaringa IF-03.

2. Artefact at Koomaringa IF-03 (A74).

Figure 6-9: Koomaringa IF-03 & OS-12. Site map.

Koomaringa OS-01 (42-5-0013)

Site Type: Artefact scatter

GPS Coordinates: 415688 E / 6260639 N (centroid)

Location of Site: The site is located along the eastern bank of drainage line and a pile of overburden located directly to the west. It is approximately 835 m northeast of the WRQ site office (**Figure 6-3**, **Figure 6-11**).

Description of Site: The site consists of an open surface scatter of artefacts. Detailed recording occurred for three of the artefacts (see **Appendix 6** for details). The site has a low density of artefacts with approximately 1–2 artefacts per 1 m^2. The soil at the site is a light brown/orange loam with basalt rocks and gravels of varying sizes present. The site extent is approximately 22 m by 10 m. The area of the site is cleared, except for some native vegetation growth, and trees close to the edge of the drainage line. There is a narrow animal track through the centre of the site (**Figure 6-10**). The visibility was moderate with patches of scalding amongst the dead grasses and weeds. There is little potential for *in situ* subsurface deposits at the site location.

Figure 6-10: Koomaringa OS-01. View of site and selection of recorded artefacts.

1. View south of Koomaringa OS-01.

2. Artefact from Koomaringa OS-01 (A42).

Figure 6-11: Koomaringa OS-01 & OS-10. Site map.

Koomaringa OS-02 (42-5-0014)

Site Type: Artefact scatter and PAD

GPS Coordinates: 415749 E / 6260802 N (centroid)

Location of Site: The site is located approximately 990 m northeast of the WRQ site office. It is located on the western bank of a drainage line and adjacent to the confluence of two drainage lines. The site is inside the Koomaringa AP (**Figure 6-3**; **Figure 6-13**).

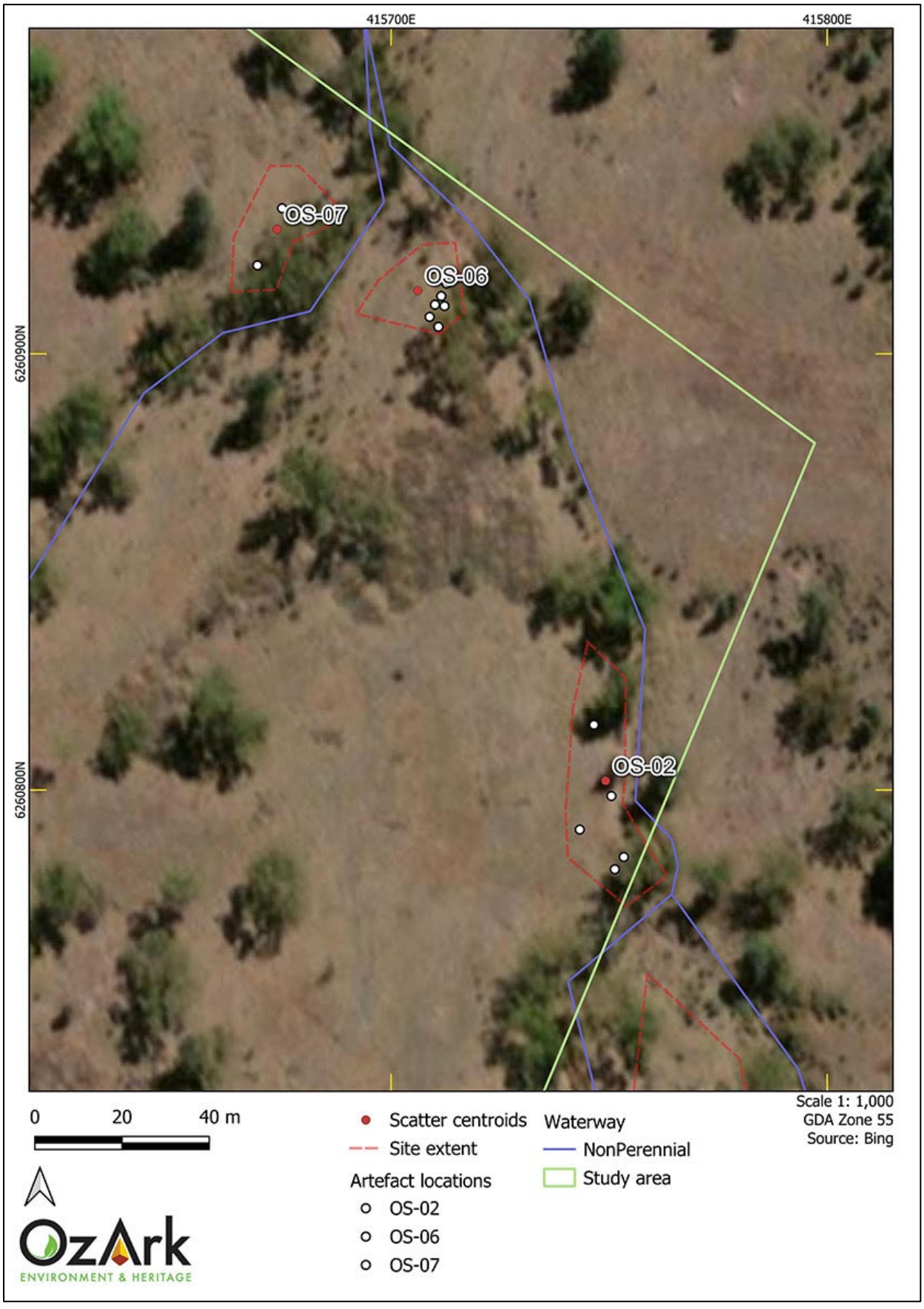
Description of Site: The site is located on the western bank of the drainage line. The area is flat and cleared of trees. There is moderate visibility with patches of scalding between short grasses and weeds. The visible surface artefacts extend approximately 60 m along the drainage line bank up to a width of 15 m (**Figure 6-13**). Five artefacts at the site were recorded in detail (see **Appendix 6** for details). The visible density of artefacts is low with approximately one artefact every 3 m^2. The soil at the site is a light brown loam (**Figure 6-12**). There is potential for intact subsurface deposits at the site.

Figure 6-12: Koomaringa OS-02. View of site and selection of recorded artefacts.

1. View north of Koomaringa OS-02.

2. Artefact from Koomaringa OS-02 (A36).

Figure 6-13: Koomaringa OS-02, OS-06 & OS-07. Site map.



Koomaringa OS-03 (42-5-0016)

Site Type: Artefact scatter

GPS Coordinates: 415492 E / 6259919 N (centroid)

Location of Site: The site is located approximately 420 m southeast of the WRQ site office. It is located on the eastern side of a minor drainage line. The site is inside the Koomaringa AP (**Figure 6-3**, **Figure 6-5**).

Description of Site: The site is located on the eastern side of a minor drainage line. The area is moderately sloping, declining towards the drainage line. There is a basalt scree slope 24 m south of the site extent (**Figure 6-14**). Thirteen artefacts were recorded in detail (see **Appendix 6** for details) and the site has an average density of one artefact per 4 m^2. The site extent is 82 m by 32 m. The soil at the site is light brown loam and the area has been cleared of trees. There is short patchy weeds and grasses.

Figure 6-14: Koomaringa OS-03. View of site and selection of recorded artefacts.

1. View southwest of Koomaringa OS-03.

2. Artefacts from Koomaringa OS-03 (A11–A15).

Koomaringa OS-04 (42-5-0015)

Site Type: Artefact scatter and PAD

GPS Coordinates: 415640 E / 6260394 N (centroid)

Location of Site: The site is located approximately 640 m northeast of the WRQ site office. It is located on the western bank of a drainage line. There is a basalt and felsite scree slope directly to the west (**Figure 6-3**; **Figure 6-16**).

Description of Site: The site is located on the western bank of a minor drainage line. There is an animal track along the western bank which cuts through the centre length of the site (**Figure 6-15**). The site extent is 133 m by a maximum of 34 m. Ten artefacts were recorded in detail (see **Appendix 6** for details), and five counts of artefacts within 0.5 m

by 0.5 m squares occurred. Overall, the site has a moderate to high density of artefacts present. Several higher density locations were counted with an average of 12 artefacts per 0.5 m^2. These higher density locations appeared to be workshop floors with flaked pieces (i.e. debitage) of varying sizes from the same coloured felsite. There is potential for intact subsurface deposits at this site, especially in the northern half of the site where there is a small open flat area.

Figure 6-15: Koomaringa OS-04. View of site and a recorded artefact.

1. View south of Koomaringa OS-04

2. Artefact from Koomaringa OS-04 (A80).

Figure 6-16: Koomaringa OS-04. Site map.

Koomaringa OS-05 (42-5-0026)

Site Type: Artefact scatter & PAD

GPS Coordinates: 415659 E / 6260988 N (centroid)

Location of Site: The site is located approximately 1 km northwest of the WRQ site office. It is situated to the western of a drainage line, and approximately 29 m east of an access track (**Figure 6-3**; **Figure 6-18**).

Description of Site: The site is located west of a drainage line. Artefacts are exposed along the edges of a drainage channel into the drainage line on the eastern side of the site (**Figure 6-17**). Six artefacts were recorded in detail (see **Appendix 6** for details). The exposure extent is 67 m by 27 m. The area is mostly cleared of vegetation and the GSV is generally low, with moderate visibility on the exposures caused by erosion. Soil at the site is a mid-brown loam. As the artefacts are eroding out of the edge of the channel, it is likely there are intact subsurface deposits surrounding the surface extent of the site.

Figure 6-17: Koomaringa OS-05. View of site and selection of recorded artefacts.

<table>
<tr><td> </td><td> </td></tr>
<tr><td>1. View southwest of Koomaringa OS-05.</td><td>2. Artefact from Koomaringa OS-05 (A54).</td></tr>
</table>

Figure 6-18: Koomaringa OS-05 & OS-08. Site map.

Koomaringa OS-06 (42-5-0027)

Site Type: Artefact scatter

GPS Coordinates: 415706 E / 6260914 N (centroid)

Location of Site: The site is located approximately 1 km northwest of the WRQ site office. It is located at the confluence of two drainage lines and approximately 130 m east of the access track (**Figure 6-3**; **Figure 6-13**).

Description of Site: The site is located at the confluence of two drainage lines. The site area is flat with some remnant vegetation surrounding the area. GSV was moderate, with a small animal track through the eastern half of the site, and an old fence line traversing through the centre. Eight artefacts were recorded in detail at the site (see **Appendix 6** for details), although a further five artefacts were observed on the eastern side of the fence. The soil at the site is brown/orange loam. The extent of site is 21 m by 22 m (**Figure 6-12**). Directly to the south of the site is large pile of overburden (**Figure 6-19**).

Figure 6-19: Koomaringa OS-06. View of site and selection of recorded artefacts.

1. View southwest of Koomaringa OS-06.

2. Artefacts from Koomaringa OS-06 (A28–A30).

Koomaringa OS-07 (42-5-0028)

Site Type: Artefact scatter and PAD

GPS Coordinates: 415673 E / 6260928 N (centroid)

Location of Site: The site is located approximately 1 km northwest of the WRQ site office. The side is located on the western bank of drainage line and approximately 93 m east of the access track (**Figure 6-3**; **Figure 6-13**).

Description of Site: The site is located on the western side of a drainage line. It consists of two artefacts located on a narrow animal trail where the soil is exposed (**Figure 6-20**). The extent of the site includes possible intact subsurface deposits and measures roughly

32 m by 20 m. Both artefacts are complete flakes, one at a secondary stage of reduction, the other at a tertiary stage of reduction. Both flakes had simple platforms and hinge terminations. The full artefact details are provided in **Appendix 6**.

Figure 6-20: Koomaringa OS-07. View of site and selection of recorded artefacts.

1. View south of Koomaringa OS-07.	2. Artefact from Koomaringa OS-07 (A45).

Koomaringa OS-08 (42-5-0017)

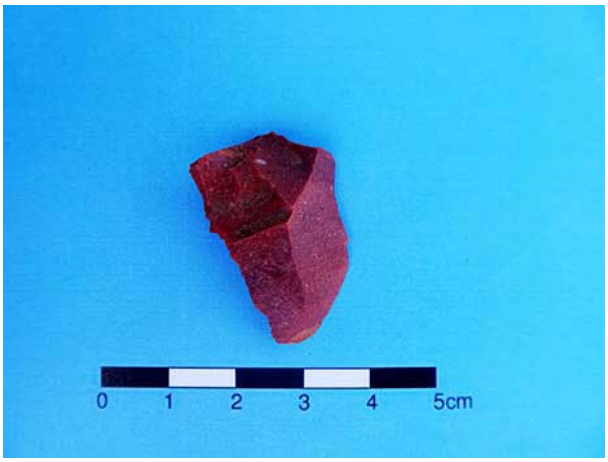
Site Type: Artefact scatter & PAD

GPS Coordinates: 415740 E / 6261095 N (centroid)

Location of Site: The site is located approximately 1.2 km northeast of the WRQ site office. It is located on the western bank of a drainage line and 85 m northeast of Koomaringa OS-07. The access track is 52 m west of the site extent (**Figure 6-3**; **Figure 6-18**).

Description of Site: The site consists of an artefact scatter eroding from the ground surface along a minor drainage channel which feeds into the drainage line along the eastern boundary of the site (**Figure 6-21**). The site extent is 55 m by 47 m and there is potential for intact subsurface deposits to be present at and around the site. The visibility within the exposures is moderate to high. Outside of the exposures the visibility low-moderate, with short grasses and weeds being prevalent. Four artefacts were recorded in detail (see **Appendix 6** for details). The site has an average density of one artefact per 1 m^2 on the exposures, which accounts for approximately half (840 m^2) of the overall 1650 m^2 extent of the site. There is potential for subsurface archaeological deposits within the surface scatter extent.

Figure 6-21: Koomaringa OS-08. View of site and selection of recorded artefacts.

	
1. View north of Koomaringa OS-08.	2. Artefact from Koomaringa OS-08 (A57).

Koomaringa OS-09 (42-5-0018)

Site Type: Artefact scatter

GPS Coordinates: 415564 E / 6260783 N (centroid)

Location of Site: The site is located approximately 870 m northeast of the WRQ site office. The site is located on the eastern bank of a drainage line and is approximately 100 m east of the access track (**Figure 6-3**; **Figure 6-23**).

Description of Site: The site is located on a narrow animal trail on the eastern side of a drainage line. There are several mature native trees at the southern extent of the site. The site consists of two artefacts: one complete flake and a flaked piece (**Figure 6-22**). The full details of the artefacts are provided in **Appendix 6**. The extent of the site is 9 m by 3 m. There are large piles of overburden approximately 20 m southeast of the site extent.

Figure 6-22: Koomaringa OS-09. View of site and selection of recorded artefacts.

1. View south of Koomaringa OS-09.	2. Artefact from Koomaringa OS-09 (A43).

Figure 6-23: Koomaringa OS-09. Site map.

Koomaringa OS-10 (42-5-0019)

Site Type: Artefact scatter and PAD

GPS Coordinates: 415770 E / 6260698 N (centroid)

Location of Site: The site is located on a flat area south of a confluence of drainage lines. The site is approximately 940 m northwest of the WRQ site office. Koomaringa OS-10 is approximately 18 m south of Koomaringa OS-02 and 52 m northeast of Koomaringa OS-01 (**Figure 6-3**; **Figure 6-11**).

Description of Site: The site consists predominately of PAD, with an exposure of surface artefacts along the western edge of the site extent. The site extent is 103 m by 62 m. Three artefacts were recorded in detail (see **Appendix 6** for details) and further flaked pieces of white/grey felsite were noted at an approximate density of three artefacts per 1 m^2 over the exposure (430 m^2) inside the site extent (**Figure 6-24**).

Figure 6-24: Koomaringa OS-10. View of site and selection of recorded artefacts.

1. View southeast of Koomaringa OS-10.

2. Artefacts from Koomaringa OS-10 (A94–A96).

Koomaringa OS-11 (42-5-0020)

Site Type: Artefact scatter

GPS Coordinates: 414784 E / 6260133 N (centroid)

Location of Site: The site is located partially inside the Koomaringa AP boundary. It is located approximately 250 m west of the WRQ site office. The site is located along the southern bank of a minor drainage channel. Koomaringa PL-01 is located 30 m northwest along the drainage line (**Figure 6-3**, **Figure 6-26**).

Description of Site: The site is located on the southern bank of a minor drainage channel near the central-south boarder of the Koomaringa AP. There is a moderate slope northwest to southeast following the drainage line across the site. Native vegetation

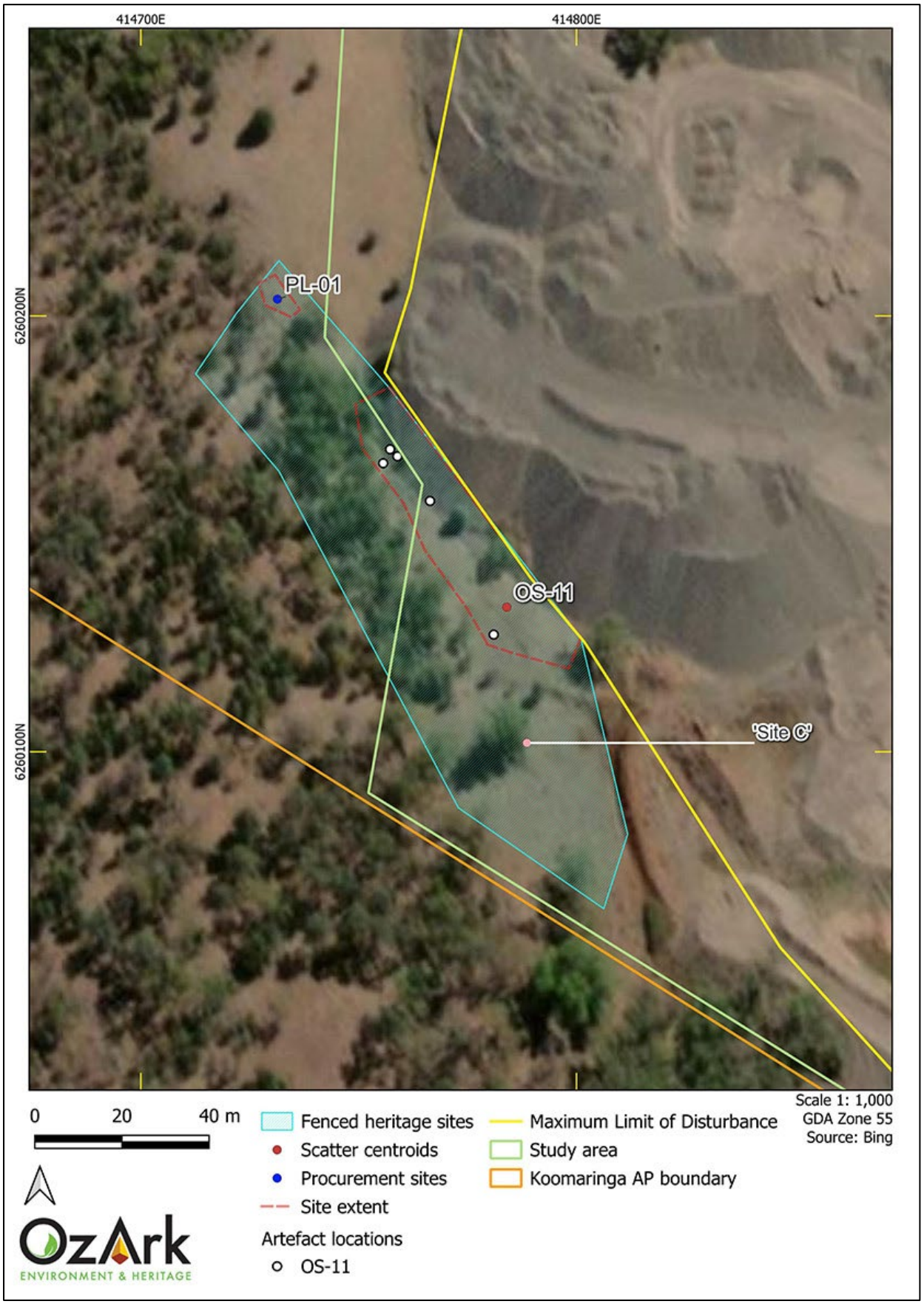
borders the site extent along its south-western edge, while there are large piles of overburden along the north-eastern extent of the site (**Figure 6-25**). The site consists of a surface scatter of artefacts which are in a secondary context. There has been ground disturbing works near the southern extent of the site with an artificial channel which the drainage line feeds into. The site extent is 130 m in length by 15 m. Ten artefacts were recorded in detail (see **Appendix 6**). The visibility was moderate, with exposures of soil and short grasses and weeds. The site is affected by water erosion.

Figure 6-25: Koomaringa OS-11. View of site and selection of recorded artefacts.

1. View northwest of Koomaringa OS-11.

2. Artefacts from Koomaringa OS-11 (A60–A62).

Figure 6-26: Koomaringa OS-11 & PL-01. Site map.



Koomaringa OS-12 (42-5-0021)

Site Type: Artefact scatter

GPS Coordinates: 415276 E / 6259956 N (centroid)

Location of Site: The site is located approximately 220 m southeast of the WRQ site office. The site is situated at the top of a slope which declines to west towards to the WRQ site office. It is 100 m east of Koomaringa IF-03 and 25 m west of the southern extent of Site A (**Figure 6-3**; **Figure 6-9**).

Description of Site: The site is located along an exposure at the top of a slope which declines west towards the WRQ site office. The site extent is 50 m by 20 m and consists of five artefacts recorded in a secondary context (**Figure 6-27**). There are large piles of overburden directly to the northeast of the site extent and grading and benching directly to the northwest. There are also felled trees and branches in piles along the eastern extent of the site. The soil at the site is light brown and thin. There are basalt gravels and naturally shattered felsite present. All the artefacts were recorded in detail (see **Appendix 6**).

Figure 6-27: Koomaringa OS-12. View of site and selection of recorded artefacts.

1. View southwest of Koomaringa OS-12.

2. Artefact from Koomaringa OS-12 (A75).

Koomaringa OS-13 (42-5-0022)

Site Type: Artefact scatter

GPS Coordinates: 415093 E / 6260388 N (centroid)

Location of Site: The site is located 305 m north of WRQ site office. It is located on a gentle slope overlooking the Area B open cut extraction location to the north. Site B is located 120 m north (**Figure 6-3**; **Figure 6-29**).

Description of Site: The site is located in a small gentle rise directly to the south of the open cut extraction known as Area B (Pearce 1987). The artefacts are in a secondary

context. The site extent is 29 m by 12 m. The site consists of two flakes, both recorded in detail (see **Appendix 6**). The visibility at the site is low–moderate with short grasses and weeds across the site. There is disturbance, a small channel, cut through the centre of the site extent. Basalt rocks are also present across the area (**Figure 6-28**).

Figure 6-28: Koomaringa OS-13. View of site and selection of recorded artefacts.

<table>
<tr><td> </td><td>
</td></tr>
<tr><td>1. View north of Koomaringa OS-13.</td><td>2. Artefact from Koomaringa OS-13 (A69).</td></tr>
</table>

Figure 6-29: Koomaringa OS-13. Site map.

Koomaringa PL-01 (42-5-0023)

Site Type: Procurement (quarrying) location

GPS Coordinates: 414729 E / 6260203 N

Location of Site: The site is located at the base of a minor drainage channel approximately 360 m northwest of the WRQ site office. The site is located close to the southern boundary of Koomaringa AP and 30 m northwest of Koomaringa OS-11 **Figure 6-3**, **Figure 6-26**).

Description of Site: The site consists of an outcrop of felsite exposed within a minor drainage channel. The felsite is predominately red/orange and tan in colour. There are two points on the bedrock which show signs of flake scars on protruding boulders of bedrock where large flakes have been removed (**Figure 6-30**). There are some broken angular fragments present around the bedrock in the drainage line, though none were noted to be diagnostic. Some of the bedrock exposure is physically weathered with large, flat pieces of felsite exfoliating from the flat surfaces.

Figure 6-30: Koomaringa PL-01. View of site and selection of recorded artefacts.

1. View northwest of Koomaringa PL-01.

2. Detail view of quarried bedrock with flake scars present.

Koomaringa PL-02 (42-5-0025)

Site Type: Procurement (quarrying) location

GPS Coordinates: 415812 E / 6260344 N

Location of Site: The site is located mid slope on the edge of small ridgeline between two drainage lines. The site is approximately 780 m northeast of the WRQ site office. There is a scree slope to the southeast and northeast of the site, and a rocky basalt knoll to the east (**Figure 6-3**; **Figure 6-32**).

Description of Site: The site consists of an outcrop of felsite located mid slope declining from a small ridgeline and scree slope southeast towards a drainage line in the northwest. The site has four small felsite boulders or bedrock eroding from the ground surface. Three of these outcrops show crushing along the top flat edge where they were used as an anvil and have large flake scars along several edges where quarrying has taken place (**Figure 6-31**). The felsite is predominately grey in colour with some tan present. The overall outcrop, and site extent, measures approximately 8 m in length by 5 m. Next to the outcrop, one large piece of felsite (a flake) was noted. No further debitage or angular fragments were observed, however, as the site is mid slope it is likely any were washed by water further down the slope or covered over in sediment. The soil at the site is a mid-brown loam with short grasses and weeds present.

Figure 6-31: Koomaringa PL-02. View of site and selection of recorded artefacts.

<table>
<tr><td> </td><td> </td></tr>
<tr><td>1. View southwest of Koomaringa PL-02.</td><td>2. Detail view of outcrop used as an anvil with flake scars around edge of outcrop.</td></tr>
</table>

Figure 6-32: Koomaringa PL-02. Site map.

Koomaringa ST-01 (42-5-0024)

Site Type: Scarred tree

GPS Coordinates: 415740 E / 6260533 N

Location of Site: The site is located on a lower slope to the east of a drainage line (**Figure 6-34**). It is approximately 800 m northeast of the WRQ site office. The site is 130 m south of Koomaringa OS-10, 110 m northeast of Koomaringa OS-04 and 200 m northwest of Koomaringa PL-02 (**Figure 6-3**; **Figure 6-34**).

Description of Site: The site consists of one scarred tree with a large scar. The scar measures 190 centimetres (cm) in length, 65 cm in width, and has 7 cm of regrowth present. The circumference of the scarred trunk is approximately 1.5 m. The scarred trunk is dead and hollow, though the other trunks surrounding the scarred trunk are alive and holding the scarred portion upright. The bimble box tree is approximately 20–30 m tall. The scar is facing southwest. There are at least two axe marks present in the top face of the canoe scar. There are two epicormic stems which have grown from below the canoe scar (**Figure 6-33**). The scarred trunk has also been ringbarked.

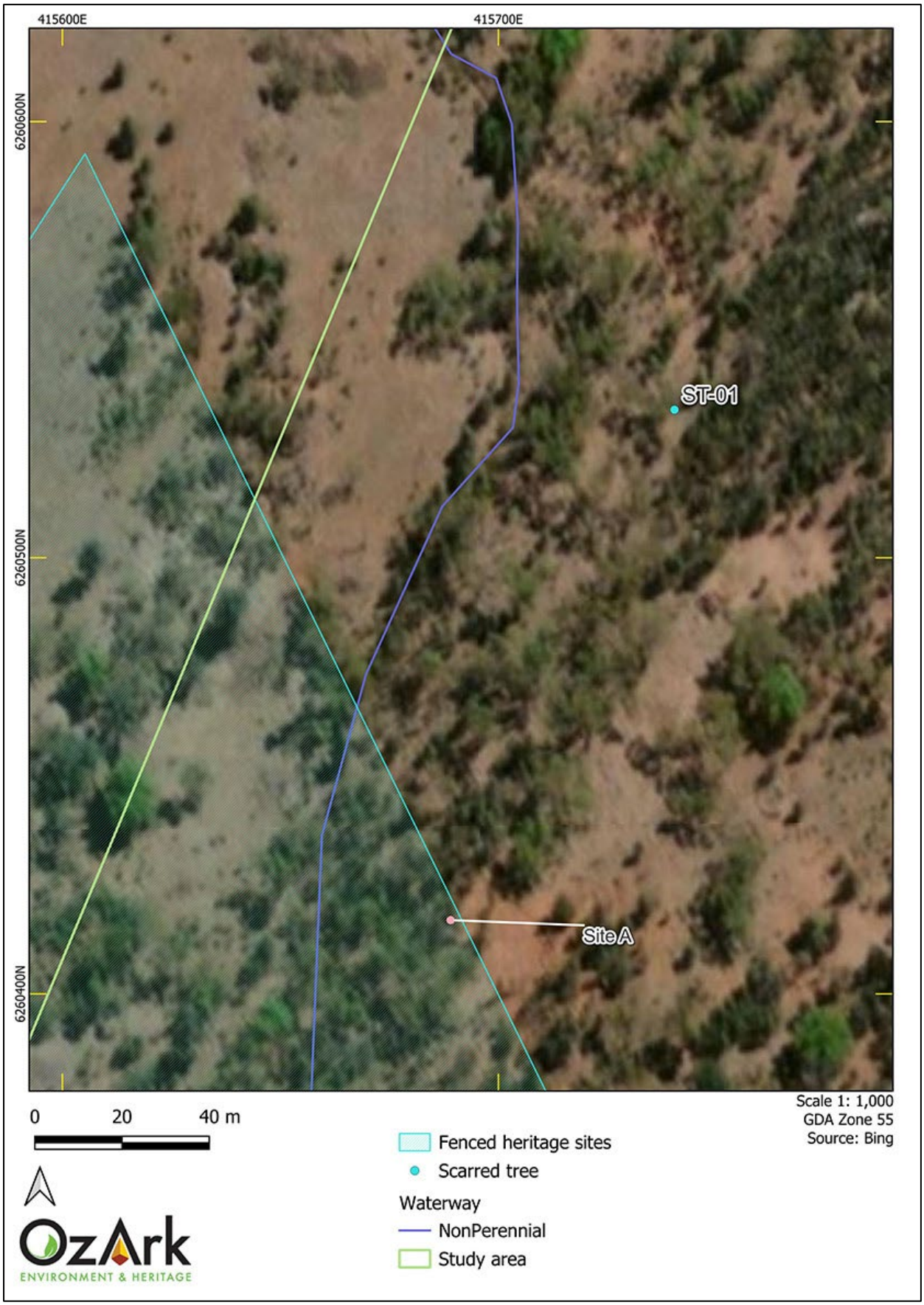
Figure 6-33: Koomaringa ST-01. View of site and selection of recorded artefacts.

1. View northeast of Koomaringa ST-01.

2. Detail view of axe marks on face of scar (circled in red).

3. View southeast of scar.	4. View northwest of scar.

Figure 6-34: Koomaringa ST-01. Site map.



6.5 PREVIOUSLY RECORDED ABORIGINAL SITES LOCATED

Two sites, Site A and Site B, as recorded by Witter (1987) and Byrne (1987), were located during the survey. The two sites were recorded and the information from the recent recording and previous recordings were combined. The details for each site are below:

Site A (42-5-0004)

Site Type: Procurement locations, artefacts, water hole / holder and potential grinding grooves

GPS Coordinates: 415536 E / 6260200 N (centroid)

Location of Site: Site A is located along the top of a small ridgeline running north–south through the south-eastern portion of the Koomaringa AP. Site A is directly west of the western edge of the existing extent of the WRQ, and is bounded along its eastern edge by a dirt vehicle track and along its western edge by a slope descending to a minor drainage line (**Figure 6-3**). The ridgeline narrows at the northern extent of the site, and there is a naturally shattered felsite scree slope present on the eastern boundary at the centre of the site extent.

Description of Site: The site consists of a series of a felsite outcrops along the ridgeline running north–south. These outcrops have been mapped previously by Byrne (1987, see **Section 1.2** and **Section 5.2**), though there was no distinction between outcrops used as procurement locations for felsite.

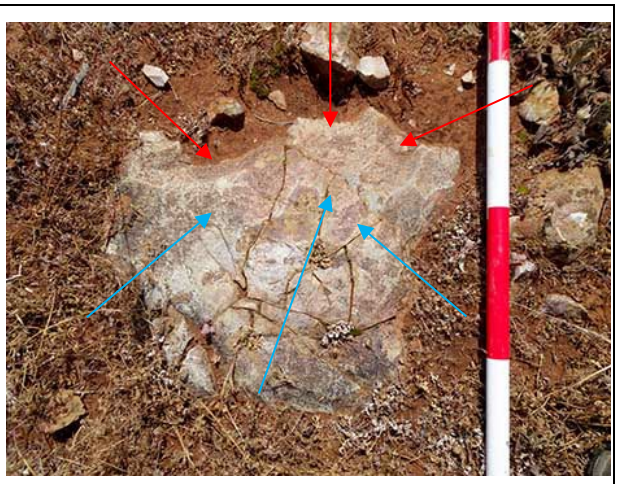
The current recording of Site A, as shown in **Figure 6-36**, differentiates between felsite outcrops which have been quarried, and those which did not show evidence of quarrying. In total, 31 separate felsite outcrops were recorded at Site A, with at least 14 outcrops showing evidence of having been used as procurement quarry locations. Evidence of procurement locations was determined by large flake scars and / or the presence of Hertzian cones in the felsite outcrops. Several areas at Site A had scatters of artefacts, including cores and flakes. The highest density of procurement locations and artefacts were at the southern extent of the site.

In addition, there is one location within Site A of potential grinding grooves, and a possible water hole / holder. Grinding groove 1 consists of two depressions on a felsite outcrop, which show deliberate flaking around the edges, and are deep enough to hold a small amount of water. The largest depression at grinding groove 1 is 30 cm by 30 cm in size and approximately 5 cm in depth. Grinding groove 2 consisted of a shallow depression, partially filled with soil. The edge which was visible is approximately 60 cm in length and the felsite bedrock had been shallowly flaked off and rubbed smooth. Both grinding groove locations were likely felsite procurement locations, which were then further modified to

create shallow depressions. The water hole / holder has an opening 35 cm by 25 cm and is 25 cm in depth. The edges of the water hole show impact fractures indicating that perhaps a natural feature that holds water, which has been modified and enlarged to function better. A selection of photographs detailing Site A and its various features is provided on **Figure 6-35**.

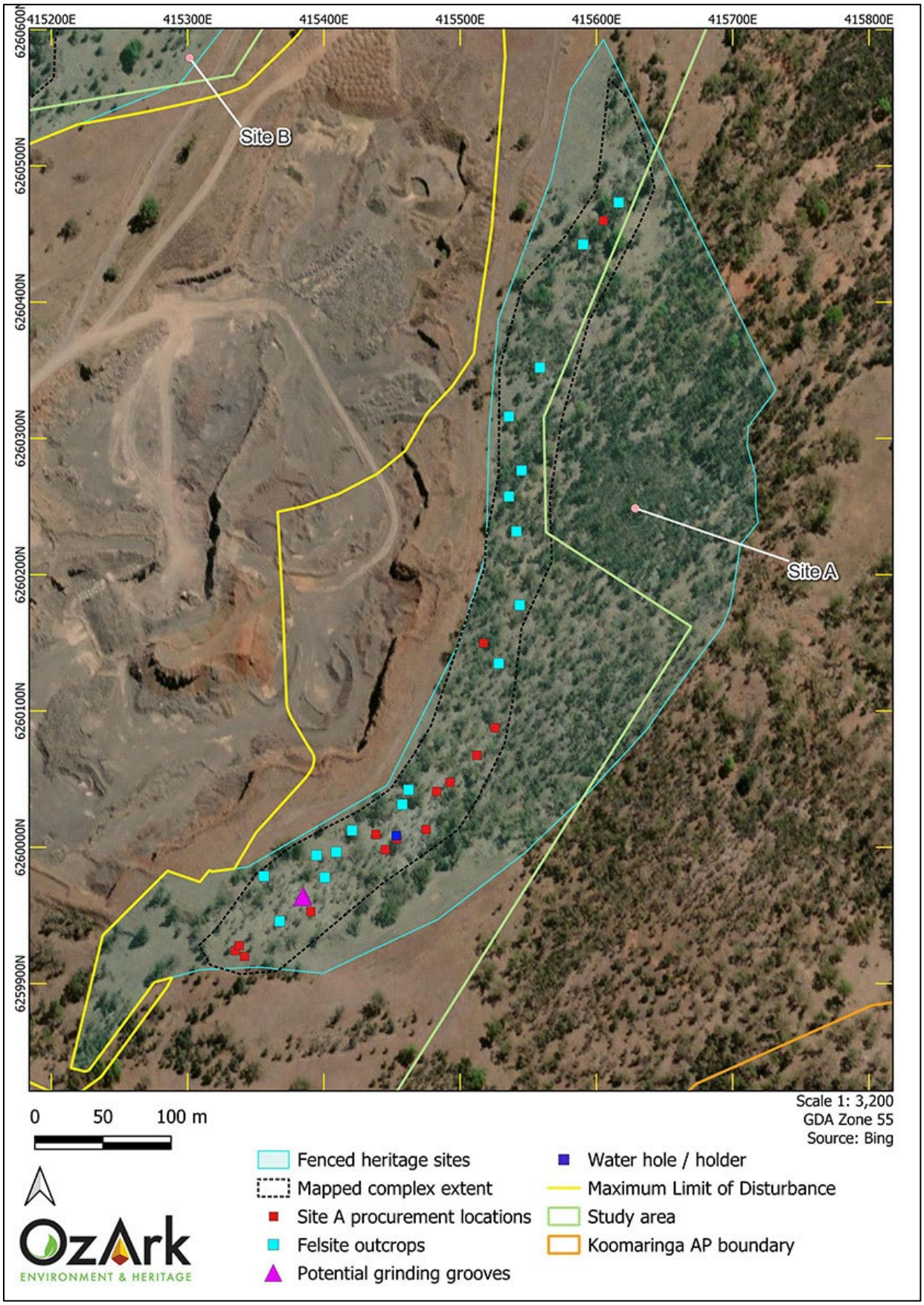
Overall, the extent of Site A covers an area of approximately 37,869 m² and measures 770 m in length north–south and is 65 m at its widest point east–west. Site A remains in good condition, and it is highly likely that further artefacts are present underneath leaf and branch litter at the site.

Figure 6-35: Site A. View of site, procurement locations and recorded artefacts.

<table>
<tr><td> </td><td>  </td></tr>
<tr><td>1. View west of procurement location in southern extent of Site A.</td><td>2. Detail of a procurement location at Site A. Note flake scars (red arrows) and impact points (blue arrows) on surface.</td></tr>
<tr><td> </td><td> </td></tr>
<tr><td>3. Detail of grinding groove 1 at Site A.</td><td>4. Detail of water hole / holder at Site A.</td></tr>
</table>

5. View south along centre ridge of Site A from near northern extent.	6. View of selected artefacts at Site A.

Figure 6-36: Site A. Site map.



Site B (42-5-0004)

Site Type: Procurement location, artefact scatter and water holes / holders

GPS Coordinates: 415272 E / 6260663 N (centroid)

Location of Site: Site B is in narrow drainage line to the northwest of the study area (**Figure 6-3**).

Site B extends along the northern and southern sides of a drainage line. It includes the drainage line itself as well as the bank and lower slopes along the north-western side of the drainage line, and the slopes and crest along the southern bank of the drainage line. The site extent includes three minor drainage tributaries which intersect with the main drainage line.

Description of Site: Site B consists of several features. The procurement locations are felsite bedrock eroding from the base of the drainage line channel. At least eight separate procurement locations were recorded. These are characterised by the presence of flake scars and Hertzian cones in the felsite outcrops. There are several areas adjacent to the drainage line where primary tool production took place, indicated by moderate to high density artefact scatters consisting of large cores, primary flakes, and debitage. These artefact areas are present as indicated in **Figure 6-38**. In addition, there are two water hole / holder locations, where slightly modified natural depressions in the felsite bedrock are present.

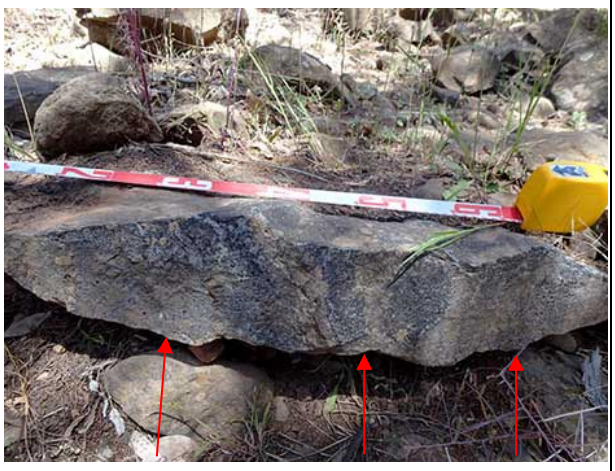
Site B extents further southeast than what has been demarcated in the field as the site extent. This includes an elevated flat area along the central south-eastern extent of the site where several scattered artefacts were recorded. The main area of Site B is at the centre of the site extent where most procurement locations are present, as well as the water holes / holders. A selection of photographs detailing Site B and its various features is provided in **Figure 6-37**.

Overall, the extent of Site B covers an area of approximately 25,000 m² and measures 530 m in length northeast–southwest and is 80 m at its widest point northwest–southeast. Site B remains in good condition, and it is highly likely that further artefacts are present underneath leaf and branch litter at the site.

Figure 6-37: Site B. View of site, procurement locations and recorded artefacts.

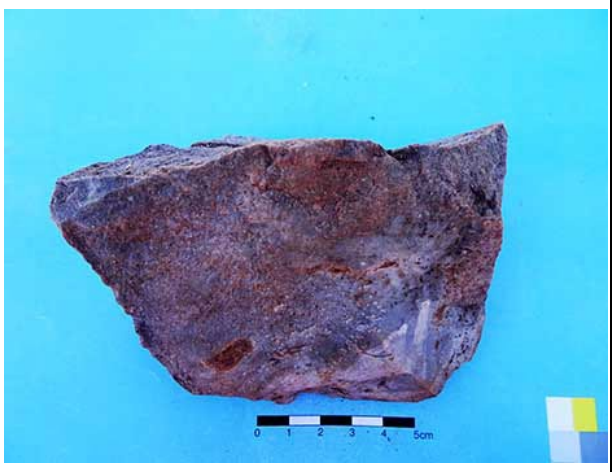
1. View southwest of Site B along the drainage line. Northern-most procurement location is 60 m southwest.

2. View southwest of felsite outcrops in the drainage line. Procurement locations are on the felsite outcrops.



3. Detail of a procurement location at Site B. Note flake scars (red arrows).

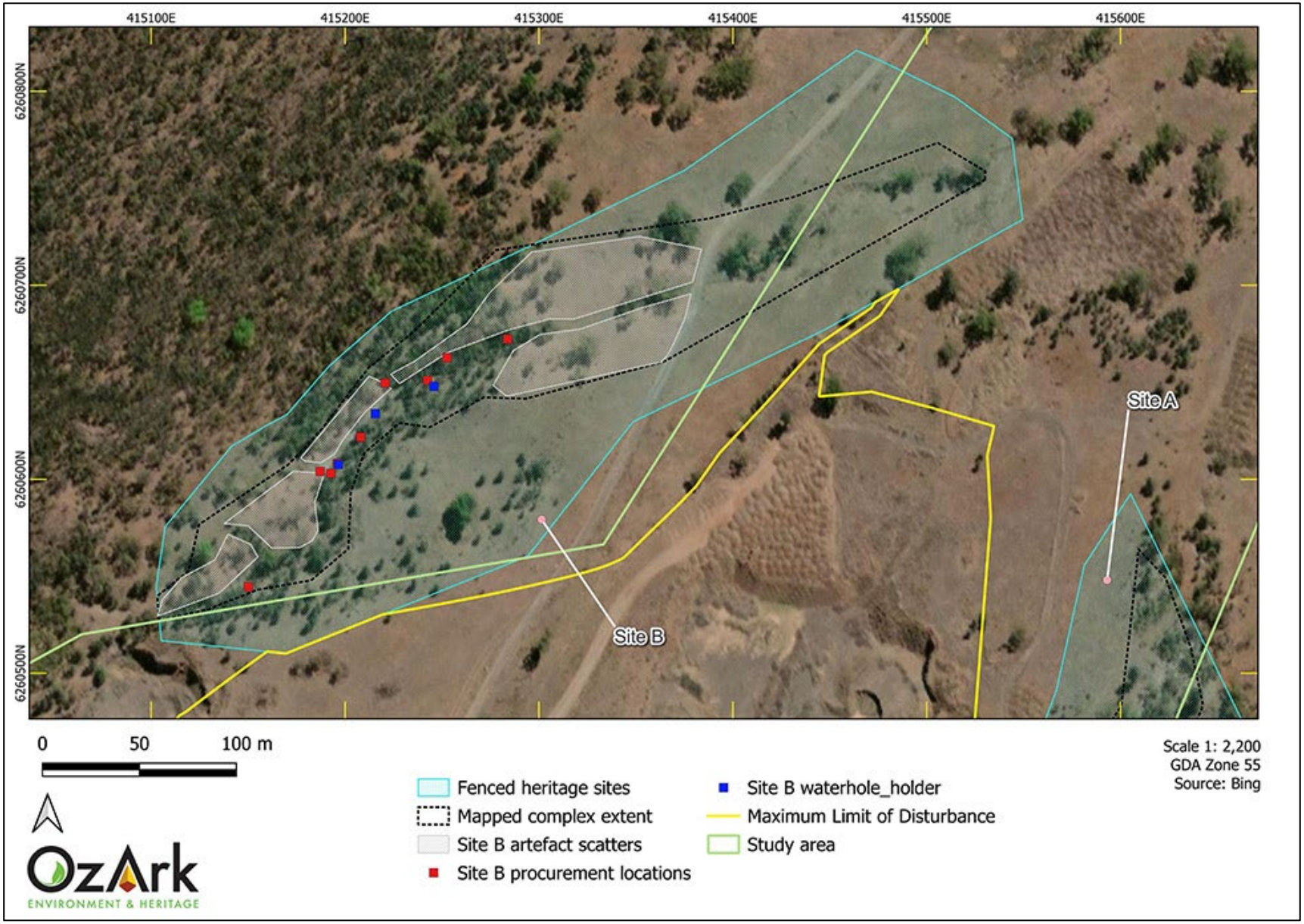
4. View southwest of southern-most procurement location at Site B.



5. Detail of large felsite core recorded at Site B (A74).

6. Detail of a large felsite core recorded at Site B (A75).

Figure 6-38: Site B. Site map.



6.6 SITES RECORDED IN 2023

In December 2023, RAPs recorded 14 sites within the Koomaringa AP during a site visit arranged by the Applicant.

The 14 sites registered on AHIMS by Mark Saddler were recorded at a time when OzArk was not present.

Based on information from the site cards, the location and description of the 2023 site recordings are detailed in **Table 6-4** and shown on **Figure 6-40**. The assessment of the significance of these sites is detailed in **Table 8-2** and **Section 8.3**.

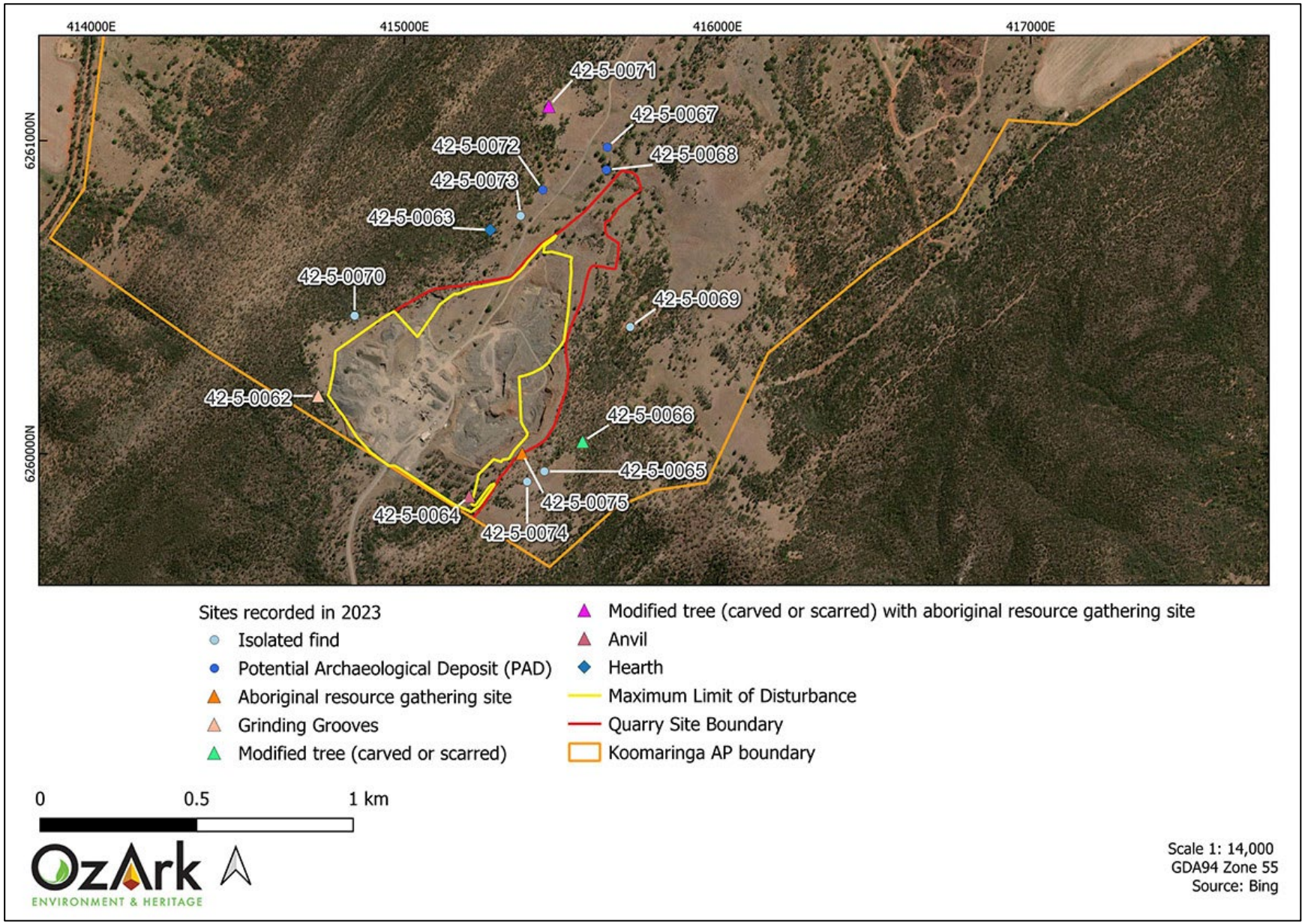
Table 6-4: Sites recorded in 2023.

Site ID	Site name	GDA Zone 55 East	GDA Zone 55 North	Site description
42-5-0062	Koomaringa Grind Groove 1 MS	414725	6260185	Single grinding groove
42-5-0063	Koomaringa Hearth 1	415274	6260715	Burnt clay nodules
42-5-0064	Koomaringa Anvil 1	415207	6259864	Single anvil
42-5-0065	Koomaringa Hammer Stone 1	415447	6259944	Broken hammer stone with pitting
42-5-0066	Koomaringa Scar 1	415569	6260039	Single scar in box tree
42-5-0067	Koomaringa PAD 2 MS	415648	6260979	PAD with visible artefacts
42-5-0068	Koomaringa PAD 1 MS	415645	6260907	PAD with visible artefacts
42-5-0069	Koomaringa Large White Core 1	415721	6260405	Core, potential manuport
42-5-0070	Koomaringa Anvil 22.12.23	414841	6260441	Single anvil
42-5-0071	Koomaringa Scar Tree 21.12.23	415461	6261110	Single scar in box tree
42-5-0072	Koomaringa PAD Site 21.12.23	415442	6260843	PAD with over 200 artefacts
42-5-0073	Koomaringa Large Core Stone 1	415371	6260760	Large core
42-5-0074	Koomaringa Axe Blank 1	415392	6259911	Axe blank
42-5-0075	Koomaringa Stock Plie 1	415376	6260001	Rock tool mound

One of these recordings, 42-5-0064 (Koomaringa Anvil 1) is within the maximum limit of disturbance. The site is described as '*Anvil still in ground*' with no further information apart from a photograph (**Figure 6-39**). From the photograph alone, it is difficult to determine whether the visible vesicles are natural or artificial, however, it is suspected that they are natural. Apart from the vesicles, there are no further features to suggest that the boulder has been used as an anvil.

Figure 6-39: View of 42-5-0064 taken from the site card.

Figure 6-40: Location of sites recorded in 2023.



7 DISCUSSION

7.1 DISCUSSION OF SURVEY RESULTS

7.1.1 Summary of survey results

- The site extents of previously recorded Site A and Site B were defined and mapped using GPS, including the extents bordering WRQ and the study area
- Three isolated finds, thirteen artefact scatters, two additional procurement locations, and one scarred tree were also recorded during the survey
- The two additional procurement locations consist of felsite outcrops situated mid-slope
- Of the thirteen artefact scatters recorded, six of the scatters have associated PAD. These sites are outside the existing footprint of WRQ and are near the main drainage line running north–south at the northern extent of WRQ
- Most artefacts recorded are felsite and consist predominately of flakes, debitage, and cores.
- Primary reduction of the quarried felsite occurred closer to the procurement locations at Site A, Site B, Koomaringa PL-01, and Koomaringa PL-02.

7.1.2 Discussion

The results of the survey indicate that further artefact scatters with PADs are likely to be located on flat or gentle slopes adjacent to the drainage lines in the general location of the study area. Sites such as Koomaringa OS-02, OS-05, OS-06, OS-07, OS-08, and OS-10 which have potential for subsurface archaeological deposits, indicate that occupation along the banks of the drainage lines is highly probable, even if such occupation would have been for relatively short periods of time, and likely only when the drainage lines held water. The presence of Koomaringa ST-01, a scarred tree, also indicates that the Koomaringa AP was used to procure resources apart from raw material for stone tool working.

The two additional procurement locations (PL-01 and PL-02) recorded during the survey show there are other locations of quarrying outside the site extents of Site A and Site B. Such locations were utilised for raw felsite material or were at least tested for stone quality.

Unsurprisingly, of the 96 artefacts recorded in detail, most are made from felsite (96%, n=92), and that the most frequently recorded artefact types sampled were flakes (46%, n=44), debitage (33%, n=32), and cores (17%, n=16). Only a few of the sampled artefacts were tools, such as side scrapers or showed signs of retouch (n=6). Primary reduction of the quarried felsite occurred closer to the procurement locations, as observed during the field survey and originally recorded by Bryce (see **Section 5.2**, **Table 5-1** and **Table 5-2**).

Based on the results of the survey, it is possible to extrapolate locations within Koomaringa AP which, when possible, should be prioritised for further survey. These locations include the banks of drainage lines which extend through the Koomaringa AP, as well as along the top of Scrubby Ridge. Furthermore, there were several sites recorded with PAD (Koomaringa OS-02, OS-05, OS-06, OS-07, OS-08 and OS-10) which could yield further information through archaeological excavation.

It is noted that during the RAP visit to the WRQ on 5 to 7 December 2023, that several further sites were recorded within the Koomaringa AP to the north and east of the WRQ (**Appendix 1 Figure 12**). These site recordings, subsequently registered with AHIMS, are mostly outside of the maximum limit of disturbance and the Quarry Site and will not be harmed by the proposal. One site, 42-5-0064 (Koomaringa Anvil 1) is within the maximum limit of disturbance. These recordings demonstrate that further sites within the Koomaringa AP and outside of the Quarry Site are highly likely to be present.

8 SIGNIFICANCE AND IMPACT ASSESSMENT

8.1 ASSESSMENT OF SIGNIFICANCE

8.1.1 Introduction

The appropriate management of cultural heritage items is usually determined based on their assessed significance, as well as the likely impacts of any proposed developments. Cultural, scientific, aesthetic, and historical significance are identified as baseline elements of significance assessment, and it is through the combination of these elements that the overall cultural heritage values of a site, place or area are resolved.

Social or Cultural Value

This area of assessment 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.

Archaeological/Scientific Value

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.

8.2 ASSESSED SIGNIFICANCE OF THE SITES RECORDED BY OZARK

Table 8-1 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.

A draft copy of this ACHAR was provided to RAPs for review on 08 October 2021. At the end of the consultation period, no further information regarding cultural values of the recorded sites was provided.

However, based on comments from site officers in the field, and because the sites are located inside Koomaringa AP, high social and cultural value has been assigned to all Aboriginal sites recorded during the assessment.

This is supported by community feedback from Wiradjuri stakeholders who volunteered their cultural values for the Koomaringa AP that includes the WRQ. The RAP's cultural values are reproduced in **Section 4.2.2** and indicate that the Koomaringa AP is a culturally significant place because of its stone resources, its natural heritage values, and as a meeting place for local Aboriginal people.

Archaeological/Scientific Value

The scientific significance of Koomaringa IF-01, IF-02, IF-03, OS-09, OS-10, OS-13 is assessed as low. These sites are described as having low scientific/archaeological significance based on the following values:

- Sites tend to represent artefacts in secondary contexts
- Low density of artefacts
- No associated archaeological deposits.

These sites have low scientific values because they have little or no research potential and a very limited ability to inform researchers about the nature and extent of Aboriginal occupation in the area. All sites are highly representative of other sites in the region.

The scientific significance of Koomaringa OS-01, OS-03, OS-06, OS-11, and OS-12 is assessed as low–moderate. These sites have low–moderate scientific values as they have little research potential and a limited ability to inform researchers about the nature and extent of Aboriginal occupation in the area. The sites are lower density surface artefact scatters with no or little likelihood of PAD and have limited variation in artefact types.

Koomaringa PL-01, PL-02 and ST-01 are assessed as having moderate scientific/archaeological values. Koomaringa PL-01 and PL-02 have been assessed as moderate scientific values as there are no associated archaeological deposits with the sites, and none or a limited density of artefacts are present. Both sites have been affected by water wash. However, the sites are procurement locations and show evidence of Aboriginal quarrying on a smaller scale than at Site A and Site B. Koomaringa ST-01 has been assessed as having moderate scientific values due to its rarity in the region of the study area. However, Koomaringa ST-01 does not have any associated archaeological deposits or additional features such as associated artefact scatters and therefore has limited research potential.

Koomaringa OS-02, OS-04, OS-05, OS-07, and OS-08 are assessed has having moderate–high scientific significance. This level of scientific/archaeological significance is based on the sites having higher density of artefacts present, a greater variety of artefact types, and the potential for associated archaeological deposits.

Aesthetic Value

Koomaringa IF-01, IF-02, IF-03, OS-01, OS-06, OS-09, OS-11, OS-12, OS-13, and PL-01 are assessed as having low aesthetic values. None of these Aboriginal sites have significant aesthetic value as the integrity of the sensory landscape has been altered in the recent past.

Koomaringa OS-02, OS-03, OS-04, OS-05, OS-07, OS-08, OS-10, ST-01, PL-02 are assessed as having moderate aesthetic values due to these sites being situated further away from quarrying

activities at WRQ. Further, the landscape at these sites has undergone minimal or no modifications.

Historic Value

None of the Aboriginal sites recorded have an apparent direct relationship to known historical Aboriginal sites (such as missions or massacre sites). To that end, all recorded sites are assessed as having no historic value. Please note that this determination is only based on archaeological and known historic evidence. The RAPs consider all Aboriginal sites to be historic and add to the collective anthropological information and story of their people whether its pre- or post-European contact.

Table 8-1: Aboriginal cultural heritage: significance assessment of sites recorded by OzArk.

AHIMS ID	Site Name	Social or Cultural Value	Archaeological / Scientific Value	Aesthetic Value	Historic Value
42-5-0010	Koomaringa IF-01	High	Low	Low	Low
42-5-0011	Koomaringa IF-02	High	Low	Low	Low
42-5-0012	Koomaringa IF-03	High	Low	Low	Low
42-5-0013	Koomaringa OS-01	High	Low–moderate	Low	Low
42-5-0014	Koomaringa OS-02	High	Moderate–high	Moderate	Low
42-5-0016	Koomaringa OS-03	High	Low–moderate	Moderate	Low
42-5-0015	Koomaringa OS-04	High	Moderate–high	Moderate	Low
42-5-0026	Koomaringa OS-05	High	Moderate–high	Moderate	Low
42-5-0027	Koomaringa OS-06	High	Low–moderate	Low	Low
42-5-0028	Koomaringa OS-07	High	Moderate–high	Moderate	Low
42-5-0017	Koomaringa OS-08	High	Moderate–high	Moderate	Low
42-5-0018	Koomaringa OS-09	High	Low	Low	Low
42-5-0019	Koomaringa OS-10	High	Low	Moderate	Low
42-5-0020	Koomaringa OS-11	High	Low–moderate	Low	Low
42-5-0021	Koomaringa OS-12	High	Low–moderate	Low	Low
42-5-0022	Koomaringa OS-13	High	Low	Low	Low
42-5-0023	Koomaringa PL-01	High	Moderate	Low	Low
42-5-0025	Koomaringa PL-02	High	Moderate	Moderate	Low
42-5-0024	Koomaringa ST-01	High	Moderate	Moderate	Low

8.3 ASSESSED SIGNIFICANCE OF SITES RECORDED IN 2023

During the site inspection undertaken by stakeholders in December 2023, the stakeholders identified and registered a further 14 sites on AHIMS: 42-5-0062 to 42-5-0075. The 14 sites were registered by RAP Mark Saddler at a time when OzArk were not present, and the assessment of their significance is based on the context of other sites in the area and any information on the site card.

Unfortunately, the site cards do not comment on the significance of the 14 recorded sites, although it is clear that they all hold high cultural value to the recorder and to the RAPs more

generally. The scientific significance of individual sites cannot be commented on as the sites have not been inspected by an archaeologist, however, in toto, these recordings, along with other previous recordings, clearly demonstrate that the Koomaringa AP has a high scientific significance as it contains a variety of sites that have high research potential. As such, all sites contribute to our understanding of the Aboriginal use of the area and are significant items within the broader cultural landscape. Similarly, the sites have moderate aesthetic significance as they are located within a significant cultural landscape that preserves the sensory elements of the sites, including sights and sounds, albeit with some impact from the agricultural use of the area. None of the sites, to OzArk's knowledge, have historic significance. As noted above, however, RAPs consider all Aboriginal sites to be historic and add to the collective anthropological information and story of their people whether its pre- or post-European contact.

Table 8-2: Aboriginal cultural heritage: significance assessment of sites recorded in 2023.

AHIMS ID	Site Name	Social or Cultural Value	Archaeological / Scientific Value	Aesthetic Value	Historic Value
42-5-0062	Koomaringa Grind Groove 1 MS	High	Contributory	Moderate	Low
42-5-0063	Koomaringa Hearth 1	High	Contributory	Moderate	Low
42-5-0064	Koomaringa Anvil 1	High	Contributory	Moderate	Low
42-5-0065	Koomaringa Hammer Stone 1	High	Contributory	Moderate	Low
42-5-0066	Koomaringa Scar 1	High	Contributory	Moderate	Low
42-5-0067	Koomaringa PAD 2 MS	High	Contributory	Moderate	Low
42-5-0068	Koomaringa PAD 1 MS	High	Contributory	Moderate	Low
42-5-0069	Koomaringa Large White Core 1	High	Contributory	Moderate	Low
42-5-0070	Koomaringa Anvil 22.12.23	High	Contributory	Moderate	Low
42-5-0071	Koomaringa Scar Tree 21.12.23	High	Contributory	Moderate	Low
42-5-0072	Koomaringa PAD Site 21.12.23	High	Contributory	Moderate	Low
42-5-0073	Koomaringa Large Core Stone 1	High	Contributory	Moderate	Low
42-5-0074	Koomaringa Axe Blank 1	High	Contributory	Moderate	Low
42-5-0075	Koomaringa Stock Plie 1	High	Contributory	Moderate	Low

8.4 AVOIDING AND MINIMISING HARM

8.4.1 Conserving significant Aboriginal cultural heritage

An object of the NPW Act is the '*conservation of objects places and features… of cultural value within the landscape, including… places, objects and features of significance to Aboriginal people*' (s.2A(1(b)(i)).

As heritage professionals, OzArk, strives for good conservation outcomes. In particular, OzArk is primarily concerned with the conservation and protection of Aboriginal cultural heritage that is of significance to Aboriginal people.

Two primary objectives when managing harm to an Aboriginal object are:

- Impacts to significant Aboriginal objects and places should always be avoided wherever possible
- Where impacts to Aboriginal objects and places cannot be avoided, proposals should be amended to reduce the extent and severity of impacts to significant Aboriginal objects and places through the use of reasonable and feasible measures.

The current assessment recorded 19 Aboriginal sites and located a previously recorded Aboriginal site, resulting in a total of 20 Aboriginal sites being recorded or investigated during the assessment. Of these 20 Aboriginal sites, all but two sites can be avoided by the proposal due to the Applicant electing to revise the maximum limit of disturbance to avoid most recorded Aboriginal sites.

Subsequently, a further 14 sites were recorded by RAPs in late 2023. All but one of these sites can be avoided by the proposal.

In total, there are 34 known sites within the Koomaringa AP (excluding the AHIMS registration of the AP itself). Of there, three sites are likely to be harmed by the proposal and 31 sites will remain in the landscape and be protected by already installed fencing, or by signage.

8.4.2 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. Regarding Aboriginal cultural heritage, ESD can be achieved by applying the principle of intergenerational equity and the precautionary principle.

8.4.2.1 Intergenerational equity

Intergenerational equity is the principle whereby the present generation should ensure the health, diversity, and productivity of the environment for the benefit of future generations.

In terms of Aboriginal heritage, intergenerational equity can be considered in terms of the cumulative impacts to Aboriginal objects and places in a region. If few Aboriginal objects and places remain in a region (for example, because of impacts under previous permits), fewer opportunities remain for future generations of Aboriginal people to enjoy the cultural benefits of those Aboriginal objects and places.

Information about the integrity, rarity or representativeness of the Aboriginal objects and places proposed to be impacted, and how they illustrate the occupation and use of land by Aboriginal people across the region, will be relevant to the consideration of intergenerational equity and the understanding of the cumulative impacts of the proposal.

Where there is uncertainty, the precautionary principle should also be followed.

8.4.2.2 The precautionary principle

The precautionary principle states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

In relation to Aboriginal cultural values, the precautionary principle should be guided by:

- Whether the proposal involves a risk of serious or irreversible damage to Aboriginal objects or places or to the value of those objects or places
- Whether there is uncertainty about the Aboriginal cultural heritage values or scientific or archaeological values, including in relation to the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted.

8.4.2.3 Principle of Integration

The Plan of Implementation of the World Summit on Sustainable Development held in Johannesburg, 2002, noted the need to "*promote the integration of the three components of sustainable development—economic development, social development and environmental protection—as interdependent and mutually reinforcing pillars*".

The principle of integration ensures mutual respect and reciprocity between economic and environmental considerations:

- Environmental considerations are to be integrated into economic and other development plans, programs, and projects
- Development needs are to be considered in applying environmental objectives.

8.4.2.4 Applicability to the proposal

The proposal adds to the cumulative impact on the region's Aboriginal cultural heritage as three sites, 42-5-0012 (Koomaringa IF-03), 42-5-0022 (Koomaringa OS-13), and 42-5-0064 (Koomaringa Anvil 1), will be harmed. However, the heritage impact value of this loss is low as these sites consist of an isolated find, a low-density artefact scatter in a secondary context, and a ballast boulder described as an 'anvil'. Furthermore, the other 31 Aboriginal sites, several with PAD, will not be harmed by the proposal. **Table 8-3** examines the application of ESD principles to the proposal.

Table 8-3: Application of ESD principles to the proposal.

ESD principle	Response
Avoiding and minimising harm	31 known Aboriginal sites will not be harmed by the proposal. The Applicant has elected to revise the maximum limit of disturbance to avoid Aboriginal sites which would have been impacted under original plans. Three Aboriginal sites, one isolated find 42-5-0012 (Koomaringa IF-03), one artefact scatter 42 5 0022 (Koomaringa OS-13), and one boulder described as an 'anvil' 42-5-0064 (Koomaringa Anvil 1) will be harmed by the proposal, however, these sites consist of a single artefact and a low-density scatter in secondary context with low

ESD principle	Response
	potential for *in situ* subsurface deposits, and a boulder of vesicular basalt described as an 'anvil'. The Applicant has permanently fenced Sites A, B and C to ensure that significant sites close to the maximum limit of disturbance are not harmed.
The integration principle	The proposal has sought to minimise environmental and heritage harm wherever possible. Two sites will be impacted by the proposal, though measures will be implemented to mitigate the loss of value associated with these sites.
The precautionary principle	The archaeological assessment has followed the precautionary principle through undertaking a robust impact assessment to ensure that harm to Aboriginal objects is minimised. The survey adopted a precautionary principle when it came to describing and assessing the archaeological potential of the landforms within the study area.
The intergenerational equity principle	The archaeological measures contained in this ACHAR are designed to mitigate the loss of inter-generational equity as much as possible. The results of the investigation and the undertakings of the Applicant have ensured that most of the recorded sites will be preserved and able to be appreciated by future generations. It is assessed that there is a minor diminution of the heritage values associated with the Koomaringa AP that is mitigated by several initiatives by the Applicant including fencing the most significant sites, providing tree screening, and facilitating site access for the Aboriginal community.

8.5 LIKELY IMPACTS TO ABORIGINAL HERITAGE FROM THE PROPOSAL

Table 8-4 presents a summary of potential impacts to Aboriginal cultural heritage associated with the proposal. Of the 20 Aboriginal sites recorded or located during the assessment and the 14 sites recorded by RAPs in December 2023, three sites are located inside the maximum limit of disturbance and may be impacted directly by the proposal (shaded blue in **Table 8-4**).

The remaining 31 sites are outside the maximum limit of disturbance and will not be impacted by the proposal.

Neither Site A or Site B are inside the maximum limit of disturbance or will be impacted by the proposed works. **Figure 8-1** shows the location of the sites in relation to the proposed works and **Figure 8-2** shows those sites that may be harmed by the proposal.

The maximum limit of disturbance is outside of the buffer demarcated by wooden stakes that were installed by the National Parks and Wildlife Service in 1987. The fencing undertaken by the Applicant in late 2023 to protect Sites A, B, and C includes a larger area than the area of the sites marked in 1987 by the National Parks and Wildlife Service and mapped in 2019 by OzArk (**Figure 8-3**). This fencing, as well as protecting Site A and Site B, also includes:

- Fencing for Site A includes Site A, Koomaringa IF-01, Koomaringa IF-02, Koomaringa OS-04, Koomaringa OS-12, Koomaringa Hammer Stone 1, Koomaringa Scar 1, Koomaringa Axe Blank 1, and Koomaringa Stock Plie (sic) 1
- Fencing for Site B includes Site B
- Fencing for Site C includes Koomaringa OS-11, Koomaringa PL-01, and Koomaringa Grind Groove 1 MS.

In addition, the cultural heritage values of Site A will be enhanced by the planting of a tree screen between Site A and the WRQ.

Table 8-4: Aboriginal cultural heritage: impact assessment.

AHIMS ID	Site Name	Type of Harm (Direct/Indirect / None)	Degree of Harm (Total/Partial / None)	Consequence of Harm (Total/Partial/No Loss of Value)
42-5-0010	Koomaringa IF-01	None	None	No loss of value
42-5-0011	Koomaringa IF-02	None	None	No loss of value
42-5-0012	Koomaringa IF-03	Direct	Total	Total
42-5-0013	Koomaringa OS-01	None	None	No loss of value
42-5-0014	Koomaringa OS-02	None	None	No loss of value
42-5-0016	Koomaringa OS-03	None	None	No loss of value
42-5-0015	Koomaringa OS-04	None	None	No loss of value
42-5-0026	Koomaringa OS-05	None	None	No loss of value
42-5-0027	Koomaringa OS-06	None	None	No loss of value
42-5-0028	Koomaringa OS-07	None	None	No loss of value
42-5-0017	Koomaringa OS-08	None	None	No loss of value
42-5-0018	Koomaringa OS-09	None	None	No loss of value
42-5-0019	Koomaringa OS-10	None	None	No loss of value
42-5-0020	Koomaringa OS-11	None	None	No loss of value
42-5-0021	Koomaringa OS-12	None	None	No loss of value
42-5-0022	Koomaringa OS-13	Direct	Total	Total
42-5-0023	Koomaringa PL-01	None	None	No loss of value
42-5-0025	Koomaringa PL-02	None	None	No loss of value
42-5-0024	Koomaringa ST-01	None	None	No loss of value
42-5-0004[4]	Site A/Site B	None	None	No loss of value
42-5-0062	Koomaringa Grind Groove 1 MS	None	None	No loss of value
42-5-0063	Koomaringa Hearth 1	None	None	No loss of value
42-5-0064	Koomaringa Anvil 1	Direct	Total	Total
42-5-0065	Koomaringa Hammer Stone 1	None	None	No loss of value
42-5-0066	Koomaringa Scar 1	None	None	No loss of value
42-5-0067	Koomaringa PAD 2 MS	None	None	No loss of value
42-5-0068	Koomaringa PAD 1 MS	None	None	No loss of value
42-5-0069	Koomaringa Large White Core 1	None	None	No loss of value
42-5-0070	Koomaringa Anvil 22.12.23	None	None	No loss of value
42-5-0071	Koomaringa Scar Tree 21.12.23	None	None	No loss of value
42-5-0072	Koomaringa PAD Site 21.12.23	None	None	No loss of value
42-5-0073	Koomaringa Large Core Stone 1	None	None	No loss of value
42-5-0074	Koomaringa Axe Blank 1	None	None	No loss of value

[4] Both Site A and Site B were registered as a single registration as AHIMS ID 42-5-0004.

AHIMS ID	Site Name	Type of Harm (Direct/Indirect / None)	Degree of Harm (Total/Partial / None)	Consequence of Harm (Total/Partial/No Loss of Value)
42-5-0075	Koomaringa Stock Plie 1	None	None	No loss of value

Figure 8-1: Recorded sites in relation to impacts from the proposal.

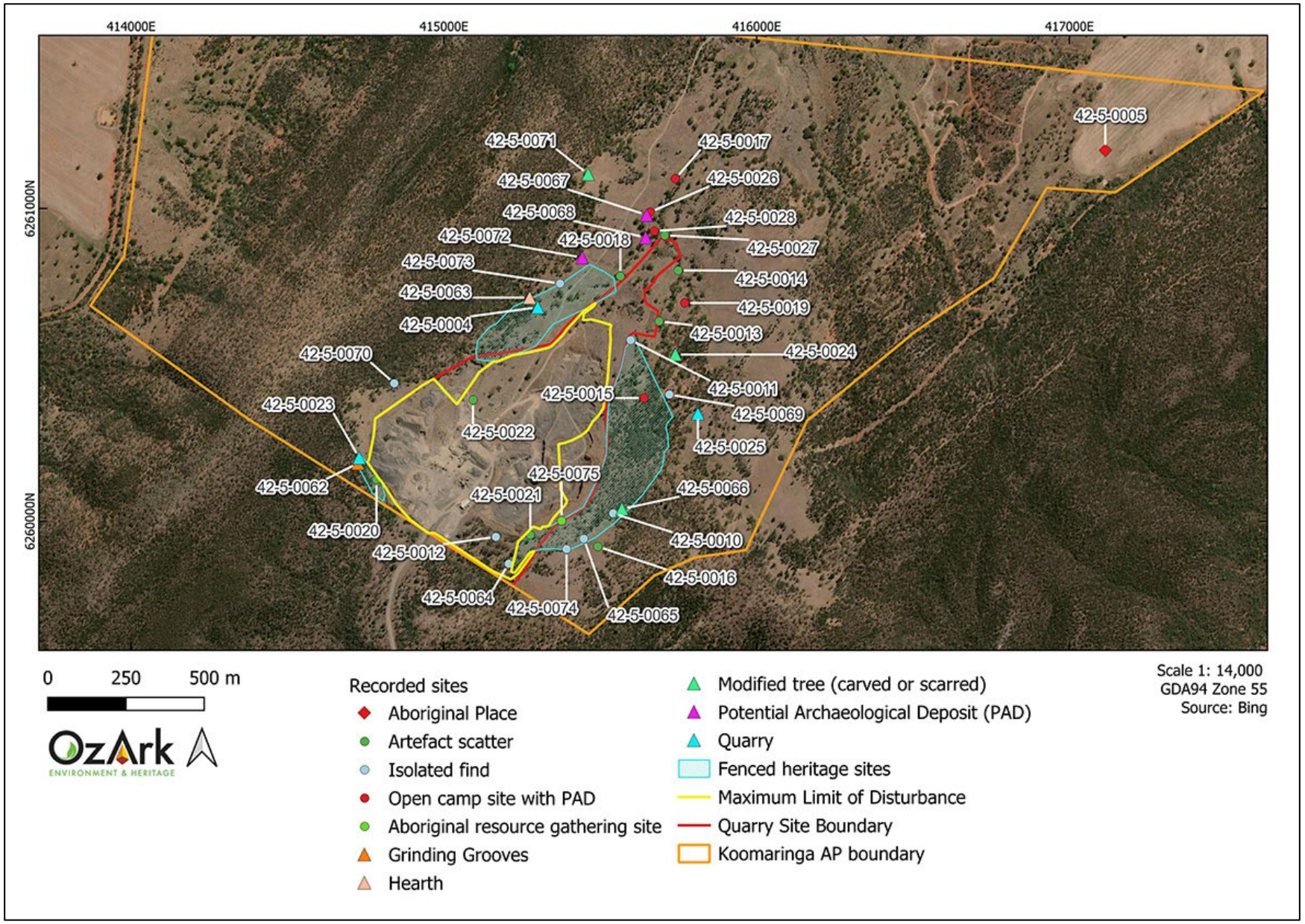


Figure 8-2: Sites that may be harmed by the proposal.

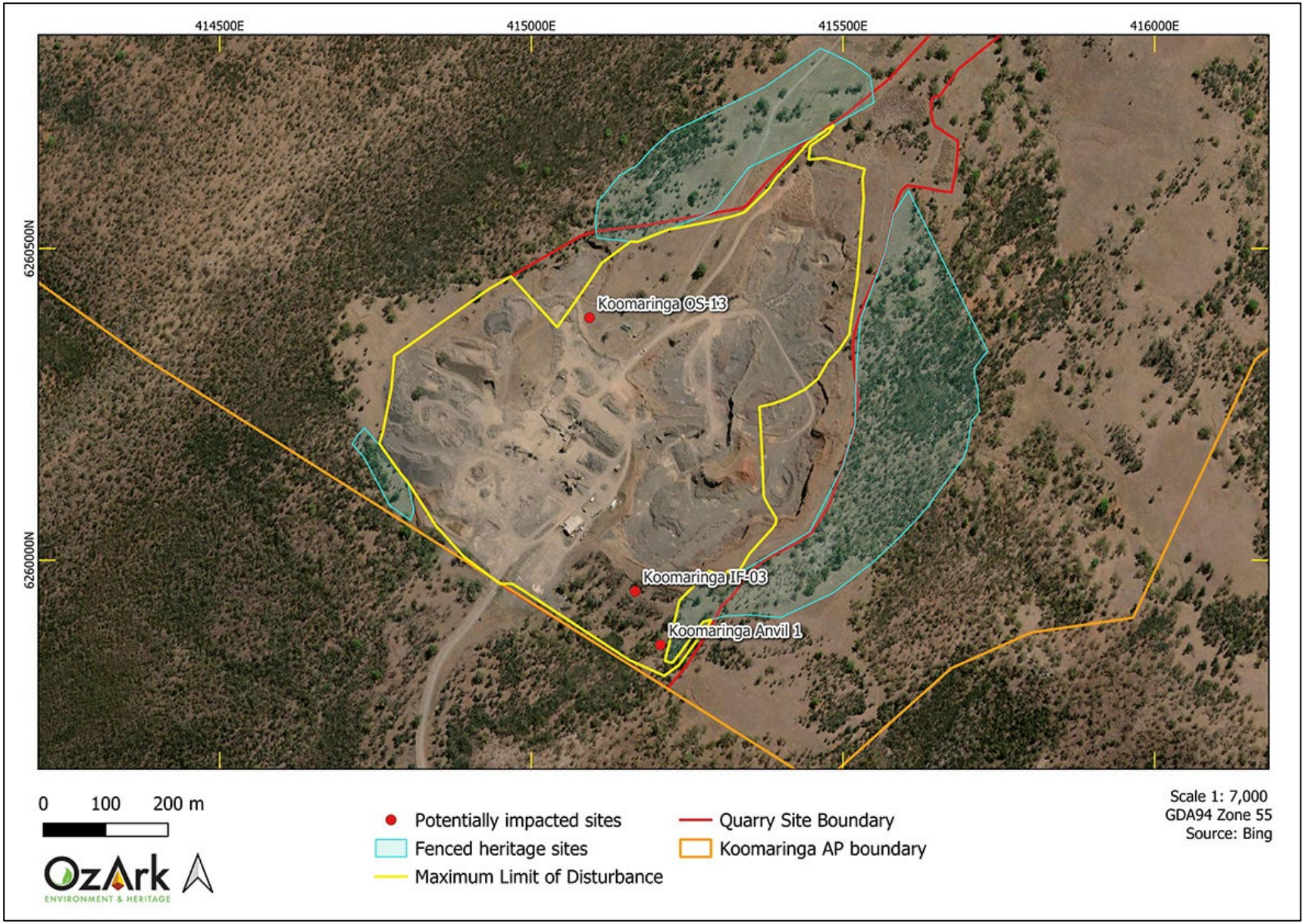


Figure 8-3: Map showing mapped site extents of Site A and Site B and the current protective fencing.

9 MANAGEMENT OF ABORIGINAL CULTURAL HERITAGE SITES

9.1 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 8.2** and **Section 8.5** 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 HNSW. Whether the AHIP is consented will depend on many factors including the site's assessed significance. This ACHAR will be required to accompany the AHIP application and normally the management recommendations contained in the ACHAR become conditions of the AHIP. As the Aboriginal community have been provided the opportunity to view the draft ACHAR, the ACHAR must make it clear that an AHIP application will be sought so that the Aboriginal community can assess the management recommendations with this knowledge. The AHIP conditions will often stipulate that the Aboriginal community should be involved in any salvage activities and will dictate what the fate of any salvaged Aboriginal objects will be.

9.2 MANAGEMENT AND MITIGATION OF RECORDED ABORIGINAL SITES

9.2.1 Mitigation of direct harm to the Koomaringa AP

A site visit by OzArk Principal Archaeologist, Ben Churcher, on 11 August 2023, identified that the wooden stakes installed by the National Parks and Wildlife Service in 1987 to mark the buffer for the culturally significant Site A and Site B remain in place, albeit often knocked over and/or decayed. This visit determined that the proposed maximum limit of disturbance is entirely outside of the demarcated buffer for Site A and Site B and that the proposal will not directly harm these sites or any land within the established 1987 buffer boundary (**Figure 8-3**). The buffer for Sites A and B (as well as so-called 'Site C', an amalgam of Koomaringa OS-11, Koomaringa PL-01, and Koomaringa Grind Groove 1 MS) have been fenced with the assistance of the RAPs.

Notwithstanding the conservation of most sites recorded during this assessment, as well as the culturally significant Site A and Site B, the proposal has the potential to diminish the Aboriginal cultural heritage values of the Koomaringa AP as three artefacts and a boulder of vesicular basalt described as an 'anvil' will be moved from their current location and placed at another location within the Koomaringa AP where they will not be harmed by the proposal (should an AHIP be approved).

To mitigate this diminution of cultural values and to enhance the overall cultural values of the Koomaringa AP, the Applicant will undertake the following initiatives:

1. The Applicant has re-fenced Sites A and B, as well as so-called 'Site C' (an amalgam of Koomaringa OS-11, Koomaringa PL-01, and Koomaringa Grind Groove 1 MS), to ensure that they are not harmed. The fencing was marked out during a three day site visit by three RAPs (Mark Saddler, James Ingram, Robert Carroll) from 5 to 7 December 2023 and increases the extent of the sites as assessed during the fieldwork in 2019 (**Figure 8-3**). The in situ fencing was again inspected by the same three RAPs during a three day site visit by the RAPs from 20 to 22 December 2023. At the end of this program, the RAPs indicated that they were satisfied that the fencing makes protection of the sites more secure. The new fencing includes the boundary pegs for Site A and Site B that were installed by the National Parks and Wildlife Service in 1987. The 1987 wooden pegs remained in place as determined by a site visit by OzArk Principal Archaeologist, Ben Churcher, on 11 August 2023 accompanied by staff from the WRQ. The location of the 1987 wooden stakes and the location of the new fencing is shown on **Figure 8-3**[5] (see also **Section 9.2.4**).

   The fenced locations of Sites A, B, and C will be marked as no-go zones on all applicable quarry plans as shown on **Figure 1-3**.

   It will be the responsibility of the Applicant to monitor site buffers at boundary of the WRQ operational areas on a regular basis and not less than every two years.

2. To assist with allowing safe access to the Koomaringa AP for the Aboriginal community, the Applicant will undertake to locate and form a gravelled carpark near the location shown on **Figure 9-1**.

3. To assist with allowing safe access to the Koomaringa AP for the Aboriginal community, the Applicant agrees to facilitate the following access protocol:

   - At least two business days prior to site visit:

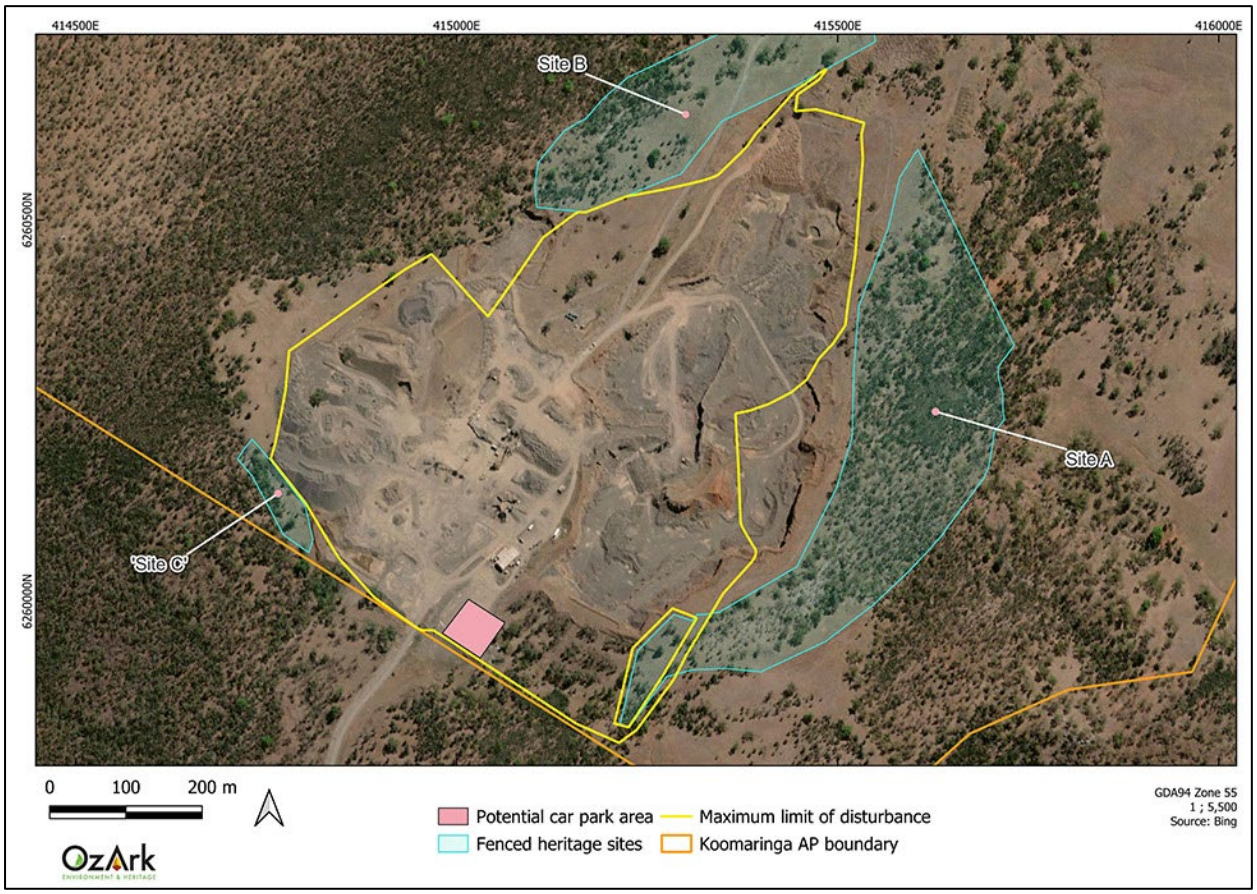
[5] The wooden stakes on the western side of Site A were mapped as shown on **Figure 9-1**. While there are in situ wooden stakes on the eastern side of Site B, these were not mapped due to reception issues with the Differential GPS being used. However, the line of wooden stakes at Site B is as shown on **Figure 9-1**.

- Call the Quarry Manager to arrange a suitable time to access site
- Provide contact details so the Quarry Manager can touch base if site activities or conditions change.

- Day of site visit:
  - Meet the Quarry Manager or delegate at the designated time at the site entrance on Munros Road
  - The Quarry Manager or delegate will provide escort to the designated parking area
  - The Quarry Manager or delegate will provide escort whilst on site to ensure the safety of visitor
  - At conclusion of the visit the Quarry Manager or delegate will provide escort back to the site entrance.

4. The Applicant will facilitate and fund the installation of a path, picnic shelter table and seats, and signage leading from the carpark to Site A. The location of these facilities will be on the advice of the Koomaringa Management Group (see Koomaringa AP Plan of Management) when it is formed and HNSW.
5. The decision to allow access to Site B will be taken by the Koomaringa Management Group who can decide on the location and form of any proposed access track. Until such times as the access track is installed, the Applicant will assist with the transport of people to Site B when required.
6. The Applicant will arrange a one-off face-to-face heritage induction for WRQ staff. The content of this induction will then be presented as a training package for later use. Both the face-to-face induction and the provision of a training package will be under an agreed contractual arrangement.

Figure 9-1: Aerial showing the potential location of a car park.



9.2.2 Management of indirect harm to the Koomaringa AP

The proposal has a low potential to indirectly harm the Koomaringa AP in terms of visual amenity and from the impact of periodic blasting. These factors are discussed below.

9.2.2.1 Visual amenity

To assess the visual amenity of the significant Site A and Site B, a series of photographs were taken to illustrate the current views from Site A and Site B (**Figure 9-2** and **Figure 9-3**). These photographs demonstrate that the current Quarry, as well as the proposed expansion, is only partially viewable from the more extensive Site A and is not easily viewed from Site B.

To improve the visual amenity of Site A, the Applicant will plant and maintain a tree screen of appropriate native species outside of the archaeological site buffer between Site A and the WRQ. This tree screen will help improve the visual amenity of Site A when looking towards the WRQ. The most appropriate tree species would be the following:

- Kurrajong (*Brachychiton populneus*)
- Black Cypress-pine (*Callitris endlicheri*)
- White Cypress-pine (*Callitris glaucophylla*)

- Dwyer's Red Gum (*Eucalyptus dwyeri*)
- Poplar Box (*Eucalyptus populnea*).

Most of these species have some traditional use by Aboriginal people, e.g. for food (particularly Kurrajong), tools, or resin to make glues etc. The addition of a local wattle like *Acacia deanei* will provide a good year-round source of seeds for native animal food.

Figure 9-2: Aerial showing the photo points taken from Site A and Site B.

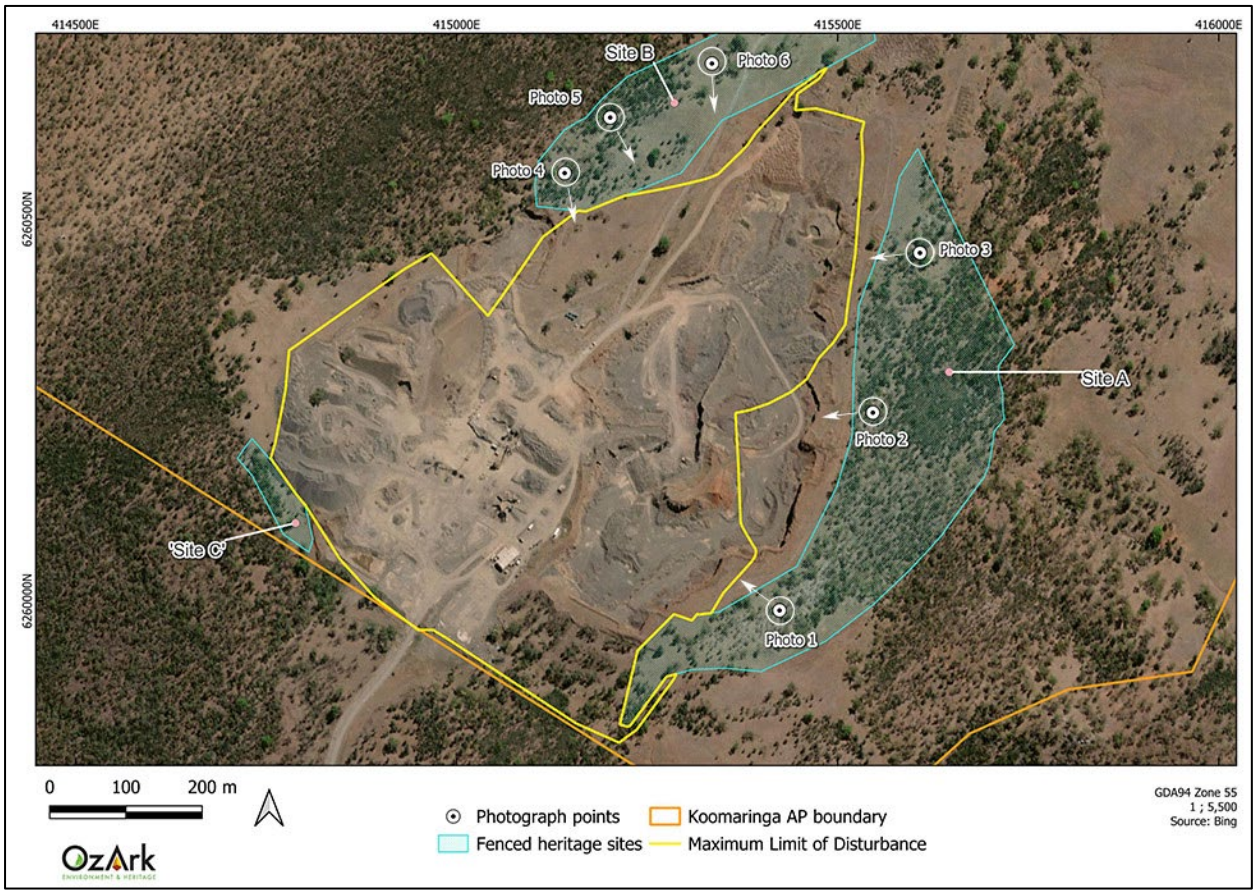


Figure 9-3: Views towards the WRQ from Site A and Site B.

	Photo point 1. View north-northwest from Site A.
	Photo point 2. View west from Site A.
	Photo point 3. View west from Site A.

	Photo point 4. View south-southeast from Site B.
	Photo point 5. View southeast from Site B.
	Photo point 6. View south-southeast from Site B.

9.2.2.2 Blasting impacts

Blasting operations at WRQ have been carried out since extraction operations commenced in 1987. The Applicant has developed a blasting method suited to the conditions at the Quarry Site. The existing blast schedule includes blasting at approximately bimonthly intervals; however, these intervals can be more frequent during periods of high product demand.

Overpressure and vibration levels from blasting are assessable against criteria proposed by the Australian and New Zealand Environment and Conservation Council (ANZECC) in their publication *"Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration – September 1990"*.

The noise and vibration impact assessment undertaken for the proposal predicted air blast overpressure and ground vibration levels would satisfy all ANZEC overpressure and vibration criteria at surrounding residences. The site inspection by OzArk Principal Archaeologist, Ben Churcher, on 11 August 2023, demonstrated that there is no evidence of blasting impacts on Site A and Site B from blasting associated with the current operations.

Notwithstanding, the drill and blast contractor would be required to monitor each blast in accordance with existing practices. If the criteria are exceeded, a further visual inspection would be undertaken of Site A and Site B to ensure there are no adverse impacts to Aboriginal cultural heritage values.

It is assessed that it is very unlikely that blasting associated with the proposal will detrimentally impact the rock slabs containing quarrying activities at Site A and Site B.

9.2.3 Management of Aboriginal sites within the maximum limit of disturbance

Three sites are located within the maximum limit of disturbance: 42-5-0022 (Koomaringa OS-13), 42-5-0012 (Koomaringa IF-03), and 42-5-0064 (Koomaringa Anvil 1) and will be appropriately managed as set out in **Section 9.2.3.1**.

9.2.3.1 Archaeological salvage

As three Aboriginal sites 42-5-0012 (Koomaringa IF-03), 42 5 0022 (Koomaringa OS-13), and 42-5-0064 (Koomaringa Anvil 1) could potentially be harmed by the proposal it is recommended that the sites be salvaged through the recording and collection of the surface artefacts and the relocation of the boulder of vesicular basalt described as an 'anvil', prior to any works proceeding. This recommendation is made due to:

- The cultural value of the sites and their importance to the Aboriginal community
- The nature of the impacted sites (an isolated find and one low-density artefact scatter located in secondary contexts, and a boulder described as an 'anvil')

- Being in landforms with previous disturbance from a range of factors including erosion and land use practices
- The low archaeological value assigned to 42-5-0012 (Koomaringa IF-03) and 42 5 0022 (Koomaringa OS-13) preclude more intensive archaeological investigations. 42-5-0064 (Koomaringa Anvil 1) has a contributory scientific value that will not be diminished by its relocation
- Sites such as these have a limited ability to further inform the community about the history and culture of the area. While any potential research questions are limited, some information can nevertheless be gained.

The archaeological salvage of 42-5-0012 (Koomaringa IF-03) and 42 5 0022 (Koomaringa OS-13) should include the following measures:

- All visible surface artefacts at a site should be flagged in the field
- The site should be photographed after flagging and before recording
- All artefacts should have the following artefact information recorded:
    - Location
    - Artefact class
    - Artefact type
    - Size
    - Reduction level
    - Raw material
    - Notes.
- A selection of indicative and / or unusual artefacts from each site will be photographed
- Once all recording is complete, the artefacts will be collected according to site with artefacts from each site being kept separate
- Should the collection team encounter a human burial, all work should cease in the area and advice from authorities and RAPs (should the remains be Aboriginal) sought
- The recording of the artefacts recovered will largely be completed in the field and this data would be incorporated into a report
- The salvaged artefacts should be relocated at an agreed upon location. This will take place in accordance with the input of RAPs. The location chosen for relocation will be an area where future developments will not occur and as close as possible to their original locations. A site card will be submitted to AHIMS to record the relocation positions and an Aboriginal Site Impact Recording Form (ASIRF) will be submitted by the archaeologist detailing the salvage process and results of the salvage.

The archaeological salvage of 42-5-0064 (Koomaringa Anvil 1) should include the following measures:

- As it is likely that 42-5-0064 (Koomaringa Anvil 1) is a detached boulder, it should be possible to safely move the boulder with the use of machinery
- RAPs must be consulted about the relocation and agreement on the method of relocation must be reached
- The salvaged boulder should be relocated at an agreed upon location. This will take place in accordance with the input of RAPs. The location chosen for relocation will be an area where future developments will not occur and as close as possible to its original location (the boulder is 13 m from the fenced enclosure for Site A). A site card will be submitted to AHIMS to record the relocation positions and an ASIRF will be submitted by the archaeologist detailing the salvage process and results of the salvage.

All three sites must be fenced until salvage under an approved AHIP is approved.

9.2.4 Management of Aboriginal sites outside the maximum limit of disturbance

Thirty-one Aboriginal sites that are detailed in this report are located outside the maximum limit of disturbance. Although these sites will not be impacted directly by the proposal, mitigation measures to avoid inadvertent impacts should be considered for the sites listed below:

- Site A and Site B. To continue to protect these sites from inadvertent impacts, new fencing has been installed by the Applicant with advice from the RAPs that increases the site extent to that mapped during the 2019 survey (**Figure 8-3**). The new fencing includes the boundary pegs for Site A and Site B that were installed by the National Parks and Wildlife Service in 1987. The 1987 wooden pegs remain in place as determined by a site visit by OzArk Principal Archaeologist, Ben Churcher, on 11 August 2023 accompanied by staff from the WRQ. In addition, so-called 'Site C', an amalgam of Koomaringa PL-01 (42-5-0023), Koomaringa OS-11 (42-5-0020), and 42-5-0062 (Koomaringa Grind Groove 1 MS), was also fenced. The Applicant will monitor the fenced site buffers of Sites A, B, and C on a regular basis and not less than every two years.
- As the newly installed fencing for Site A includes Site A, Koomaringa IF-01, Koomaringa IF-02, Koomaringa OS-04, Koomaringa OS-12, Koomaringa Hammer Stone 1, Koomaringa Scar 1, Koomaringa Axe Blank 1, and Koomaringa Stock Plie (sic) 1, and the fencing for Site C includes Koomaringa OS-11, Koomaringa PL-01, and Koomaringa Grind Groove 1 MS, there are an additional 19 sites located away from the maximum limit of disturbance that are not currently fenced (Koomaringa OS-01, OS-02, OS-3, OS-05, OS-06, OS-07, OS-8, OS-09, OS-10, PL-02, ST-01, Koomaringa Hearth 1, Koomaringa PAD 2 MS, Koomaringa PAD 1 MS, Koomaringa Large White Core 1, Koomaringa Anvil 22.12.23, Koomaringa Scar Tree 21.12.23, Koomaringa PAD Site 21.12.23, and Koomaringa Large Core Stone 1). To protect these sites from any inadvertent impacts during the life of the quarrying operations, it is recommended that two star pickets with a sign attached between them be installed at each site facing the most obvious direction of travel from the quarry area. The sign will identify the area as an 'environmental area' (not an Aboriginal site that may draw unwanted attention to it) and provide advice not to disturb

the area and a contact number of a responsible person at the Quarry to contact for further information (see **Figure 9-4**).

Figure 9-4: Example of signage.

	1. Example of potential signage.

9.2.5 Koomaringa Plan of Management

The heritage management protocols contained in the Koomaringa AP Plan of Management apply to any sites outside the WRQ. While the WRQ is within the Koomaringa AP, heritage management for sites within the WRQ will be managed under the WRQ development consent (DA2022/029).

In particular, the following list of management priorities are noted in the Koomaringa AP Plan of Management.

- Mapping used at the WRQ must reflect the registered curtilage of the Aboriginal Place, locations and extent of all tangible archaeological sites, and the boundary and extent of the approved WRQ. To protect Aboriginal sites from inadvertent harm from the WRQ, this information must be present on all applicable WRQ site plans and those areas where Aboriginal objects are known must be clearly delineated as no go zones.
- It is the responsibility of WRQ to organise a suitably qualified archaeologist and Wiradjuri stakeholders to undertake salvage of 42-5-0012 (Koomaringa IF-03), 42-5-0022 (Koomaringa OS-13), and 42-5-0064 (Koomaringa Anvil 1) under the authority of an approved AHIP (see also **Section 9.2.3.1**).
- A suitable buffer between site 42-5-0004 (Site A and Site B) and the WRQ operations has been demarcated with high visibility fencing. RAPs assisted in the correct placement of the demarcation during site visits from 5 to 7 December 2023 and again from 20 to 22 December 2023. The buffer must be periodically monitored to ensure that the demarcation remains clear (see also **Section 9.2.1**).
- Site signage at other known sites (Koomaringa OS-01, OS-02, OS-3, OS-05, OS-06, OS-07, OS-8, OS-09, OS-10, PL-02, ST-01, Koomaringa Hearth 1, Koomaringa PAD 2 MS, Koomaringa PAD 1 MS, Koomaringa Large White Core 1, Koomaringa Anvil 22.12.23, Koomaringa Scar Tree 21.12.23, Koomaringa PAD Site 21.12.23, and Koomaringa Large Core Stone 1) will be installed (see **Section 9.2.4**). The buffer should be periodically monitored to ensure that the demarcation remains clear. It is the responsibility of WRQ to organise a suitably qualified archaeologist and Wiradjuri stakeholders to establish the signage.
- It is the responsibility of WRQ or any other proponent of ground disturbing activity not approved in the WRQ development approval to engage a suitably qualified archaeologist and representatives of the Koomaringa Management Group to inform whether further archaeological assessment is required. Prior to the commencement of any vegetation clearing or earthworks, WRQ will commission a surveyor to survey and physically mark out the approved areas of disturbance using appropriately labelled and highly visible permanent survey markers such as yellow painted concrete posts. Survey markers would be positioned at the corners of key component areas and along boundaries at distances / spacing that allows visibility of the next marker. All personnel would be made aware of the approved areas of disturbance and the importance of not disturbing any area beyond the approved areas.

- WRQ will liaise with the Koomaringa Management Group to determine a suitable protocol for ongoing management of the sites, including monitoring and record keeping, to ensure sites are not harmed by ongoing activities or works at the WRQ.

10 AHIP APPLICATION DETAILS

The AHIP application area will include the 35 ha maximum limit of disturbance assessed as part of this ACHAR (see **Section 1.5**) (henceforth 'the AHIP area'). All ground disturbing impacts associated with the proposal will be contained within the AHIP area. The proposed term of the AHIP will cover 10 years from a proposed start date in 2024. There have been no other applications for AHIPs relating to the study area.

10.1 CADASTRAL DETAILS

Table 10-1 details the cadastral information specific to the AHIP area.

Table 10-1: Cadastral details for the AHIP area.

Information Requirement	Details
Street Address(es)	"Western Riverina Quarry", Koomaringa, Rankins Springs
Lot(s) / DP(s)	Lot 1 DP821515
LGA(s)	Carrathool Shire Local Government Area
Zone(s)	RU1 Primary Production
Parish(es)	Cooper and Melbergen South

10.2 AHIP AREA

The AHIP area includes those areas where all ground disturbing impacts associated with the proposal will be located. The Applicant will apply for approval to impact sites 42-5-0012 (Koomaringa IF-03), 42-5-0022 (Koomaringa OS-13), and 42-5-0064 (Koomaringa Anvil 1).

Figure 10-1 shows the AHIP area and **Table 10-2** provides GPS points demarcating the AHIP area. **Figure 10-2** shows the AHIP Area along with sites that may be harmed by the proposal, as well as the no-go fenced areas around Sites A, B, and C.

No further archaeological investigation is required at 42-5-0012 (Koomaringa IF-03) and 42-5-0022 (Koomaringa OS-13) as both sites are low-density artefact scatters or isolated flakes located in secondary contexts and without PAD (**Section 6.4**). A community collection of surface artefacts should take place at these sites. Following the collection, the sites will be listed as 'destroyed' on the AHIMS register and the collected artefacts will be moved outside the maximum limit of disturbance.

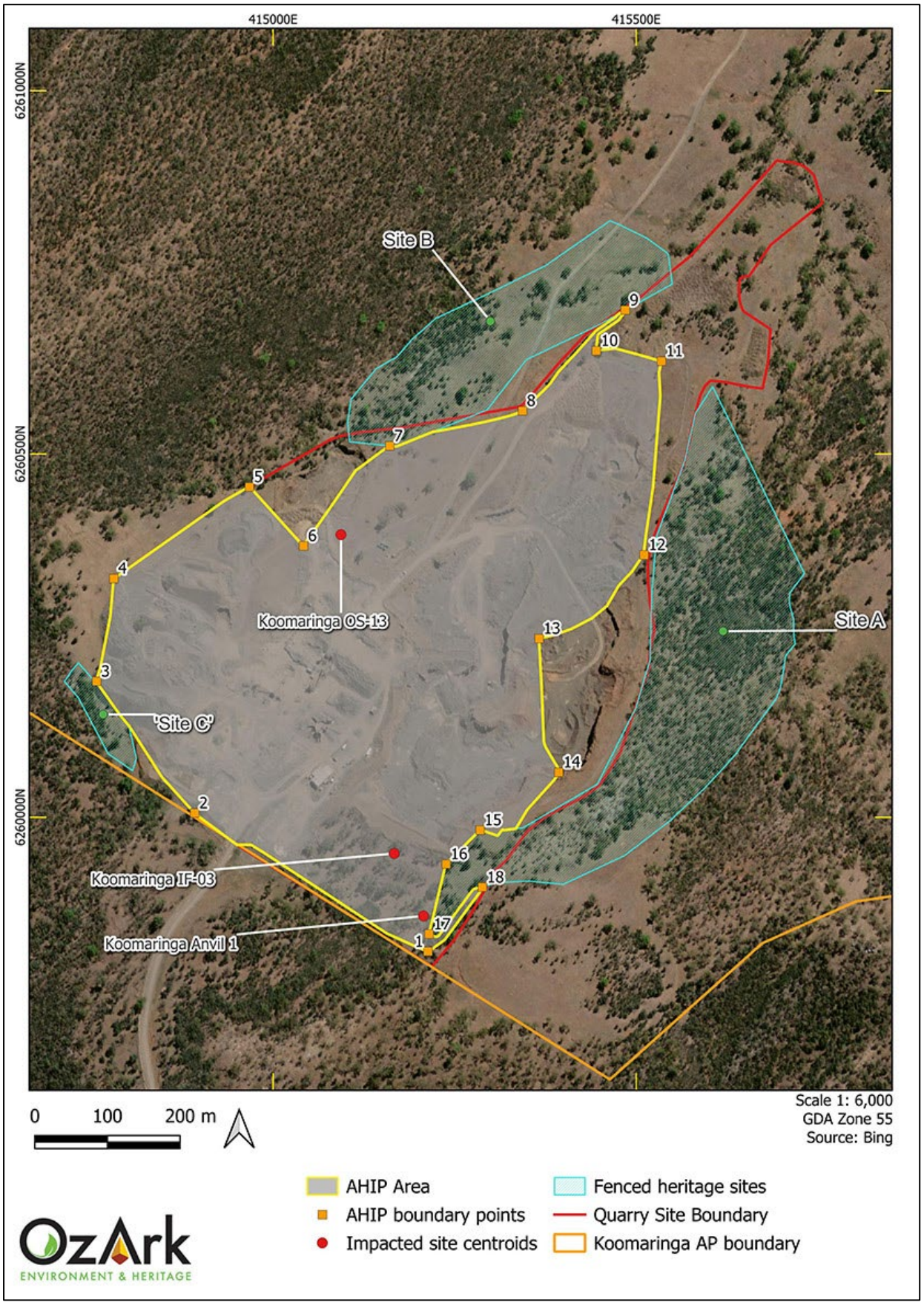
No further archaeological investigation is required at 42-5-0064 (Koomaringa Anvil 1) as the site consists of a vesicular basalt boulder described as an 'anvil'. Community consultation on the relocation of the boulder should take place. Following the relocation, the site will be listed as 'destroyed' on the AHIMS register and the boulder will be moved outside the maximum limit of disturbance.

Table 10-2: AHIP area boundary points.

AHIP area boundary points	GDA94 Zone 55 East	GDA94 Zone 55 North
1	415213	6259815
2	414892	6260006
3	414757	6260187
4	414781	6260329
5	414967	6260455
6	415042	6260373
7	415161	6260511
8	415343	6260559
9	415485	6260698
10	415445	6260642
11	415535	6260628
12	415511	6260361
13	415366	6260246
14	415393	6260062
15	415238	6259935
16	415285	6259982
17	415215	6259839
18	415288	6259904

Figure 10-1: The AHIP area.

Figure 10-2: The AHIP area with sites.



10.2.1 Movement only of certain Aboriginal objects

The surface artefacts recorded at 42-5-0012 (Koomaringa IF-03) and 42 5 0022 (Koomaringa OS-13) should be salvaged and relocated within the study area but outside of the AHIP area. The method for collecting the surface artefacts is outlined in **Section 9.2.3.1**.

The vesicular basalt boulder described as an 'anvil' registered as 42-5-0064 (Koomaringa Anvil 1) should be salvaged and relocated within the study area but outside of the AHIP area. The method for relocating the boulder is outlined in **Section 9.2.3.1**.

10.2.2 Treatment of objects from surface artefact collection

Depending on the community's wishes, the artefacts and the boulder should be relocated at an agreed upon location within the study area but outside of the AHIP area (maximum limit of disturbance). It is noted that RAP Robert Clegg suggested the artefacts be placed at the base of the scarred tree, Koomaringa ST-01 (**Section 4.2.2**). The boulder 42-5-0064 (Koomaringa Anvil 1) is 13 m from the fenced no-go area for Sita A and it would be appropriate to move the boulder to a point within the fenced Site A close to the original location for 42-5-0064 (Koomaringa Anvil 1).

The location/s will be discussed with RAPs during the AHIP enactment. Site card/s will also be submitted to AHIMS to record the relocation area/s.

10.2.3 Harm to certain Aboriginal objects through the proposed works

The harm to certain Aboriginal objects through the proposed works would apply to any stone artefacts not identified during the survey inside the AHIP area. Impact to these stone artefacts from the proposal would be authorised by the AHIP.

Further, should an AHIP be approved, and the Aboriginal objects moved to a place of safe-keeping, the Aboriginal cultural values of the Koomaringa AP will be diminished as three Aboriginal artefacts and a boulder described as an 'anvil' will be moved from their current location to another location within the Koomaringa AP.

10.2.4 Areas where Aboriginal objects will not be harmed

No harm will occur to any land within the fenced area for Sites A, B, and C established with the assistance of RAPs in December 2023 and fenced in 2023 with new high visibility fencing (see **Section 9.2.1** and **Figure 8-3**).

The heritage management protocols contained in the Koomaringa AP Plan of Management must be followed within the Koomaringa AP that includes the WRQ (see **Section 9.2.5**). Sites other than those listed in an approved AHIP must not be harmed within the Koomaringa AP.

10.2.5 Heritage contingency protocols for unanticipated finds

If unexpected Aboriginal features, such as a large number of stone artefacts or skeletal material, are encountered within the AHIP area that are not identified in this ACHAR, work must stop immediately, and the area be cordoned off with high visibility fencing. The AHIP holder must be notified of the situation as soon as possible and the following protocol followed.

1. If any Aboriginal object is discovered and/or harmed in, or under the land, while undertaking the proposed development activities (excluding human skeletal remains), the Applicant must:
    a. Not further harm the object
    b. Immediately cease all work at the particular location
    c. Secure the area to avoid further harm to the Aboriginal object
    d. Notify a suitably qualified archaeologist and the RAPs registered for the proposal
    e. With the assistance of the archaeologist and the RAPs, salvage the artefact under the terms of the AHIP by recording and collecting the artefact
    f. The salvaged artefact should be reburied along with the other artefacts recovered from the surface collection
    g. A brief addendum to this report should be written to record the find.
2. If Aboriginal burials are unexpectedly encountered during the activity, work must stop immediately, the area secured to prevent unauthorised access and NSW Police and HNSW contacted. It should be noted that an AHIP, should it be granted, will not allow harm to human skeletal material and that further investigation, as set out below, will be required.
    a. In the event of human skeletal material being uncovered, the Applicant must cooperate with the appropriate authorities and relevant Aboriginal community representatives to facilitate:
        i. The recording and assessment of the find(s)
        ii. The fulfilment of any legal constraints arising from the find(s), including complying with HNSW directions
        iii. The development and implementation of appropriate management strategies, including consultation with stakeholders and the assessment of the significance of the find(s).
    b. 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 HNSW (at a minimum with a variation to the AHIP).

Further details regarding the discovery of human skeletal material are provided in **Appendix 4**.

HISTORIC HERITAGE ASSESSMENT

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11 HISTORIC HERITAGE ASSESSMENT: INTRODUCTION

11.1 BRIEF DESCRIPTION OF THE PROPOSAL

Please refer to **Sections 1** and **2** for a description of the proposal and the environmental context of the study area.

11.2 RELEVANT LEGISLATION

11.2.1 State legislation

Environmental Planning and Assessment Act 1979 (EP&A Act)

Please refer to **Section 3.3.1** for a description of the EP&A Act.

Heritage Act 1977 (Heritage Act)

The *Heritage Act 1977* (Heritage Act) is applicable to the current assessment. This Act established the Heritage Council of NSW. The Heritage Council's role is to advise the government on the protection of heritage assets, make listing recommendations to the Minister in relation to the State Heritage Register (SHR), and assess/approve/decline proposals involving modification to heritage items or places listed on the SHR. Most proposals involving modification are assessed under Section 60 of the Heritage Act.

Automatic protection is afforded to 'relics', defined as 'any deposit or material evidence relating to the settlement of the area that comprised New South Wales, not being Aboriginal settlement, and which holds state or local significance' (note: formerly the Act protected any 'relic' that was more than 50 years old. Now the age determination has been dropped from the Act and relics are protected according to their heritage significance assessment rather than purely on their age). Excavation of land on which it is known or where there is reasonable cause to suspect that 'relics' will be exposed, moved, destroyed, discovered, or damaged is prohibited unless ordered under an excavation permit.

11.2.2 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Please refer to **Section 3.3.2** for a description of the EPBC Act.

11.2.3 Applicability to the proposal

The proposal will be assessed under Part 4 of the EP&A Act.

Any items of local or state historical heritage significance within the study area are afforded legislative protection under the Heritage 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 do not apply.

11.3 HISTORIC HERITAGE ASSESSMENT OBJECTIVES

The current assessment will apply the Heritage Council's *Historical Archaeology Code of Practice* (Heritage Council 2006) in the completion of a historical heritage assessment, including field investigations, to meet the following objectives:

Objective One: To identify whether historical heritage items or areas are, or are likely to be, present within the study area

Objective Two: To assess the significance of any recorded historical heritage items or areas

Objective Three: Determine whether the proposal is likely to cause harm to recorded historical heritage items or areas

Objective Four: Provide management recommendations and options for mitigating impacts.

11.4 DATE OF HISTORIC HERITAGE ASSESSMENT

The historic heritage assessment took place at the same time as the Aboriginal heritage assessment. Please refer to **Section 3.1** for the dates of the fieldwork.

11.5 OZARK INVOLVEMENT

The fieldwork and reporting of the historic heritage assessment are the same personnel involved with the Aboriginal heritage assessment. Please see **Section 3.2** for details.

12 HISTORIC HERITAGE ASSESSMENT: BACKGROUND

12.1 BRIEF HISTORY OF RANKINS SPRINGS

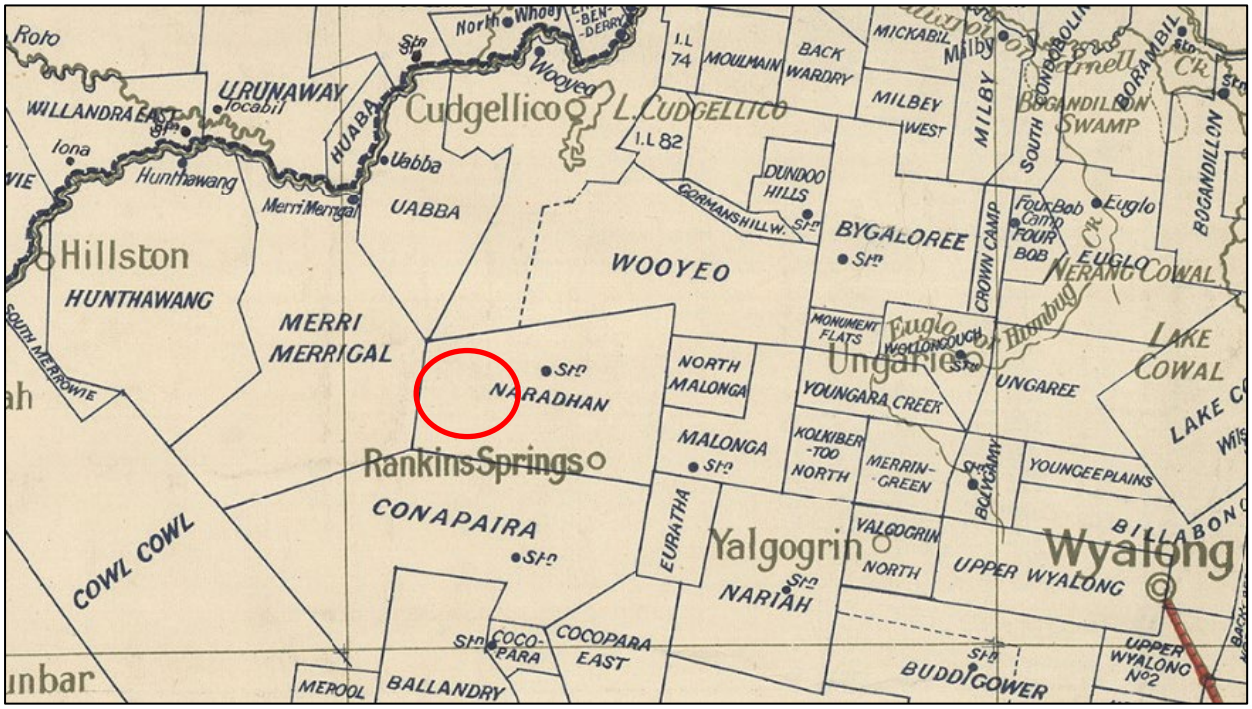
The early settlement of Rankins Springs was located approximately 10 km northeast of the town's current location. The town was likely named after pastoralist Arthur Ranken who had extensive holdings throughout NSW, including the 'Cunimbla' run south of the Lachlan River. Permanent settlement in Rankins Springs was established in 1869, during a period of increased population and consolidation of Riverina townships as the NSW government encouraged settlement in the inland regions. The location of Rankins Springs at the convergence of multiple roads and proximity to a water supply, provided amenities to travelling public and residents of the district (Buxton 1967).

A hotel was constructed at Rankins Spring in the early 1870s, while a post office was established in September 1875. The hotel burnt down in early 1892, though a new stone-built hotel was completed in 1893 (Buxton 1967).

In 1923 a railway line opened connected Rankins Springs with Barmedman, on the central western railway which connected Lake Cargelligo to Cootamundra. The Rankins Springs railway station was built approximately 10 km southwest of the hotel and the line provided transport for agricultural produce as well as passenger services. Rankins Springs proceeded to grow rapidly around the railway station and included a public hall, garage, bakery, and general store. A new hotel was built by 1928 inside the township limits and a police station also opened that year.

The study area is likely situated inside the former boundary of the Naradham pastoral run (see **Figure 12-1**). By 1931, Koomaringa is listed in the Australian Pastoral Directory, and again in 1954. The study area is also inside a Bourke Cooper Dowling and Gipps Gold Field which was proclaimed on 15 October 1880.

Figure 12-1: Extract of the 1903 NSW Pastoral Stations Map with the general location of the study area marked in red (source: SLNSW 2021).



13 HISTORIC HERITAGE ASSESSMENT

13.1 DESKTOP DATABASE SEARCHES CONDUCTED

A desktop search was conducted on the following databases to identify any potential previously recorded heritage within the study area. The results of this search are summarised in **Table 13-1**.

Table 13-1: Historic heritage: desktop-database search results.

Name of Database Searched	Date of Search	Type of Search	Comment
National and Commonwealth Heritage Listings	3/11/2023	Carrathool LGA	No National or Commonwealth heritage listings are present within a 5 km radius of the study area.
State Heritage Listings	3/11/2023	NSW	No State Heritage Listings are present within a 5 km radius of the study area.
Local Environmental Plan (LEP)	3/11/2023	Carrathool LEP 2012	No LEP historic listings are present within a 5 km radius of the study area.

A search of the Heritage Council of NSW administered heritage databases and the Carrathool LEP returned no records for historical heritage sites within the designated search area (a radius of 5 km around the study area).

13.2 SURVEY METHODOLOGY

Standard archaeological field survey and recording methods were employed in this study (Burke & Smith 2004). The historic heritage field survey was completed concurrently with the Aboriginal heritage field assessment (see **Section 6.1**).

13.3 PROJECT CONSTRAINTS

There were no constraints to the historic heritage assessment.

13.4 RESULTS OF HISTORIC HERITAGE ASSESSMENT

No historic heritage sites, archaeologically sensitive areas, or potential historical archaeological deposits were identified during the survey.

Although the study area is inside a proclaimed gold field, there is no evidence that gold mining has occurred inside or near the study area.

13.5 DISCUSSION OF RESULTS

Overall, there was limited potential for historic heritage to be present inside the study area. The heritage values associated with the study area are derived from practices which are unlikely to have physical remains such as grazing. As such, potential remaining physical fabric such as cattle yards, fencing, etc. if present, were removed prior to the quarry beginning operations. No historic remnants of activities associated with grazing or agricultural practices were recorded during the survey, excepting some trees which had been ring barked. In addition, no areas of potential historical deposits were identified during the survey.

13.6 GENERAL PRINCIPLES FOR THE MANAGEMENT OF HISTORIC SITES

Appropriate management of heritage items is primarily determined based on their assessed significance as well as the likely impacts of the proposed development.

In terms of best practice and desired outcomes, avoiding impact to any historical item is a preferred outcome, however, where a historical site has been assessed as having no heritage value, impacts to these items does not require any legislated mitigation.

14 RECOMMENDATIONS

14.1 ABORIGINAL CULTURAL HERITAGE

Under Section 89A of the NPW Act it is mandatory that all newly recorded 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 19 Aboriginal sites were recorded during the assessment, and two previously recorded sites located.

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 HNSW
- The findings of the current investigations undertaken within the study area
- The interests of the Aboriginal community.

As it is acknowledged that the proposed harm to three Aboriginal artefacts at the WRQ diminishes the Aboriginal cultural heritage values of the Koomaringa AP, the Applicant agrees to undertake the following initiatives to ensure that the overall Aboriginal cultural heritage values of the Koomaringa AP are enhanced by the proposal:

1. Applicant will monitor the fenced site buffers of Sites A, B, and C that are located at the boundary of the WRQ operational areas on a regular basis and not less than every two years. Monitoring will be undertaken by at least two representatives of the Koomaringa Management Group, where practicable.
2. Photos from the northern, southern, eastern, and western perimeters of the approved Quarry Site boundary will be taken not less than every two years to provide evidence that quarrying activities are within the approved Quarry curtilage. The photos will be made available to the Koomaringa Management Group (see Koomaringa AP Plan of Management).
3. The Applicant will arrange a one-off face-to-face heritage induction for WRQ staff. The content of this induction will then be presented as a training package for later use. Both the face-to-face induction and the provision of a training package will be under an agreed contractual arrangement.
4. The Applicant will fund the installation of heritage signage at the WRQ. The location and wording of any signage will be discussed with the Koomaringa Management Group when

it is formed. It is imagined that the signs would recognise the significance of the Aboriginal Place and provide site access details.

5. The Applicant will plant and maintain a tree screen of appropriate native species outside of the archaeological site buffer between Site A and the WRQ. This tree screen will help improve the visual amenity of Site A when looking towards the WRQ. Appropriate species for the tree screen are provided in **Section 9.2.2.1**.
6. To assist with allowing safe access to the Koomaringa AP for the Aboriginal community, the Applicant will undertake to locate and form a gravelled carpark near the location shown on **Figure 9-1**.
7. The Applicant agrees to facilitate an appropriate access protocol as set out in **Section 9.2.1** to allow the Aboriginal community to visit the Koomaringa AP.
8. The Applicant will facilitate and fund the installation of a path, picnic shelter table and seats, and signage leading from the carpark to Site A. The location of these facilities will be on the advice of the Koomaringa Management Group when it is formed and HNSW.

Additional recommendations concerning Aboriginal cultural values within the study area are as follows:

9. The Applicant will apply for an AHIP to impact 42-5-0012 (Koomaringa IF-03), 42-5-0022 (Koomaringa OS-13), and 42-5-0064 (Koomaringa Anvil 1) as per the methodology set out in **Section 9.2.3**, with the AHIP area shown on **Figure 10-1**. Until an AHIP is approved, these sites must be protected with fencing.
10. The Applicant will avoid any inadvertent harm to the remaining 31 Aboriginal sites by following the management and mitigation measures outlined in **Section 9.2.4**.
11. All ground-disturbing activities must be confined to the AHIP area shown on **Figure 10-1**. Should ground disturbing works extend beyond this, then further archaeological assessment and impact assessment may be required.
12. The heritage management protocols of the Koomaringa AP Plan of Management apply to the WRQ as set out in **Section 9.2.5**. The consent approval for the WRQ (DA2022/029) and any applicable AHIPs, if granted, will manage cultural heritage within the WRQ.
13. If skeletal remains are identified during the construction and operation of the proposal, the *Unanticipated Skeletal Remains Protocol* (**Appendix 4**) will be followed.
14. If Aboriginal objects are identified outside of the maximum limit of disturbance (AHIP area), all work will cease and the procedures in the *Unanticipated Finds Protocol* (**Appendix 3**) will be followed.

15. Inductions for work crews will include a cultural heritage awareness procedure to ensure they recognise Aboriginal artefacts (see **Appendix 5**) and are aware of the legislative protection of Aboriginal objects under the NPW Act and the contents of the *Unanticipated Finds Protocol.*

14.2 HISTORIC HERITAGE

The following recommendations are made based on the impacts associated with the proposal and with regard to:

- Legal requirements under the terms of the Heritage Act
- Guidelines presented in the *Burra Charter*
- The findings of the current assessment
- The interests of the local community.

The recommendation concerning the historic values within study area is as follows:

16. In the unlikely event that historical relics or deposits are unearthed during the proposed works, the *Historical Heritage Unanticipated Finds Protocol* (**Appendix 7**) will be followed.

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APPENDIX 1: ABORIGINAL COMMUNITY CONSULTATION

Appendix 1 Figure 1: Consultation Log.

Date	Organisation	Comment	Method
13.8.19	The Area News	Rebecca Hardman (RH) rang - newspaper is printed on a Monday, Wednesday and Friday. The cut off is by 11:30 am the day prior to each	phone
21.8.19	The Area News	RH sent advert for proof and quote	email
21.8.19	BCD DPIE (OEH)	RH sent stage1 agency letter requesting potential stakeholders. Closing date 4.9.19	email
21.8.19	Griffith Local Aboriginal Land Council	RH sent stage1 agency letter requesting potential stakeholders. Closing date 4.9.19	email
21.8.19	Office of The Registrar, ALRA	RH sent stage1 agency letter requesting potential stakeholders. Closing date 4.9.19	email
21.8.19	National Native Title Tribunal	RH sent stage1 agency letter requesting potential stakeholders. Closing date 4.9.19	email
21.8.19	NTSCORP	RH sent stage1 agency letter requesting potential stakeholders. Closing date 4.9.19	email
21.8.19	Carrathool Shire Council	RH sent stage1 agency letter requesting potential stakeholders. Closing date 4.9.19	email
21.8.19	Riverina Local Land Services	RH sent stage1 agency letter requesting potential stakeholders. Closing date 4.9.19	email
21.8.19	BCD DPIE (OEH) - Sam Kirby	RH sent letter enquiring re meeting on site prior to commencing stage 1	email
21.8.19	The Area News	RH received proof	email
21.8.19	The Area News	RH enquired re proof size	email
21.8.19	The Area News	RH received 2nd proof	email
21.8.19	The Area News	RH phoned to confirm	phone
21.8.19	National Native Title Tribunal	RH received notification *Records held by the National Native Title Tribunal as at 21 August 2019 indicate that there are no Native Title Determination Applications, Determinations of Native Title, or Indigenous Land Use Agreements over the identified area*	email
26.8.19	The Area News	RH requested a tear sheet	email
26.8.19	The Area News	RH received tear sheet	email
26.8.19	Riverina Local Land Services	RH received email recommending to contact Hay LALC	email
30.8.19	BCD DPIE (OEH)	RH received list of stakeholders to contact	email
2.9.19	Carrathool Shire Council	RH received email: *The only stakeholders that may have an interest is the Aboriginal Land Council in Griffith NSW.* *There are not many other groups, if any, in this area*	email

Date	Organisation	Comment	Method
9.9.19	Griffith Local Aboriginal Land Council	RH received call, confirming would like to register as a RAP. May know others also interested in registering but has not yet had a chance to talk to them. RH advised the only contact we received from OEH for this project was the Griffith LALC so if anyone wants to register as a RAP to please get them to contact us.	Phone
9.9.19	Griffith Local Aboriginal Land Council	RH received email registering the Griffith LALC, Robert Carroll and Judy Johnson as RAPs	email
9.9.19	Griffith Local Aboriginal Land Council	RH responded to see if Stephen has an email for Robert and Judy	email
9.9.19	Griffith Local Aboriginal Land Council	RH received email: *I don't have their email addresses, but will get them to you ASAP.*	email
26.9.19	Griffith Local Aboriginal Land Council	RH received email addresses for RAPs	email
30.9.19	Griffith Local Aboriginal Land Council	RH thanked Stephen	email
30.9.19	Griffith Local Aboriginal Land Council	RH sent stage 2. Feedback closes 28th Oct 2019	email
30.9.19	Robert Carroll	RH sent stage 2. Feedback closes 28th Oct 2019	email
30.9.19	Judy Johnson	RH sent stage 2. Feedback closes 28th Oct 2019	email
1.10.19	Griffith Local Aboriginal Land Council	RH sent invite to fieldwork	email
3.10.19	BCD DPIE (OEH)	RH sent notification of RAPs	email
3.10.19	Griffith Local Aboriginal Land Council	RH sent notification of RAPs	email
3.10.19	Griffith Local Aboriginal Land Council	RH phoned to follow up on fieldwork invite - Line disconnected	phone
3.10.19	Griffith Local Aboriginal Land Council	RH phoned to follow up on fieldwork invite - Line disconnected	phone
3.10.19	Griffith Local Aboriginal Land Council	RH sent email asking for Stephen to get back to her today with availability	email
3.10.19	Griffith Local Aboriginal Land Council	RH sourced Stephen's mobile, phoned and left message	email
3.10.19	Griffith Local Aboriginal Land Council	RH received call back and spoke to Stephen, he will confirm in an email tomorrow who will be attending as the site officer. RH advised we still have a current copy of workers comp	phone
4.10.19	Griffith Local Aboriginal Land Council	RH received email confirming will attend fieldwork. Site officers name and that Stephen would like to attend to observe.	email
4.10.19	Griffith Local Aboriginal Land Council	RH responded to see if Stephen had Ma's contact number and noting he is welcome to come as a volunteer if he likes.	email
8.10.19	Griffith Local Aboriginal Land Council	RH received email saying will get a number for the site officer	email
8.10.19	Griffith Local Aboriginal Land Council	RH received number for site officer	email
8.10.19	Griffith Local Aboriginal Land Council	RH phoned site officer to advise of delay due to car accident OzArk Field	phone

Date	Organisation	Comment	Method
		officer had to take detour for. RH will call back with ETA when known	
8.10.19	Griffith Local Aboriginal Land Council	RH phoned and pushed fieldwork back to 1pm	phone
11.10.19	BCD DPIE (OEH)	RH received email confirming receipt of notification of RAPs	email
14.10.19	BCD DPIE (OEH)	RH thanked Andrew	email
14.10.19	Office of The Registrar, ALRA	RH received a letter noting there are currently not any registered Aboriginal Owners in the project area. Suggested to contact Griffith and Murrin Bridge LALC	email
8.10.19 to 11.10.19	Griffith Local Aboriginal Land Council	Site officer (Max Harris) from Griffith LALC attended field survey. Stephen, CEO of Griffith LALC participated Friday morning as a volunteer and see area in person.	In person
25.11.19	Griffith Local Aboriginal Land Council	RH received call clarifying rates	phone
26.11.19	Griffith Local Aboriginal Land Council	RH received invoice	email
7.7.20	Griffith Local Aboriginal Land Council	RH sent project update	email
7.7.20	Robert Carroll	RH sent project update	email
7.7.20	Judy Johnson	RH sent project update	email
8.12.20	Griffith Local Aboriginal Land Council	Alyce Cameron (AC) sent project update	Email
8.12.20	Robert Carroll	AC sent project update	Email
8.12.20	Judy Johnson	AC sent project update	Email
18.8.21	Griffith Local Aboriginal Land Council	AC sent project update	Email
18.8.21	Robert Carroll	AC sent project update	Email
18.8.21	Judy Johnson	AC sent project update	Email
8.10.21	Griffith Local Aboriginal Land Council	Catherine Burrowes (CB) sent stage 4 letter and draft report exp 5.11.21	Email
8.10.21	Robert Carroll	CB sent stage 4 letter and draft report exp 5.11.21	Email
8.10.21	Judy Johnson	CB sent stage 4 letter and draft report exp 5.11.21	Email
29.5.23	Griffith Local Aboriginal Land Council	CB sent project update	Email
29.5.23	Robert Carroll	CB sent project update	Email
29.5.23	Judy Johnson	CB sent project update	Email
6.9.23	Yalmambirra	CB sent Project update letter September 2023	Email
6.9.23	Peter Ingram	CB sent Project update letter September 2023	Email
6.9.23	Robert Clegg	CB sent Project update letter September 2023	Email
6.9.23	Paul Brydon	CB sent Project update letter September 2023	Email
13.9.23	Griffith Local Aboriginal Land Council	CB sent follow up email with questions asking for comments/ feedback	Email
13.9.23	Robert Carroll	CB sent follow up email with questions asking for comments/ feedback	Email

Date	Organisation	Comment	Method
13.9.23	Judy Johnson	CB sent follow up email with questions asking for comments/ feedback	Email
13.9.23	Yalmambirra	CB sent follow up email with questions asking for comments/ feedback	Email
13.9.23	Peter Ingram	CB sent follow up email with questions asking for comments/ feedback	Email
13.9.23	Robert Clegg	CB sent follow up email with questions asking for comments/ feedback	Email
13.9.23	Paul Brydon	CB sent follow up email with questions asking for comments/ feedback	Email
19.9.23	Griffith Local Aboriginal Land Council	CB called and left message. Call not returned.	Phone
19.9.23	Robert Carroll	CB called and left message. Call not returned.	Email
19.9.23	Judy Johnson	Unable to confirm contact number	Email
19.9.23	Yalmambirra	Unable to confirm contact number	Email
19.9.23	Peter Ingram	CB called and left message. Call not returned.	Phone
19.9.23	Robert Clegg	CB reforwarded email to Robert asking for feedback.	Phone
19.9.23	Paul Brydon	CB Called, *Paul is happy with project, no comment*	Phone
19.9.23	Robert Clegg	CB received call from Rob - comments placed against email sent. Comments in folder	Phone
20.9.23	Griffith Local Aboriginal Land Council	CB called and left message. Call not returned.	Phone
24.10.23	Griffith Local Aboriginal Land Council	CB received call from Steve - Comments in folder	Phone / Email
8.11.23	Griffith Local Aboriginal Land Council	BC called the LALC to speak with Stephen but only got the message machine. Left a message	Phone
8.11.23	Griffith Local Aboriginal Land Council	BC emailed the Griffith LALC asking that Stephen give him a call back to discuss his response.	Email
9.11.23	Griffith Local Aboriginal Land Council	BC called the LALC to speak with Stephen but only got the message machine. Left a message	Phone
9.11.23	Robert Carroll	BC sent email to Robert including the Koomaringa Plan of Management, the WRQ ACHAR, and the 13 Sept email (inc project update)	email
9.11.23	Robert Carroll	BC receives delivery receipts from both of Robert's email addresses	email
10.11.23	Griffith Local Aboriginal Land Council	BC called the LALC to speak with Stephen but only got the message machine. Left a message	Phone
13.11.23	Robert Carroll	BC called and spoke with Robert. Robert said he has received the documents sent last week and is going through them today and will provide comment. BC invited Robert to call him if he had any questions. From speaking with Robert, he has a very confused view of what is happening at Koomaringa and thinks	Phone / Email

Date	Organisation	Comment	Method
		that the significant sites have been removed etc and that the quarry expansion will remove the remaining vestiges. BC tried to explain it to him but he said he'd look at the documents and provide comment.	
13.11.23	Griffith Local Aboriginal Land Council	BC called the LALC to speak with Stephen but only got the message machine. Left a message	Phone
13.11.23	Griffith Local Aboriginal Land Council	BC re-emailed the Griffith LALC asking that Stephen give him a call back to discuss his response.	Email
14.11.23	Robert Carroll	BC received email from Robert (saved on server) setting out his association with Koomaringa AP and requesting a site visit	Email
14.11.23	Robert Carroll	BC replied thanking Robert and saying he would be in touch about the site visit	Email
14.11.23	Robert Carroll	BC sent Robert an invitation for a site visit either on 23/11/23 or 24/11/23	Email
15.11.23	Mark Saddler	BC receives email from Mark saying he wants to meet on the 8/12/23. Robert Carroll and James Ingram cc'd into email.	Email
15.11.23	Mark Saddler	BC calls Mark to see if another date is possible. No answer. Left meassage	Phone
16.11.23	Mark Saddler	BC receives email from Mark saying a meeting on 24/11/23 is OK	Email
16.11.23	James Ingram	BC receives email from James saying a meeting on 24/11/23 is OK	Email
16.11.23	Mark Saddler, James Ingram, Robert Carroll	BC confirms the site meeting at 10.30 on 24/11/23	Email
16.11.23	Robert Carroll	BC receives email confirming Robert will be at the site meeting	Email
20.11.23	Griffith Local Aboriginal Land Council	BC emailed the Griffith LALC inviting Stephen to the site visit on 24/11/23.	Email
18.11.23	Griffith Local Aboriginal Land Council	BC received call from Stephen Young who said he cannot make the site visit on 24/11/23. Suggested another time (Friday 1 December) and BC said he'd check with the quarry.	phone
23.11.23	Robert Carroll	Geoff Pygram (GP) speaks with Robert who described his concerns about the site and the process.	phone
24.11.23	Mark Saddler, James Ingram, Robert Carroll	Site visit with Jordan Henshaw and Peter and Chris Woods (former quarry owner). Jordan's meeting summary in folder.	on-site
26.11.23	Mark Saddler	OzArk receives report of site visit from Mark Saddler (saved into folder)	Email
27.11.23	Robert Carroll	GP speaks with Robert about the possibility of site visit and how the project might proceed, outcomes and next steps etc.	phone
28.11.23	Mark Saddler, James Ingram, Robert Carroll	BC writes to Mark, Robert, and James thanking them for their time to visit the WRQ and to ask for any further responses. BC attaches Koomaringa PoM for Mark's information	Email

Date	Organisation	Comment	Method
29.11.23	Robert Carroll	BC receives email from Robert with his report on the site visit. Saved to folder.	Email
29.11.23	Mark Saddler	BC receives email with attachment from Mark referring to the Koomaringa PoM but also applicable to the WRQ. Saved in folder.	Email
29.11.23	Robert Carroll / Mark Saddler	BC thanks Mark and Robert seperately for their contributions	Email
5.12.23 to 7.12.23	Mark Saddler, James Ingram, Robert Carroll	Attend site visit (3 days) to inspect area and to provide guidance on the placing of protective fencing for sites	on-site
20.12.23 to 22.12.23	Mark Saddler, James Ingram, Robert Carroll	Attend site visit (3 days) to review the in situ protective fencing for sites	on-site
22.12.23	Robert Carroll	GP speaks with Robert where he advised that the fencing was satisfactory.	phone
24.12.23	Robert Carroll	GP speaks with Robert about the timeframe for receiving their report and the next steps.	phone
2.1.24	Robert Carroll	GP speaks with Robert about the timeframe for receiving their report and the next steps.	phone
3.1.24	Mark Saddler, James Ingram, Robert Carroll	Provide written submission with further questions around the management of the area.	Email
18.2.24	Mark Saddler, James Ingram, Robert Carroll	OzArk provide written response to their joint response received on 3.1.24.	Email
18.2.24	Robert Carroll	OzArk provide written response to Robert's questions received on 29 November 2023.	Email
18.2.24	Mark Saddler	OzArk provide written response to Mark's questions response received on 29 November 2023.	Email

Appendix 1 Figure 2: Stage 1 advertisement.

Expression of Interest
Cultural Heritage Management

OzArk Environment & Heritage has been engaged by R.W. Corkery & Co. on behalf of Milbrae Quarries Pty Ltd (the Applicant) to seek the registration of Aboriginal groups or individuals in the Western Riverina area interested in being consulted for two projects: the proposed expansion of the Western Riverina Quarry located in Carrathool LGA; and the management of the Koomaringa Aboriginal Place.

We will be preparing an Aboriginal Cultural Heritage Assessment (ACHAR) for the Quarry which could potentially lead to the need for an Aboriginal Heritage Impact Permit application (AHIP) and a Plan of Management (PoM) for the Koomaringa Aboriginal Place.

The consultation for the Quarry expansion will assist the Applicant in the potential preparation of an AHIP application (if required) and assist the approval agency in their consideration of any application(s). The consultation for the PoM will ensure the place is understood and managed to protect cultural values.

If you hold cultural knowledge relevant to determining the significance of Aboriginal objects or places in the Koomaringa Aboriginal Place area and wish to assist in developing management strategies or if you like to be consulted in relation to the proposed Quarry expansion, please register your interest. Registrations can be made by post: OzArk EHM PO Box 2069 Dubbo NSW 2830; email: rebecca@ozarkehm.com.au or by phoning OzArk on 02 6882 0118. All submissions should be received no later than **Friday 6th September 2019.**

Appendix 1 Figure 3: Stage 1 letters to agencies.

OzArk Environment & Heritage ABN 59 104 582 354
Dubbo T: 02 6882 0118 145 Wingewarra St
Queanbeyan enquiry@ozarkehm.com.au PO Box 2069
Newcastle www.ozarkehm.com.au DUBBO NSW 2830

21st August 2019

Members
Griffith Local Aboriginal Land Council
PO Box 8043
EAST GRIFFITH NSW 2680
grifflalc@bigpond.com

ABORIGINAL PLACE MANAGEMENT PLAN – KOOMARINGA ABORIGINAL PLACE & ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT – WESTERN RIVERINA QUARRY EXTENSION, CARRATHOOL LGA

Dear Members,

OzArk Environment & Heritage (OzArk) has been engaged by RW Corkery & Co Pty Limited (RW Corkery) on behalf of the Applicant, Milbrae Quarries Pty Ltd (Milbrae Quarries) to undertake Aboriginal community consultation as per the Office of Environment and Heritage *Aboriginal cultural heritage consultation requirements for proponents 2010*.

Milbrae Quarries are proposing to expand the Western Riverina Quarry located in the Carrathool LGA which is incorporated within the Koomaringa Aboriginal Place (AP). This AP is a large Aboriginal stone quarry with part of the land currently quarried by Milbrae Quarries, however the most significant area is cordoned off and protected from extraction. The Quarry Site is shown in **Figure 1**.

Milbrae Quarries is also working with the Biodiversity and Conservation Division (BCD) of the Department of Planning, Industry and Environment (DPIE) to prepare a Plan of Management (PoM) for the Koomaringa Aboriginal Place.

We are therefore seeking Expressions of Interest from Aboriginal groups and individuals in the Riverina area, to form a consultation group. This consultation is to assist OzArk and the proponent in preparing an Aboriginal Cultural Heritage Assessment Report (ACHAR) and potential Aboriginal Heritage Impact Permit application for the quarry expansion as well as the PoM for the Koomaringa AP.

If your organisation can recommend and provide contact details for any known Aboriginal groups or individuals with cultural knowledge relevant to determining cultural significance and assisting in developing a PoM for the Koomaringa AP and the Quarry extension ACHAR, please advise our office. We would appreciate it if you could provide any feedback to the contact details provided at the top of the page, regarding these Aboriginal stakeholder groups by **Wednesday 4th September 2019**, or sooner if possible.

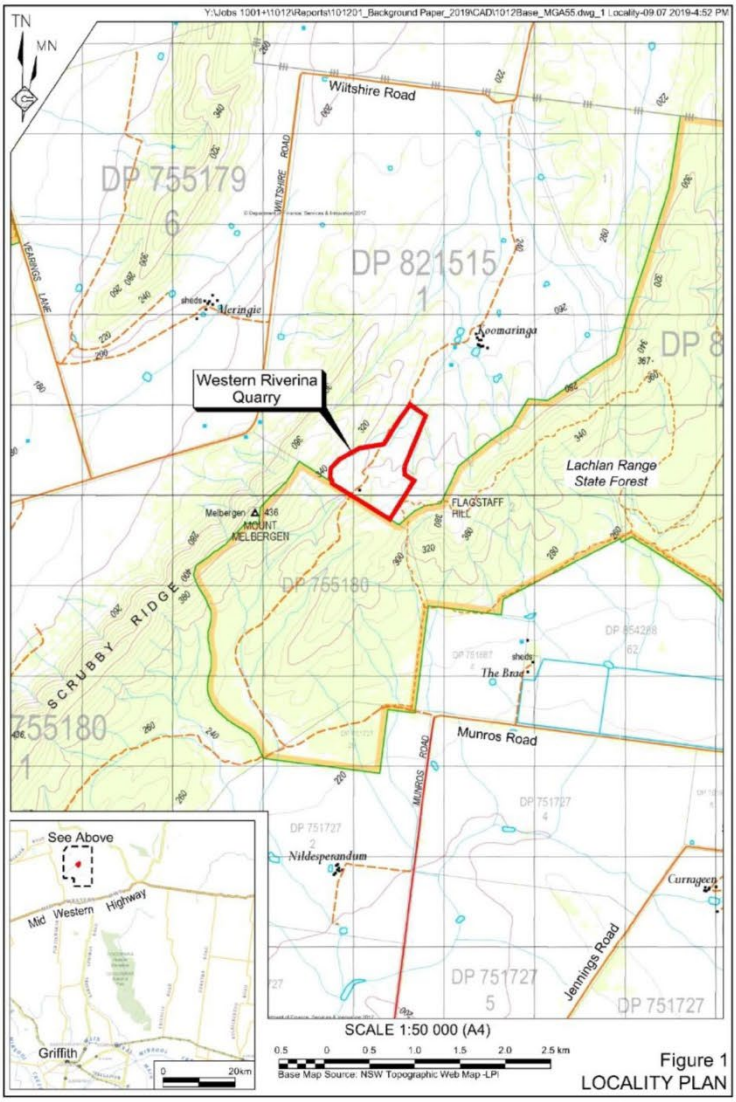
OzArk Environment & Heritage

Once relevant groups and individuals have been identified, they will form part of the formal consultation process for the project.

Kind regards,

Rebecca Hardman
Community Liaison & Administration

FIGURE 1. WESTERN RIVERINA QUARRY LOCATION



Appendix 1 Figure 4: Stage 1 replies from agencies.

NSW GOVERNMENT | Planning, Industry & Environment

Our ref: DOC19/716918
Senders ref:

Ms Rebecca Hardman

OzArk Environment & Heritage

145 Wingewarra St
PO Box 2069
DUBBO NSW 2830

Via email: www.ozarkehm.com.au

29 August 2019

Dear Ms Hardman

Subject: **ACHAR – Western Riverina Quarry Expansion, Carrathool LGA**

WRITTEN NOTIFICATION OF PROPOSAL AS REQUIRED UNDER DECCW ABORIGINAL CULTURAL HERITAGE CONSULTATION REQUIREMENTS FOR PROPONENTS 2010

Thank you for your correspondence received 21 August 2019 about the above matter seeking comments from the Biodiversity and Conservation Division of the Department of Planning, Industry and Environment (The Department).

The Biodiversity and Conservation Division was formerly part of the Office of Environment and Heritage (OEH). It forms part of the new Environment, Energy and Science Group in the Department (see https://intranet.dpie.nsw.gov.au/). The Environment, Energy and Science Group works to protect and strengthen NSW's natural environment by managing the conservation of our environment and energy resources. We support the community, as well as business and government, in developing their ability to achieve these outcomes.

The Biodiversity and Conservation Division has statutory responsibilities relating to biodiversity (including threatened species, populations, ecological communities, or their habitats), Aboriginal cultural heritage and flooding. For matters relating to national parks estate matters please refer these to the National Parks and Wildlife Service.

Attached is a list of known Aboriginal parties for the Carrathool local government area that the Department considers likely to have an interest in the development. Please note this list is not necessarily an exhaustive list of all interested Aboriginal parties. Receipt of this list does not remove the requirement of a proponent/ consultant to advertise in local print media and contact other bodies seeking interested Aboriginal parties, in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (April 2010).

Under Section 4.1.6. of the Consultation Requirements, you must also provide a copy of the names of each Aboriginal person who registered an interest to the relevant Department regional office and Local Aboriginal Land Council (LALC) within 28 days from the closing date for registering an interest.

Please note that the contact details in the list provided by the Department may be out of date as it relies on Aboriginal parties advising the Department when their details need changing. If individuals/companies undertaking consultation are aware that any groups contact details are out of date, or letters are returned unopened, please contact either the relevant stakeholder group (if you know their more current details) and/or the Department. AHIP applicants should make a note of any group they are unable to contact as part of their consultation record.

512 Dean Street Albury 2640 | PO Box 1040 Albury 2640 | rog.southwest@environment.nsw.gov.au | dpie.nsw.gov.au | 1

If you have any questions about this advice, please contact me via rog.southwest@environment.nsw.gov.au or 02 6022 0623.

Yours sincerely

Andrew Fisher

Senior Team Leader Planning

South West Branch

Biodiversity and Conservation Division

Department of Planning, Industry and Environment

ATTACHMENT A Registered Aboriginal Interests – Carrathool Local Government Area

ATTACHMENT A Registered Aboriginal Interests

Carrathool Local Government Area

Organisation/ Individual Name	Address	Contact Details
Griffith Local Aboriginal Land Council	PO Box 8043 EAST GRIFFITH NSW 2680 5 Wiradjuri Place GRIFFITH NSW 2680	Phone: 02 6962 6711 Fax: 02 6964 1477 Email: grifflalc@bigpond.com.au
Murrin Bridge Local Aboriginal Land Council	39 Foster Street PO Box 157 LAKE CARGELLIGO NSW 2672	Phone: 02 6898 1119 Fax: 02 6898 1158 Email: murrinbridgelalc@gmail.com
Ivanhoe Local Aboriginal Land Council		No contact details available

Appendix 1 Figure 5: Stage 2/3 letters to RAPs with assessment methodology.

OzArk Environment & Heritage ABN 59 104 582 354

Dubbo
Queanbeyan
Newcastle

T: 02 6882 0118
enquiry@ozarkehm.com.au
www.ozarkehm.com.au

145 Wingewarra St
PO Box 2069
DUBBO NSW 2830

30 September 2019

Members
Griffith Local Aboriginal Land Council
c/- Stephen Collins
PO Box 8043
EAST GRIFFITH NSW 2680
grifflalc@bigpond.com

KOOMARINGA ABORIGINAL PLACE MANAGEMENT PLAN
SURVEY METHODOLOGY

Dear Members,

Thank-you for your registration of interest to become a Registered Aboriginal Party (RAP) to be consulted for the proposed Aboriginal Place Management Plan – Koomaringa Aboriginal Place (AP) & Aboriginal Cultural Heritage Assessment Report – Western Riverina Quarry Extension, in the Carrathool LGA.

OzArk Environment and Heritage will be conducting a research program into the Koomaringa AP on behalf of Milbrae Quarries (Milbrae). Milbrae has received a heritage grant from the former NSW Office of Environment and Heritage for the purpose of drafting a Plan of Management (PoM) for Koomaringa AP. This will include site survey and recording over Koomaringa AP, identification of and consultation with Aboriginal community stakeholders, as well as the mapping of plotting archaeological remains.

Koomaringa AP was gazetted in 1991 and has had no management plans or activities undertaken in the meantime. There is an existing blue stone quarry, Western Riverina Quarry (WRQ), inside the curtilage for Koomaringa AP and a PoM is necessary to help protect the values of the AP and to assist Milbrae to ensure that WRQ operates in consideration of these values, so as to ensure they are protected and conserved.

We would appreciate your feedback on the proposed methodology for the research program, which is set out in the accompanying document. In addition to comments on the draft report, if you can share any Aboriginal cultural heritage knowledge relevant to the proposed study area, we welcome this input so as to improve our assessment outcomes and to ensure Aboriginal cultural values are considered. OzArk is required to give you 28 days to supply feedback on the attached documents. This period closes **5pm on Monday 28th October 2019**. If you need any help supplying feedback, please do not hesitate to contact our office.

Should you have any queries in relation to the enclosed information please do not hesitate to contact our office.

Kind regards,

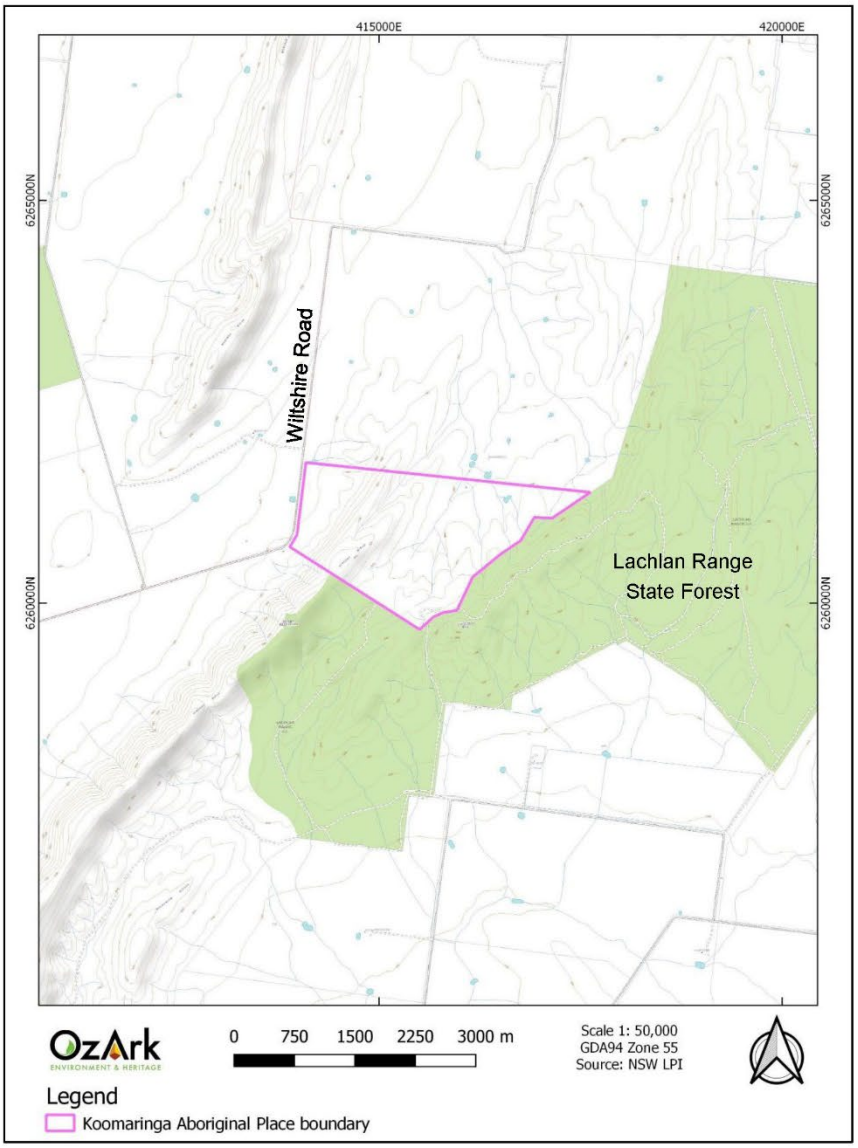
Rebecca Hardman
Community Liaison & Administration

1 BACKGROUND

1.1 KOOMARINGA ABORIGINAL PLACE

Koomaringa Aboriginal Place (AP) is located approximately 55.5 kilometres (km) north of Griffith and 17 km northwest of Rankins Springs, NSW. Koomaringa AP covers approximately 430 hectares (ha) of Lot 1 DP821515 and is surrounded by the Lachlan Range State Forest to the south and east, Wiltshire Road to the west, and the Koomaringa Homestead to the north (**Figure 1-1**). Koomaringa was gazetted as an Aboriginal Place in 1991.

Figure 1-1: Location of Koomaringa Aboriginal Place.



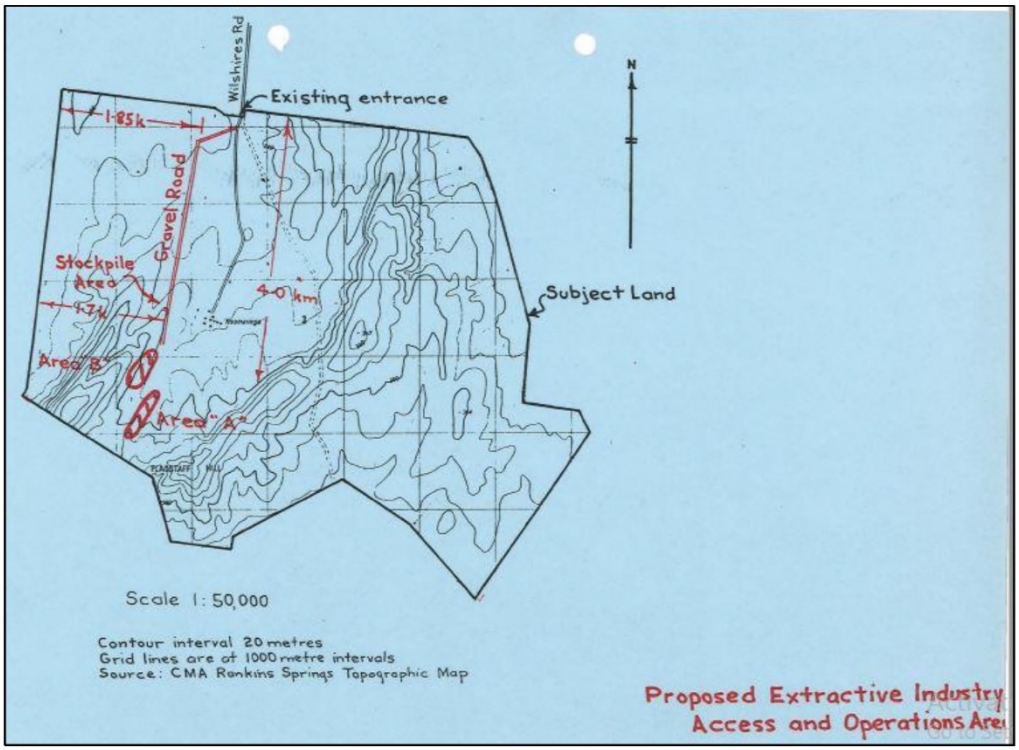
OzArk Environment & Heritage

1.2 PREVIOUS REPORTS AND RECORDING

The site was first officially recorded by R Williams and D Ingram as AHIMS #42-5-0004 (Wiradjuri Regional Aboriginal Land Council [RLAC]) in 1987. This site card details that the site is located approximately 500–1000 metres (m) south of the Koomaringa Homestead. The GPS coordinates provided on this card places the site towards the northern boundary of the curtilage for the Aboriginal Place. Unfortunately, there is no map or photographs provided with the site card. The site is recorded as a stone tool extraction and working/knapping area and is in a creek bed. AHIMS #42-5-0005 is not a formal site card, but contains the gazette notice for Koomaringa Aboriginal Place, and a map showing the AP boundaries. The GPS coordinates for #42-5-0005 is near the northeast corner of the AP boundary.

Witter (1987) undertook a heritage assessment of WRQ and Koomaringa AP to supplement an EIS done in 1986 by Terry Pearce for Western Riverina Quarry (WRQ). Witter's report stated there were two locations proposed for rock extraction - 'Area A' and 'Area B'. A map is provided in the EIS (Pearce 1986) which shows the two proposed extraction areas (see **Figure 1-2**).

Figure 1-2: Map of rock extraction Area A and Area B at Koomaringa (Pearce 1986: 25).



The land west of Area B (**Figure 1-2**) was referred to as the 'western felsite zone' by Witter and described as having "abundant flaked stone as waste from the process of breaking out core. The breaking out was done by hurling great blocks of stone against the bedrock in order to detach large spalls. These spalls then could be used as core blanks" (Witter 1987: 2). The bedrock anvils and workshop areas are also mentioned as being present in this western felsite zone. The 'eastern felsite zone', described as being adjacent to the east of Area A (**Figure 1-2**), is recorded as being an outcrop upslope of the basalt, with a variety of flaked stone as well as bedrock anvils.

Witter states that the Koomaringa Aboriginal stone quarry is an "outstanding example of its kind" (1987: 3), and has been heavily worked by the Aboriginals, likely due to the rarity of felsite in the area. The felsite is also described as being highly distinctive with red, yellow and orange colour variations.

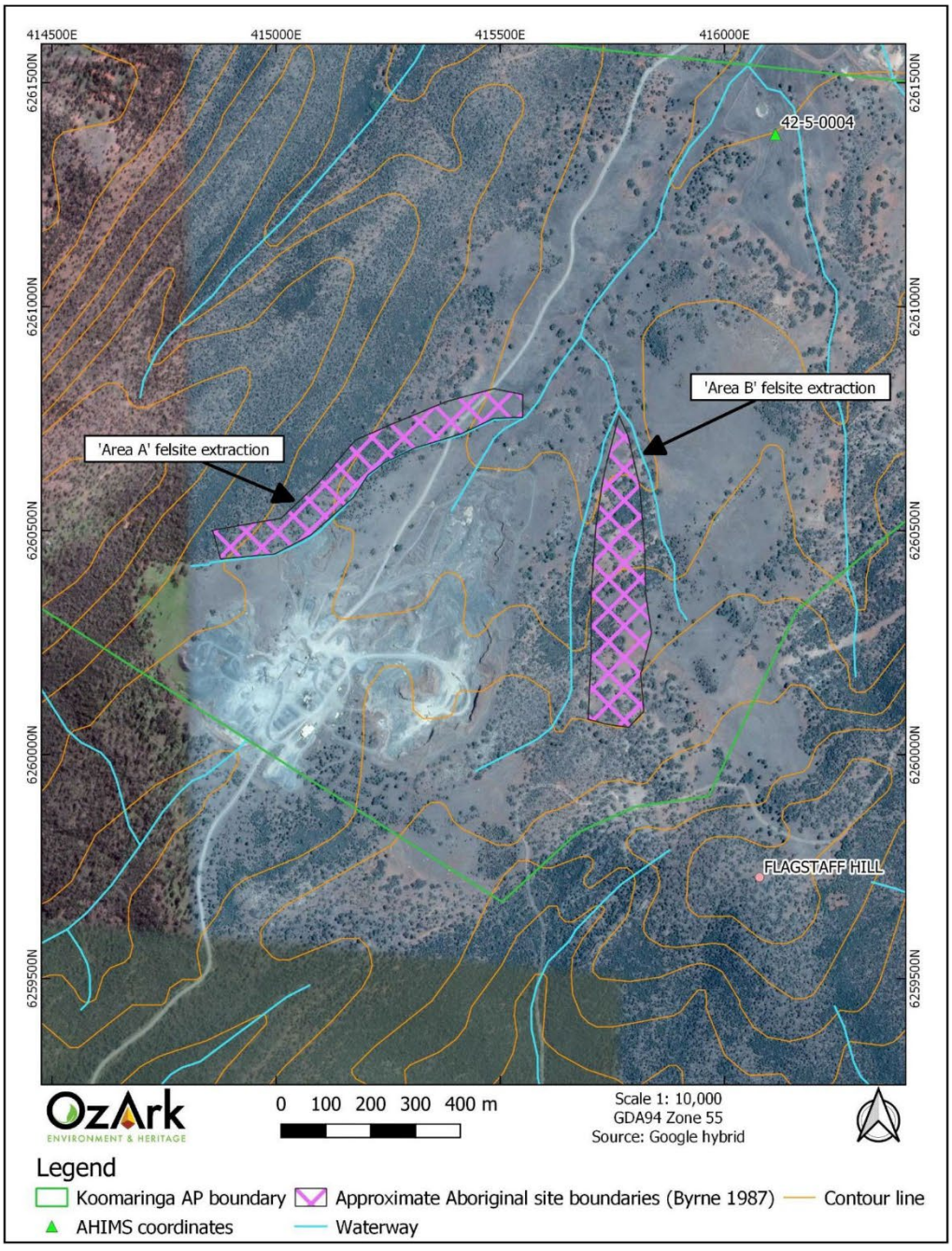
Witter recommended several management recommendations in the report:

- Mapping of the site map showing the location and distribution of the cultural resource. He noted this could achieved by:
    - Firstly, as a large base map including the gullies that cut through the area and indicating hills and ridges.
    - Secondly, by plotting the archaeological material including:
        - Areas of flaked debris, bed rock anvils, flake removal locations, or artefacts with retouch.
- Marking out the archaeological site(s) using star pickets
- Installation of a barrier fence.

Byrne (1987) also assessed the Aboriginal sites at Koomaringa to further supplement the EIS by Pearce (1986). Byrne's main objective was to map the extent of the archaeological evidence of Aboriginal felsite extraction. Furthermore, Byrne also considered approximate 'buffer zones' between the proposed blue-stone extraction and the Aboriginal sites. **Figure 1-3** shows the approximately location of the two Aboriginal quarrying areas at Koomaringa based on the maps drawn by Byrne (1987). As part of Byrne's assessment, steel star-pickets were installed as barrier fences as recommended by Witter (1987). These star pickets were placed at 50 m intervals, with a single strand of wire to stop vehicle passage but allow stock movement.

The information provided about Koomaringa AP from the NSW State Heritage Inventory does state that the most significant area of the Aboriginal site is cordoned off and protected from mining (OEH 2019).

Figure 1-3: Approximate location of Aboriginal sites based on Byrne (1987).



OzArk Environment & Heritage

2 FIELD SURVEY

2.1.1 Aims of field survey

The aims of the field survey are to primarily undertake a more formal recording of Koomaringa AP, in particular accurate mapping of and recording of Aboriginal features located during survey.

2.1.2 *Methodology*

As the Koomaringa AP encompasses a very large land area, it will not be feasible within the parameters of the current project to undertake comprehensive field survey across the entire area.

Instead a more targeted methodology has been devised, with a likely recommendation of the PoM being that further field investigations should be undertaken in the future as the funding becomes available.

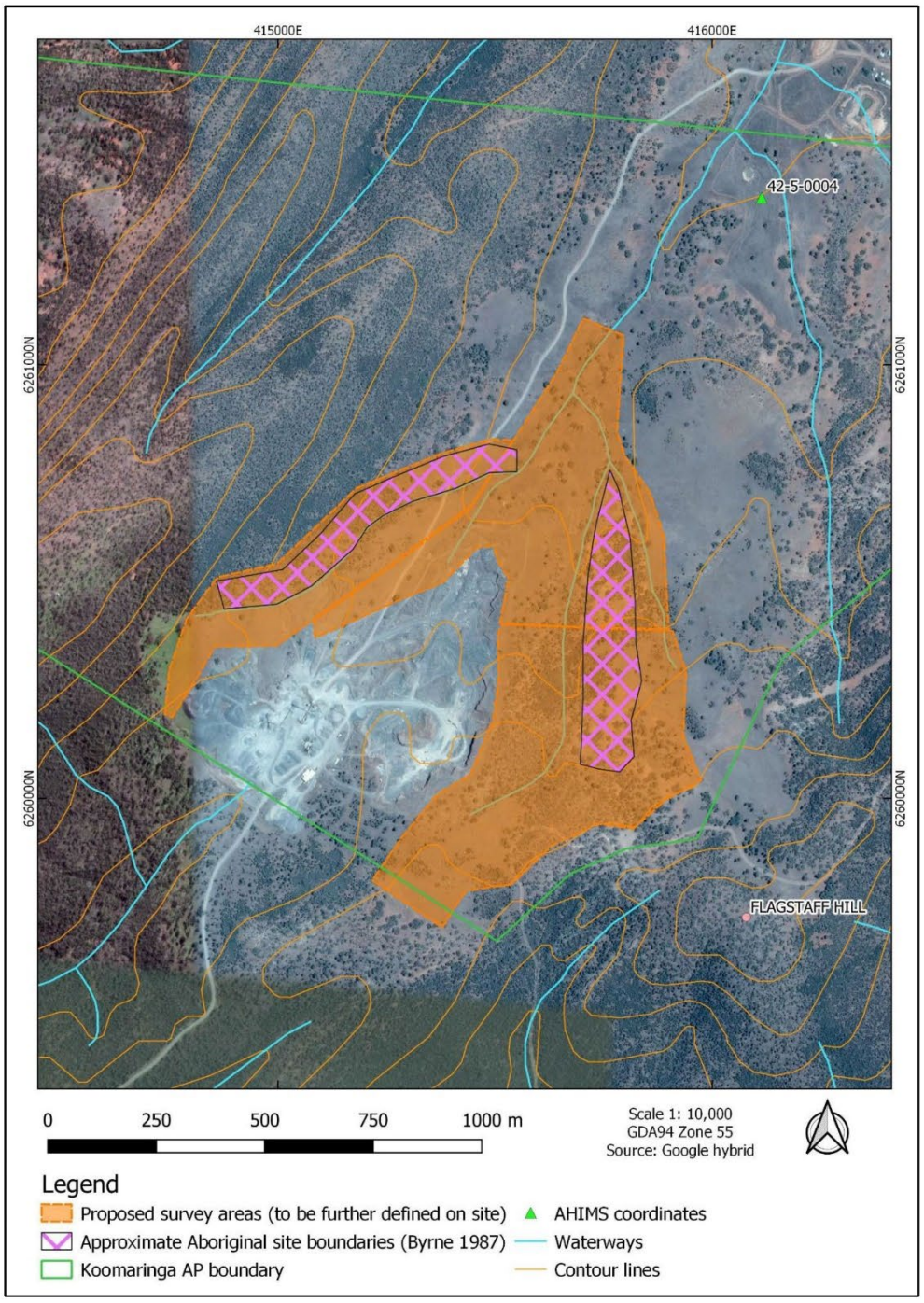
We further note that as no-one from the OzArk archaeological team has as yet been on site, this methodology may need some minor modification once the OzArk archaeologist, the Aboriginal community representatives and the representative from NSW Premier and Cabinet are present together on site.

With this in mind, the following draft methodology is proposed:

- Targeted pedestrian survey over sections of Koomaringa AP. Some likely locations for the survey are shown in **Figure 4-1**. Survey areas will be adjusted as further information is provided during the consultation process. The purpose of the survey is to identify:
    - outcrops of rock with indications of Aboriginal quarrying
    - locations of bedrock anvils
    - stone artefacts present on the ground surface; and if so, are there any high density scatters present.
- A map of the Koomaringa AP will be produced, focusing on the areas closest to the existing rock extraction quarry, where survey effort is likely to be highest. Potential survey areas are shown in **Figure 4-1** based on Pearce (1986), Witter (1987) and Byrne (1987). Confirmation of these locations will be undertaken during the survey. This will be achieved using GPS and supplemented by hand-drawn maps. Features, if present, will be mapped as follows:
    - Extent of the Aboriginal quarried rock outcrops
    - Bedrock anvils
    - Flaking debitage or 'aprons'
    - Large flake scars
    - Locations of high-density scatters
- A representative sample of stone artefacts within a selection of features will be recorded in detail including:
    - Size (length, width, thickness)
    - Artefact type
    - Stage of reduction
    - Integrity
    - Raw material

  - Scaled photographs of select artefacts
  - Additional information where present (core type and features, retouch, etc.)
- Representative views of the AP in general, and specifically of procurement areas by Aboriginal people, will be taken using digital photography. All photographs will include an appropriate scale where feasible.
- Further consultation with the local Aboriginal community to understand the cultural values of the site.
- A report detailing the findings of the fieldwork will be produced and used to inform the PoM being prepared for the Koomaringa AP. This will be lodged on AHIMS in relation to the appropriate site card/s.
- The AHIMS site card/s will be updated with further information concerning the overall site and AP. This may also include updated GPS coordinates.

Figure 2-1: Koomaringa Aboriginal Place and proposed survey areas.



3 DEVELOPMENT OF A PLAN OF MANAGEMENT

The following approach is advocated for the development of the PoM:

3.1 PREPARE A DRAFT TABLE OF CONTENTS (TOC) FOR THE POM

This will be prepared based on:

- The NSW Government *Declared Aboriginal Places: Guidelines for developing Management Plans* (OEH 2017), which noted the following elements as requisite:
    - A statement of cultural values of the Aboriginal Place, including whether it is a men's or women's site.
    - Threats to the place, an assessment of risk of harm and ways in which significant threats will be treated.
    - Other uses of the area i.e. recreational, economic
    - Appropriate fire regimes.
    - Activities that may require Aboriginal Heritage Impact Permits issued under Part 6 of the National Parks and Wildlife Act 1974, and maps of where these activities are authorised under a permit.
    - The treatment of culturally sensitive information in accordance with a section 161 notice.
    - Ongoing management actions, who is responsible for doing them, and what consultation arrangements are needed.
    - A process for periodic monitoring and recording of Aboriginal Place site conditions.
    - Funding and resources.
- The substance of the PoM will also be guided by the more site specific elements of the Koomaringa AP, which notably include the operation of the WRQ within its curtilage.
- Further, the PoM will be guided by the specific wishes of the Aboriginal community and NSW government, Department of Premier and Cabinet.

Once a draft of the ToC has been developed, this would be circulated to the stakeholders for review and input.

3.2 POM DEVELOPMENT

Sections of the PoM would be drafted so as to include all feedback received as well as content from the archaeological assessment.

The draft PoM would be circulated for review and input. Once comments were received, the document would be finalised.

4 REFERENCES

Byrne 1987 — Byrne, D. 1987. *Investigation and assessment of an Aboriginal stone extraction site at Koomaringa, near Rankins Springs, Western NSW.* Report to Mr Glen Neyland.

OEH 2017 — *Declared Aboriginal Places: Guidelines for developing Management Plans.*

OEH 2019 — *Koomaringa Aboriginal Place.* [Online resource]: https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5062944

Pearce 1986 — Pearce, T. 1986. *Environmental Impact Statement for proposed "Extractive Industry" at "Koomaringa" Rankins Springs, New South Wales.* Report to Mr & Mrs G Neyland.

Witter 1987 — Witter, D. 1987. *Koomaringa Rock Extraction Management Plan*.

Appendix 1 Figure 6: Stage 4 letter sent to RAPs.

OzArk Environment & Heritage ABN 59 104 582 354
Dubbo T: 02 6882 0118 145 Wingewarra St
Queanbeyan enquiry@ozarkehm.com.au PO Box 2069
Newcastle www.ozarkehm.com.au DUBBO NSW 2830

8 October 2021

Members
Griffith Local Aboriginal Land Council
c/- Stephen Collins
PO Box 8043
EAST GRIFFITH NSW 2680

ABORIGINAL CULTURAL HERITAGE & HISTORIC HERITAGE ASSESSMENT REPORT FOR THE WESTERN RIVERINA QUARRY EXPANSION, RANKIN SPRINGS NSW.

Dear Members,

Thank-you for your continued participation as a Registered Aboriginal Party (RAP) and involvement in the above-mentioned project.

Milbrae Quarries (the Proponent) would like to offer you the opportunity to provide feedback on the draft report that has been undertaken in accordance with stage four (4) of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCR).

As per the ACHCRs we are required to give you twenty-eight (28) days to supply feedback on the attached document. This period closes on the **Friday 5th November 2021**. Should our office not be contacted within this time frame, we will presume that you are satisfied with the contents of the report as it stands.

If you need any help supplying feedback or have any queries, please do not hesitate to contact our office.

Kind regards,

Catherine Burrowes
Office Manager/ Community Liaison

Appendix 1 Figure 7: Project updates sent to RAPs.

7 July 2020

OzArk Environment & Heritage ABN 59 104 582 354
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7 July 2020

Members
Griffith Local Aboriginal Land Council
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grifflalc@bigpond.com

UPDATE FOR THE ABORIGINAL PLACE MANAGEMENT PLAN – KOOMARINGA ABORIGINAL PLACE & ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT – WESTERN RIVERINA QUARRY EXTENSION, CARRATHOOL LGA.

Dear Members,

We wish to apologise for the delay in correspondence and thank-you for your registration of interest to become a Registered Aboriginal Party (RAP) for the proposed expansion to the Western Riverina Quarry (the project) located in the Carrathool LGA which is incorporated within the Koomaringa Aboriginal Place (AP).

The purpose of this letter is to update you in relation to the progress of the above-mentioned project. As you are aware, the project commenced *Aboriginal Cultural Heritage Consultation Requirements* in August 2019.

Stage 1 commenced on 21st August 2019 with a closing date of 6th September 2019. As part of Stage 1 an advertisement was placed in The Area News on Friday 23rd August 2019.

Stage 2 commenced on 30th September 2019 with a closing date of 28th October 2019.

Fieldwork was carried out by OzArk and a representative from Griffith Local Aboriginal Lands Council on the 8th, 9th, 10th and 11th October 2019 with the following sites found **(Table 1)**.

Table 1. Aboriginal cultural heritage sites recorded during the survey.

Site Name	Feature(s)	Landform
Koomaringa IF-01	Isolated find	Drainage line and banks
Koomaringa IF-02	Isolated find	Slopes
Koomaringa IF-03	Isolated find	Drainage line and banks
Koomaringa OS-01	Artefact scatter	Drainage line and banks
Koomaringa OS-02	Artefact scatter & PAD	Drainage line and banks
Koomaringa OS-03	Artefact scatter	Drainage line and banks

OzArk Environment & Heritage

Site Name	Feature(s)	Landform
Koomaringa OS-04	Artefact scatter	Drainage line and banks
Koomaringa OS-05	Artefact scatter & PAD	Drainage line and banks & flats and gentle slope
Koomaringa OS-06	Artefact scatter & PAD	Drainage line and banks
Koomaringa OS-07	Artefact scatter & PAD	Drainage line and banks
Koomaringa OS-08	Artefact scatter & PAD	Drainage line and banks & flats and gentle slope
Koomaringa OS-09	Artefact scatter	Drainage line and banks
Koomaringa OS-10	Artefact scatter & PAD	Drainage line and banks & flats and gentle slope
Koomaringa OS-11	Artefact scatter	Drainage line & slopes
Koomaringa OS-12	Artefact Scatter	Slopes
Koomaringa OS-13	Artefact scatter	Slopes
Koomaringa PL-01	Procurement location (quarried felsite bedrock)	Drainage line and banks
Koomaringa PL-02	Procurement location (quarried felsite bedrock)	Slopes
Koomaringa ST-01	Scarred tree (canoe scar)	Slopes

Going forward a draft report is being prepared and request for input and feedback (**Stage 4**) will be sent out for your consideration as soon as the draft report and editing is complete.

Should you have any queries in relation to the enclosed information please do not hesitate to contact our office

Kind regards,

Rebecca Hardman
Community Liaison & Administration

8 December 2020

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8 December 2020

Members
Griffith Local Aboriginal Land Council
PO Box 8043
EAST GRIFFITH NSW 2680
grifflalc@bigpond.com

UPDATE FOR THE ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT – WESTERN RIVERINA QUARRY EXTENSION, CARRATHOOL LGA.

Dear Members,

We wish to apologise for the delay in correspondence and thank-you for your registration of interest to become a Registered Aboriginal Party (RAP) for the proposed expansion to the Western Riverina Quarry (the project) located in the Carrathool LGA which is incorporated within the Koomaringa Aboriginal Place (AP).

The purpose of this letter is to update you in relation to the progress of the above-mentioned project. As you are aware, the project commenced *Aboriginal Cultural Heritage Consultation Requirements* in August 2019.

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Stage 2 commenced on 30th September 2019 with a closing date of 28th October 2019.

Fieldwork was carried out by OzArk and a representative from Griffith Local Aboriginal Lands Council on the 8th, 9th, 10th and 11th October 2019. During the fieldwork three isolated finds, seven artefact scatters, six artefact scatters with potential archaeological deposit, two felsite procurement locations and one scarred tree were identified and recorded.

A project update letter was sent on 7 July 2020.

Going forward a draft *Aboriginal Cultural Heritage Assessment Report* is still being prepared and request for input and feedback (Stage 4 ACHCRs) will be sent out for your consideration as soon as the draft report and editing is complete.

Should you have any queries in relation to the enclosed information please do not hesitate to contact our office

Kind regards,

OzArk Environment & Heritage

Alyce Cameron
Senior Archaeologist

18 August 2021

OzArk Environment & Heritage ABN 59 104 582 354
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18 August 2021

Members
Griffith Local Aboriginal Land Council
PO Box 8043
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grifflalc@bigpond.com

UPDATE FOR THE ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT – WESTERN RIVERINA QUARRY EXTENSION, CARRATHOOL LGA.

Dear Members,

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The purpose of this letter is to update you in relation to the progress of the above-mentioned project. As you are aware, the project commenced *Aboriginal Cultural Heritage Consultation Requirements* in August 2019. Stage 1 commenced on 21st August 2019 with a closing date of 6th September 2019. As part of Stage 1 an advertisement was placed in The Area News on Friday 23rd August 2019. Stage 2 commenced on 30th September 2019 with a closing date of 28th October 2019.

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A project update letter was sent on 8 December 2020.

Going forward a draft *Aboriginal Cultural Heritage Assessment Report* is still being prepared and request for input and feedback (Stage 4 ACHCRs) will be sent out for your consideration as soon as the draft report and editing is complete.

Should you have any queries in relation to the enclosed information please do not hesitate to contact our office

Kind regards,

Alyce Cameron
Senior Archaeologist

29 May 2023

OzArk Environment & Heritage **ABN 59 104 582 354**

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29 May 2023

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UPDATE FOR THE ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT
WESTERN RIVERINA QUARRY EXTENSION, CARRATHOOL LGA.

Dear Members,

We wish to apologise for the delay in correspondence and thank-you for your registration of interest to become a Registered Aboriginal Party (RAP) for the proposed expansion to the Western Riverina Quarry (the project) located in the Carrathool LGA which is incorporated within the Koomaringa Aboriginal Place (AP).

The purpose of this letter is to update you in relation to the progress of the above-mentioned project. As you are aware, the project commenced *Aboriginal Cultural Heritage Consultation Requirements* in August 2019. Stage 1 commenced on 21 August 2019 with a closing date of 6 September 2019. As part of Stage 1 an advertisement was placed in The Area News on Friday 23 August 2019. Stage 2 commenced on 30 September 2019 with a closing date of 28 October 2019.

Fieldwork was carried out by OzArk and a representative from Griffith Local Aboriginal Land Council from 8 October to 11 October 2019. During the fieldwork three isolated finds, seven artefact scatters, six artefact scatters with potential archaeological deposit, two felsite procurement locations, and one scarred tree were identified and recorded.

A project update letter was sent to you on 8 December 2020 and on 18 August 2021.

A draft *Aboriginal Cultural Heritage Assessment Report* (ACHAR) was sent to you on 8 October 2021 with a closing date for comments of 5 November 2021. No responses were received from any of the Registered Aboriginal Parties with regard to the ACHAR.

Since that time, development of the Plan of Management (PoM) for the Koomaringa AP has proceeded, and following community consultation, this document has been finalised.

The proponent, EB Mawsons & Sons Pty Ltd, will now submit the ACHAR and the PoM to the Carrathool Shire Council for consideration of Development Application 2022/29 related to the proposed expansion of quarry operations at the Western Riverina Quarry.

Should you have any queries in relation to the enclosed information please do not hesitate to contact our office.

Kind regards,

Ben Churcher
Principal Archaeologist

6 September 2023

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6 September 2023

Griffith Local Aboriginal Land Council
grifflalc@bigpond.com

WESTERN RIVERINA QUARRY

PROJECT UPDATE: SEPTEMBER 2023

Dear Members,

Thank you for your continued interest in the Koomaringa Aboriginal Place (AP) and for the Western Riverina Quarry (WRQ) that is located within the AP.

On 8 October 2021, those of you registered as Registered Aboriginal Parties (RAPs) for the WRQ were sent a draft of the Aboriginal Cultural Heritage Assessment Report (ACHAR) that examined the heritage implications associated with the Development Application (DA20200/029) that is currently with the Carrathool Shire Council for consideration.

Those of you who are acknowledged as stakeholders for the Koomaringa AP, but are not RAPs for the WRQ, may not have received the ACHAR and we can send this to you if required.

DA20200/029 involves a limited expansion from the existing WRQ footprint and two Aboriginal sites have potential to be harmed: 42-5-0012 (Koomaringa IF-03) and 42 5-0022 (Koomaringa OS-13). Koomaringa IF-03 is a white felsite core and Koomaringa OS-13 is a scatter of two felsite flakes. Site 42-5-0021 (Koomaringa OS-12) will be conserved in place within a no-go zone.

Should DA20200/029 be approved, this will lead to a loss of value to the AP because approximately three artefacts within the AP will be harmed through being relocated to another nearby area.

When Heritage NSW reviewed the ACHAR, they requested that the views of the Aboriginal community be sought with the realisation that Aboriginal artefacts will be harmed within an AP.

To improve the Aboriginal cultural values of the AP, the WRQ has undertaken to provide access for visitors to the AP, including a car parking area with signage. The WRQ has also undertaken to plant a tree screen between the Aboriginal quarry area and the WRQ to improve the amenity of the Aboriginal site.

In addition, the original buffer boundary established in 1987 to protect the Aboriginal quarry site from the impacts of the modern quarry will be reestablished with new pegs and signage. On 11 August 2023, a site visit located many of the original buffer 1987 boundary pegs and all activities associated with DA20200/029 are outside of this pegged buffer and the significant Aboriginal sites will not be harmed.

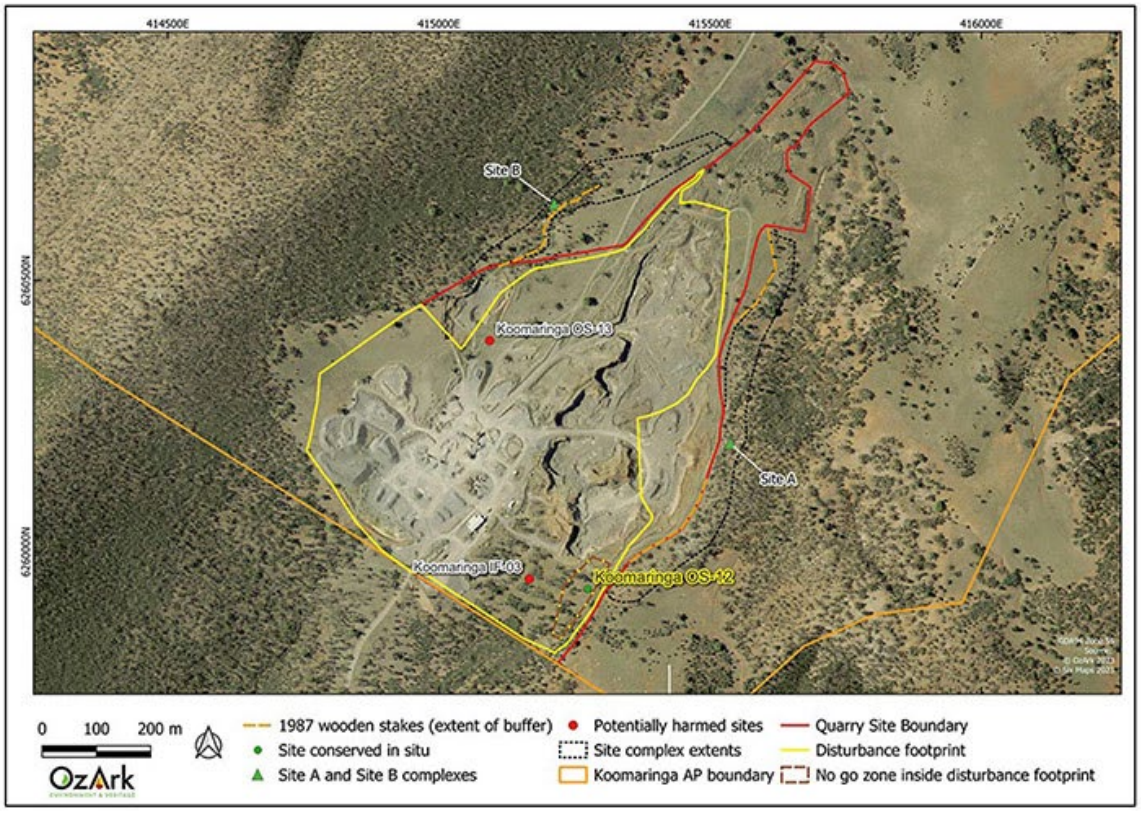
OzArk Environment & Heritage

Given the cultural significance of the AP, your views these or other management measures that will improve the cultural value of the AP are welcomed.

OzArk would like to call you and speak with you personally on these matters. Please let me know if you do not wish to be contacted.

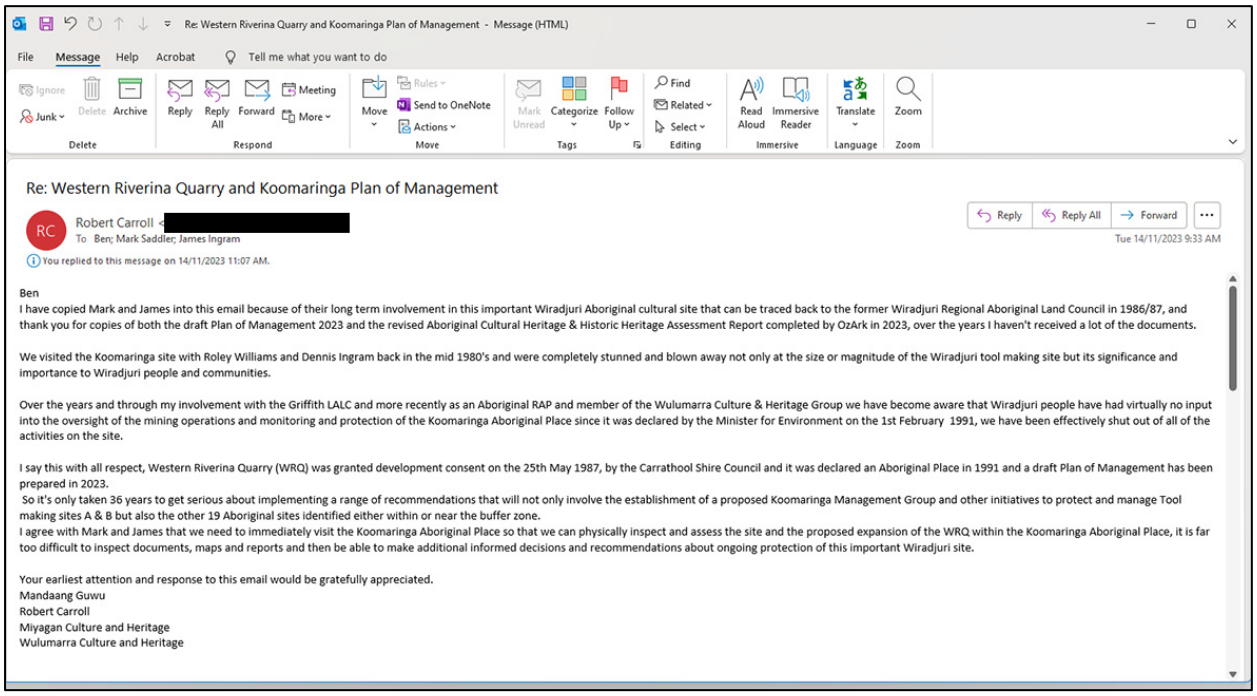
Kind regards,

Catherine Burrowes
Consultation Officer
catherine@ozarkehm.com.au



This figure shows the line of wooden stakes installed in 1987 to mark the buffer installed to avoid harm to the two most significant sites in the area, Site A and Site B (orange dotted line). Outside of the buffer is the Quarry Site Boundary, and within this, the maximum limit of disturbance should DA20200/029 be approved (the disturbance footprint). The three sites within the disturbance footprint are shown: Koomaringa IF-03 and Koomaringa OS-13 that are recommended for salvage by surface artefact collection and Koomaringa OS-12 that will be preserved in a no-go zone. As can be seen, the activity associated with DA20200/029 is mostly contained within disturbed landforms associated with the existing quarry and all proposed disturbances will not harm land within the buffer established to protect Site A and Site B.

Appendix 1 Figure 8: Email from Robert Carroll, 14 November 2023.



Re: Western Riverina Quarry and Koomaringa Plan of Management - Message (HTML)

File Message Help Acrobat Tell me what you want to do

Ignore Junk Delete Archive | Reply Reply All Forward Meeting More | Move Rules Send to OneNote Actions | Mark Unread Categorize Follow Up | Find Related Select | Read Aloud Immersive Reader | Translate | Zoom

Delete Respond Move Tags Editing Immersive Language Zoom

Re: Western Riverina Quarry and Koomaringa Plan of Management

RC Robert Carroll <[redacted]>
To Ben; Mark Saddler; James Ingram

Reply Reply All Forward
Tue 14/11/2023 9:33 AM

You replied to this message on 14/11/2023 11:07 AM.

Ben
I have copied Mark and James into this email because of their long term involvement in this important Wiradjuri Aboriginal cultural site that can be traced back to the former Wiradjuri Regional Aboriginal Land Council in 1986/87, and thank you for copies of both the draft Plan of Management 2023 and the revised Aboriginal Cultural Heritage & Historic Heritage Assessment Report completed by OzArk in 2023, over the years I haven't received a lot of the documents.

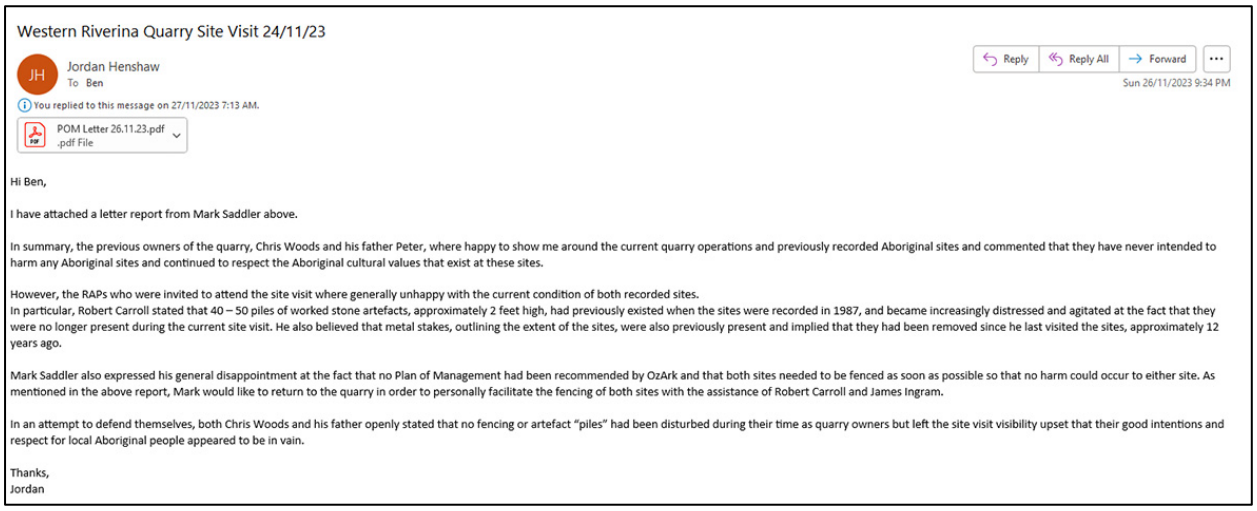
We visited the Koomaringa site with Roley Williams and Dennis Ingram back in the mid 1980's and were completely stunned and blown away not only at the size or magnitude of the Wiradjuri tool making site but its significance and importance to Wiradjuri people and communities.

Over the years and through my involvement with the Griffith LALC and more recently as an Aboriginal RAP and member of the Wulumarra Culture & Heritage Group we have become aware that Wiradjuri people have had virtually no input into the oversight of the mining operations and monitoring and protection of the Koomaringa Aboriginal Place since it was declared by the Minister for Environment on the 1st February 1991, we have been effectively shut out of all of the activities on the site.

I say this with all respect, Western Riverina Quarry (WRQ) was granted development consent on the 25th May 1987, by the Carrathool Shire Council and it was declared an Aboriginal Place in 1991 and a draft Plan of Management has been prepared in 2023.
So it's only taken 36 years to get serious about implementing a range of recommendations that will not only involve the establishment of a proposed Koomaringa Management Group and other initiatives to protect and manage Tool making sites A & B but also the other 19 Aboriginal sites identified either within or near the buffer zone.
I agree with Mark and James that we need to immediately visit the Koomaringa Aboriginal Place so that we can physically inspect and assess the site and the proposed expansion of the WRQ within the Koomaringa Aboriginal Place, it is far too difficult to inspect documents, maps and reports and then be able to make additional informed decisions and recommendations about ongoing protection of this important Wiradjuri site.

Your earliest attention and response to this email would be gratefully appreciated.
Mandaang Guwu
Robert Carroll
Miyagan Culture and Heritage
Wulumarra Culture and Heritage

Appendix 1 Figure 9: Email record of site visit, 24 November 2023.



Western Riverina Quarry Site Visit 24/11/23

JH Jordan Henshaw
To Ben

Reply Reply All Forward
Sun 26/11/2023 9:34 PM

You replied to this message on 27/11/2023 7:13 AM.

POM Letter 26.11.23.pdf
.pdf File

Hi Ben,

I have attached a letter report from Mark Saddler above.

In summary, the previous owners of the quarry, Chris Woods and his father Peter, where happy to show me around the current quarry operations and previously recorded Aboriginal sites and commented that they have never intended to harm any Aboriginal sites and continued to respect the Aboriginal cultural values that exist at these sites.

However, the RAPs who were invited to attend the site visit where generally unhappy with the current condition of both recorded sites.
In particular, Robert Carroll stated that 40 – 50 piles of worked stone artefacts, approximately 2 feet high, had previously existed when the sites were recorded in 1987, and became increasingly distressed and agitated at the fact that they were no longer present during the current site visit. He also believed that metal stakes, outlining the extent of the sites, were also previously present and implied that they had been removed since he last visited the sites, approximately 12 years ago.

Mark Saddler also expressed his general disappointment at the fact that no Plan of Management had been recommended by OzArk and that both sites needed to be fenced as soon as possible so that no harm could occur to either site. As mentioned in the above report, Mark would like to return to the quarry in order to personally facilitate the fencing of both sites with the assistance of Robert Carroll and James Ingram.

In an attempt to defend themselves, both Chris Woods and his father openly stated that no fencing or artefact "piles" had been disturbed during their time as quarry owners but left the site visit visibility upset that their good intentions and respect for local Aboriginal people appeared to be in vain.

Thanks,
Jordan

Appendix 1 Figure 10: Letter from Mark Saddler (Bundyi Culture), 26 November 2023.

Bundyi Cultural Services

Mark Saddler

Koomaringa Aboriginal Place, Rankin Springs, NSW

Bundyi Cultural Services, Mark Saddler

26/11/2023

Artwork by Mark Saddler. (Copyright)

Artwork Title, Murrawarra (stand your ground, protect)

Back Ground Artwork "Ngumbaay Bula Bila Mayiny (3 River people)

Mark Saddler

This report was compiled by Bundyi Cultural Services !

Contents:

Page 1: Title Page.
Page 2: Contents, Acknowledgement.
Page 3: Travelling Stock Reserves (TSRs)
Page 4: Objectives, Objects.
Page 5: Due Diligence.
Page 6: Due Diligence Flow Chart.
Page 7: AHIMS Data Base Search.
Page 8: Site Location Maps.
Page 9: Site Recordings, Site Information.
Page 10: Contact Information.
Page 11: Site Report and Recommendations.
Page 12: Site Report and Recommendations.
Page 13: References and End Report

"I would like to acknowledge the traditional custodians of this land, my land, "The Wiradjuri People"

What I record and find is dedicated to those who have gone before us, to those present and to those who will follow us"

Mark Saddler, Wiradjuri Gibirr (man)

2

Travelling Stock Reserves (TSRs)

Travelling Stock Reserves (TSRs) are parcels of Crown land reserved under legislation for use by travelling stock. Local Land Services is responsible for the care, control and maintenance of almost 500,000ha of TSRs in NSW.

TSRs provide pasture reserves for travelling or grazing stock. These reserves can be beneficial in times of drought, bushfire or flood. They are also used for public recreation, apiary sites and for conservation.

Local Land Services manages the land to strike a balance between the needs of travelling or grazing stock and the conservation of native species.

The role of Local Land Services role in managing TSRs includes:

- *Authorising and monitoring stock, recreation and apiary site use*
- *Controlling noxious weeds*
- *Controlling pest animals and insects*
- *Provision and maintenance of fencing, watering points and holding yards*
- *Consideration of land management and animal health legislation.*

Local Land Services has developed the first draft state-wide planning framework for TSRs to support the future management of this land. We are now keen to hear from the public with their opinions on how to manage TSRs in the future. We want to understand the values people hold important for TSRs, including biodiversity and Aboriginal cultural heritage values.

The draft state-wide framework allows for the development of TSR regional management plans to facilitate more consistent and transparent management, resourcing and reporting.

NSW Travelling Stock Reserves Draft State Planning Framework 2016-19
TSR State Planning Framework Fact Sheet
Frequently asked questions

3

Aboriginal objects:

Aboriginal objects are physical evidence of the use of an area by Aboriginal people. They can also be referred to as 'Aboriginal sites', 'relics' or 'cultural material'.

Aboriginal objects include:

** Physical objects, such as stone tools, Aboriginal-built fences and stockyards, scarred trees and the remains of fringe camps*
** Material deposited on the land, such as middens*
** The ancestral remains of Aboriginal people.*

Handicrafts made by Aboriginal people for sale are ***not*** *'Aboriginal objects' under the NPW Act.*
Known Aboriginal objects and sites are recorded on OEH's Aboriginal Heritage Information Management System (AHIMS). If you find a site you should report it to us.

Protecting Aboriginal objects and places:

You will need to exercise due diligence in determining whether your actions will harm Aboriginal objects. The ***Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW***
http://www.environment.nsw.gov.au/resources/cultureheritage/ddcop/10798ddcop.pdf
This link will explain and provide practical guidance about what due diligence means. Anyone who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defence against prosecution for the strict liability objects offence if they later harm an Aboriginal object.

An Aboriginal Heritage Impact Permit (AHIP) can be issued by OEH under Part 6 of the NPW Act where harm to an Aboriginal object or Aboriginal place cannot be avoided. An AHIP is a defence to a prosecution for harming Aboriginal objects and/or Aboriginal places if the harm was authorised by the AHIP and the conditions of that AHIP were not contravened.

Find out about AHIPs, due diligence and care agreements see ***Information on Aboriginal Heritage Impact Permits.***
http://www.environment.nsw.gov.au/licences/Section87Section90.htm

4

Purpose of code of practice for Due Diligence.

This code of practice is to assist individuals and organisations to exercise due diligence when carrying out activities that may harm Aboriginal objects and to determine whether they should apply for consent in the form of an Aboriginal Heritage Impact Permit (AHIP). The National Parks and Wildlife Act 1974 (NPW Act) provides that a person who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defence against prosecution for the strict liability offence if they later unknowingly harm an object without an AHIP.

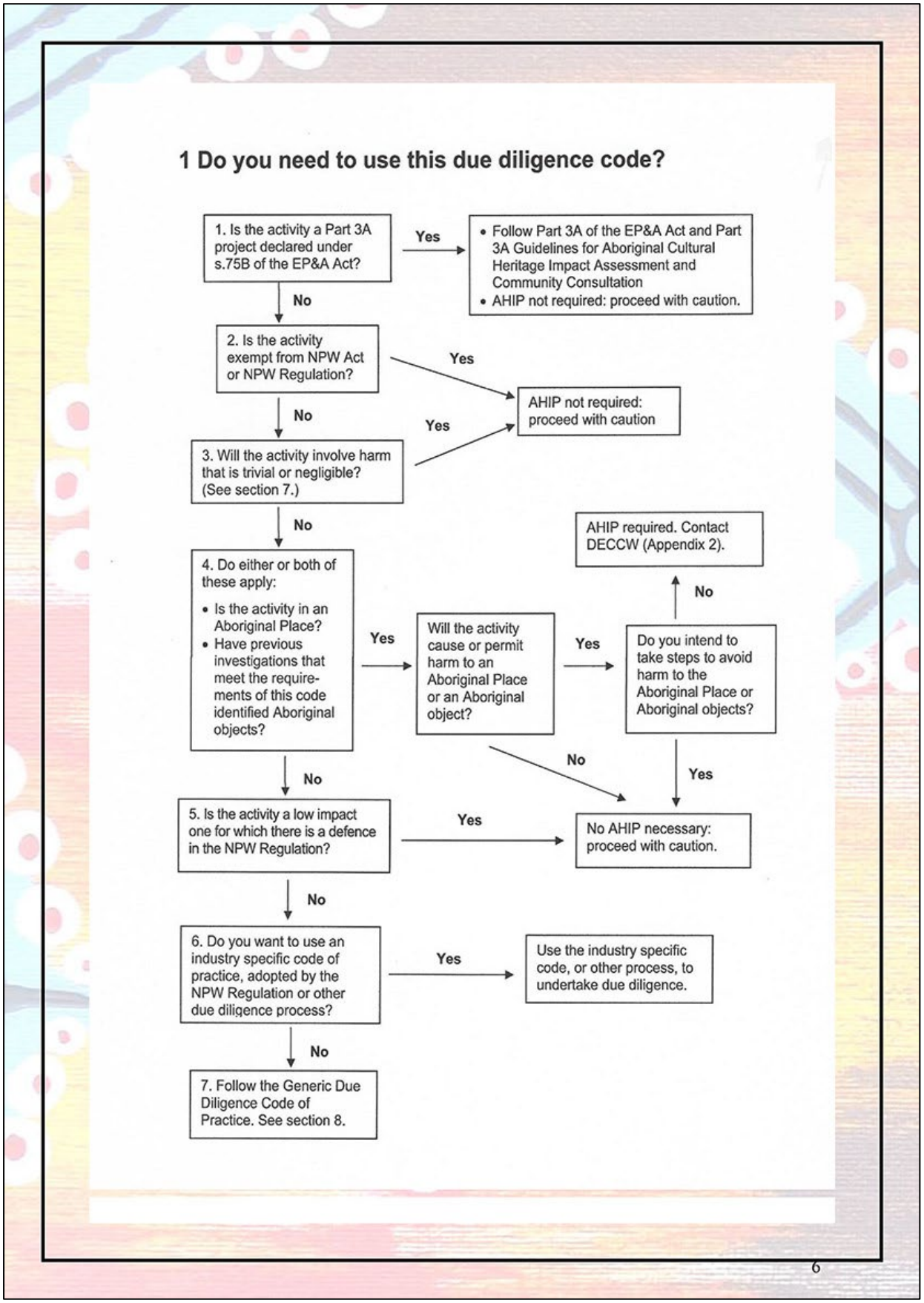
The NPW Act allows for a generic code of practice to explain what due diligence means. Carefully following this code of practice, which is adopted by the National Parks and Wildlife Regulation 2009 (NPW Regulation) made under the NPW Act, would be regarded as 'due diligence'. This code of practice can be used for all activities across all environments.

This code sets out the reasonable and practicable steps which individuals and organisations need to take in order to: 1 identify whether or not Aboriginal objects are, or are likely to be, present in an area 2 determine whether or not their activities are likely to harm Aboriginal objects (if present) 3 determine whether an AHIP application is required.

If Aboriginal objects are present or likely to be present and an activity will harm those objects, then an AHIP application will be required. Information about the permits and how to apply for them can be obtained through the Department of Environment, Climate Change and Water (DECCW) website at

www.environment.nsw.gov.au/licences/index.htm.

5


1 Do you need to use this due diligence code?
1. Is the activity a Part 3A project declared under s.75B of the EP&A Act?
Yes
• Follow Part 3A of the EP&A Act and Part 3A Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation
• AHIP not required: proceed with caution.
No
2. Is the activity exempt from NPW Act or NPW Regulation?
Yes
AHIP not required: proceed with caution
No
3. Will the activity involve harm that is trivial or negligible? (See section 7.)
Yes
No
4. Do either or both of these apply:
• Is the activity in an Aboriginal Place?
• Have previous investigations that meet the requirements of this code identified Aboriginal objects?
Yes
Will the activity cause or permit harm to an Aboriginal Place or an Aboriginal object?
Yes
Do you intend to take steps to avoid harm to the Aboriginal Place or Aboriginal objects?
No
AHIP required. Contact DECCW (Appendix 2).
No
Yes
No AHIP necessary: proceed with caution.
No
5. Is the activity a low impact one for which there is a defence in the NPW Regulation?
Yes
No
6. Do you want to use an industry specific code of practice, adopted by the NPW Regulation or other due diligence process?
Yes
Use the industry specific code, or other process, to undertake due diligence.
No
7. Follow the Generic Due Diligence Code of Practice. See section 8.

AHIMS Data Base Search.

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : 16.11.23/1
Client Service ID : 840357

Mark Saddler

Date: 16 November 2023

P.O.Box 8005 Kooringal Post Office
Kooringal New South Wales 2650

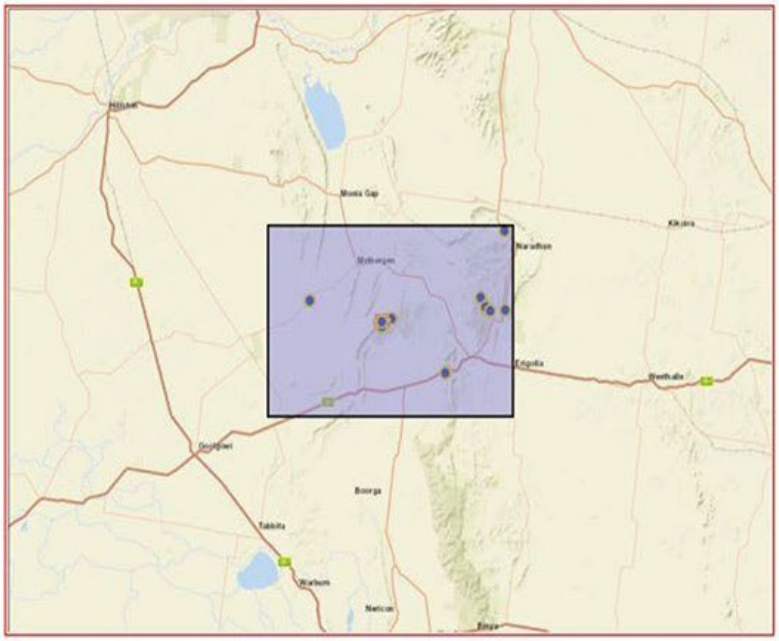
Attention: Mark Saddler

Email: marksad@live.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -33.9273, 145.8543 - Lat, Long To : -33.6499, 146.3487, conducted by Mark Saddler on 16 November 2023.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

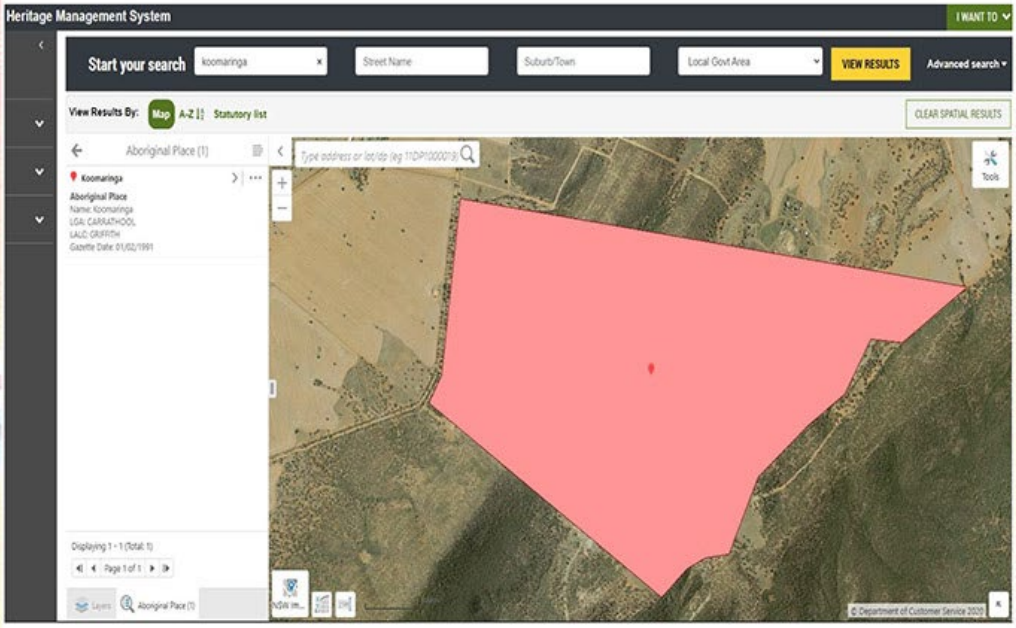


A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

36	Aboriginal sites are recorded in or near the above location.
1	Aboriginal places have been declared in or near the above location. *

ID	Aboriginal Place Name
18	Koomaringa

Maps and reference location to site:



8

Site recordings and location of site cards relevant to this site:

Site name	Koomaringa AP, Rankin Springs, NSW		
Recorder	Mark Saddler		
Contact details	Ph 0412 693 030	Email:	marksad@live.com.au
Date prepared	26/11/2023	Web:	http://www.bundyiculture.com.au/

AHIMS ID (Site Card ID)	Site Type	Location of Site Cards on Web Page.	Date Recorded

Any site cards that have been done have been recorded by OzArk Environment & Heritage.
Please contact Ben Churcher
Principal Archaeologist Ph 0416 009 910

9

Contact Information

Stakeholder details	*Responsibilities*	
Jackie Taylor Senior Heritage Officer	*Heritage Programs, West - Heritage NSW*	*(02) 6229 7089*
National Parks and State Forests	*Head Office*	
Thomas Walter, Milbrae	*Reginal Quarry Manager*	*0407 324 586*
Bundyi Cultural Services, Mark Saddler	*Culture Advisor, Recorder, Knowledge Holder*	*0412 693 030*
Ben Churcher Principal Archaeologist. OzArk Environment & Heritage	*Heritage Consultant*	*0416 009 910*

To find out more about Cultural Site Management, rules and protection go to this these web page links for more in depth information.

Do you need to use the due diligence code?

http://www.environment.nsw.gov.au/resources/cultureheritage/ddcop/10798ddcop.pdf

*OEH **legislation** which ensures that Aboriginal cultural heritage must be considered as part of land management practices.*

http://www.environment.nsw.gov.au/conservation/aboriginalculture.htm

10

Site Report and Recommendations.

26/11/2023

Koomaringa AP, Rankin Springs, NSW. Wiradjuri Country.

On my site inspection on 24/11/2023, I walked and covered a very large area of Koomaringa AP, Rankin Springs, to assist in trying to locate many hundreds of artifacts for safe keeping and protection. This work is to assist the current and former owners of the quarry site which sits inside the Aboriginal Place (AP).

Koomaringa is a very spiritual place for my Wiradjuri people and as such has many special places, songlines and dreaming places that my people have cared for and continue to have connection to for over 80,000 + years.

On my recent visit, I witnessed that no exclusion zones or fencing were evident in the area that needs protection from quarry works. As this AP has had many visits from OzArk and others, to record sites and places, (recordings from 1987 to current day) I struggle to understand why the old and current quarry owners have not been correctly informed on their responsibility to protect this ancient site from any further destruction?

I have several questions and also some statements that I will make that need to have urgent replies and action taken.

***Question:** Why is it that exclusion zones have not been erected in the areas of our artifacts and special places so as to protect from further damage?*

***Question:** Why is it that a "Plan of Management" (POM) has not been done or asked to done by those who have declared this place an AP, and why have the people who have written reports with regards to this place not insisted or enforced that a POM be done in the past?*

***Question:** On the day of my survey 24/11/2023, I saw a sign on the Northern Entrance that states that "Carrathool Shire" had an "Application of Development" lodged for a "Rock Quarry & Gravel Crushing Plant" I would ask to be able to see that application to verify the information and the approval processes that may or may not have taken place?*

***Statement:** Myself, Mark Saddler RAP, Uncle James Ingram, RAP and Uncle Rob Carroll, RAP are deeply concerned about what has happened to this AP. The reason why we attended this week onsite was because I was aware that WaterNSW had been accepting Basalt Rock from this quarry site and I was very concerned about the fact that this AP does not have a POM in place for the protection of our sites. I told WaterNSW to stop taking resources from this quarry site until we sort out the issues.*

Uncle James Ingram and Uncle Rob Carroll will, in due course, also write letters about their feelings and investigations of this appalling lack of attention to detail with regards to an AP and an ancient Wiradjuri site.

For those Ministers, Governments, councils, shires and other departments and staff, including archaeologists who have so badly disrespected this site and our Wiradjuri culture, by not ensuring and enforcing a POM be in place from before the AP declaration in 1991, I will be addressing your roles as well very shortly.

I believe that the previous and current quarry owners/operators have sought to get the right information from those who should know about these things. The quarry owners/operators should be very disappointed in how their monies have been spent for trying to gain

11

assistance in how to protect and work in an AP area as the information and assistance has not been correctly done or supplied.

To date, I still have not seen any information on a POM, or how to fix what has gone wrong.

With regards to the AP and POM, I insist that myself, Uncle James Ingram and Uncle Rob Carroll be engaged for at least 5-7 days work to oversee the erection of exclusion zones, the expansion of recorded site areas, the more in depth and complete survey work and site recording, and the allowing of myself to do 3 D Drone Mapping of the area.

The 3 D Mapping is done for my information, if these are wanted by others then a set rate, which will be advised, will be charged.

Also, our contract rates for the above work will need to be negotiated with those concerned. As we already have our work rates and conditions for other jobs in place, these can be supplied in further discussions.

In conclusion, to have an ancient Wiradjuri quarry site of at least 40,000 years treated in these most disrespected ways just makes me shake my head and point my finger at those who have failed in their duties as public servants and professionals in their fields of expertise.

Yuwin Ngadhi Mark Saddler Ngurrigiilang Wiradjuri Gibirr!

(Name Mine Mark Saddler Proud Wiradjuri Man)

To understand more about working in and around aboriginal sites look at the procedures to work around Aboriginal sites. Information can be found at this link,

http://www.aboriginalheritage.org/sites/legislation/

12

References:

OEH, http://www.environment.nsw.gov.au/

Local Land Services, http://www.lls.nsw.gov.au/livestock/stock-routes

Mark Saddler, Cultural Advisor and Knowledge holder, www.bundyiculture.com.au

Goggle Earth Maps, https://www.google.com/earth/

Aboriginal Heritage, http://www.aboriginalheritage.org/sites/legislation/

Prepared by:
Mark Saddler, Bundyi Cultural Services
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Copyright Mark Saddler Artwork and Report.

13

Appendix 1 Figure 11: Letter from Robert Carroll (Miyagan Culture and Heritage), 29 November 2023.

Miyagan Culture and Heritage

ABN: 90613071198

Address: [redacted]

Email: [redacted]

Mobile: [redacted]

"Koomaringa Aboriginal Place & Quarry"

I write pertaining to my walk over and inspection of the above significant Wiradjuri site on the 24th November 2023, in the company of Mark Saddler – Bundyi Cultural Services, James Ingram – Bidya Marra consultancy, the current owner and various staff from the quarry.

I first visited the Koomaringa rural property with Roley Williams – Aboriginal site curator with the Wiradjuri RALC at the invitation of the then owner Glen Neyland way back in 1987, to inspect the size and significance of this unique Wiradjuri Aboriginal tool making site.

This was not the only occasion I have visited the site, in fact over the years I have been out to it previously with James Ingram, Roley Williams, Dennis Ingram, and Stephen Young on several occasions.

What astounded Roley, I and everyone else who has ever visited the site was its overall size, which included A & western Cultural B tool making sites and the sheer numbers of mounds of worked felsite debitage or tailing's, artefacts, bedrock anvils and the percussion scars that are clearly visible on the remaining felsite vein which were created by ancient Wiradjuri tool makers smashing larger basalt blocks into it to gather core material for further working.

In February of 1987, Dan Witter – Archaeologist with National Parks &Wildlife Service (NP&WS) at Coonabaraban completed an inspection and Report with Judith Webster also of NP&WS and commented that the:

"Koomaringa Aboriginal stone quarry is an outstanding example of its kind, he also estimated that it is between 5,000 and 20,000 years old and could have been used as an ancient Wiradjuri tool making site for up to 40,000 years".

What has disappointed me, and many other Wiradjuri people is that this important Aboriginal site has never been afforded the importance, care and protection that it rightfully warrants/deserves by previous or current owners of the Quarry or by any government agency that has the legislative responsibility for the ongoing protection of significant Aboriginal Places, sites or cultural material.

I remember in an earlier visit to the site, that I clearly noticed there were very visible steel star pegs with yellow plastic tips marking the buffer or exclusion area to the site, they all appear to have been removed, and only a few wooden pegs remain and the once very noticeable and prominent mounds of worked felsite debitage or tailings have all been scattered and are no longer visible.

My question is why was this allowed to happen and who was responsible for it happening? because it has completely ruined the protection and overall appearance and importance of the site to any potential future untrained Aboriginal or non-Aboriginal visitor to the site eg Elder or children's groups undertaking a cultural or education excursion.

These prominent Wiradjuri tool making felsite debitage mounds need to be re-established and fenced off for ongoing protection from native or feral animals such as emu's, kangaroos, pigs and goats.

Why are there no Cultural signs on the edge of the buffer or exclusion zone that clearly explains the history, significance, and importance of the Koomaringa Aboriginal Place to various traditional and contemporary Wiradjuri Aboriginal groups and communities?

Why has it taken so long to develop a "Plan of Management" for the Koomaringa Aboriginal Place, when you consider it was declared an Aboriginal Place back on the 1st of February 1991, and received a letter of support from the Griffith LALC to acquire government grant funding on the 25th of January 2019, and now finally there is light at the end of tunnel and a draft document.?

Why have members of various Wiradjuri Aboriginal communities and RAPs been effectively shut out of the "Komaringa Aboriginal Place" over the past 30 odd years and yet the various owners such as Milbrae Quarries Pty Ltd and EB Mawson & Sons Pty Ltd been allowed to mine non-stop, with no-one engaged on a full-time or part-time basis to regularly monitor the impacts or effects of the mining on the Aboriginal site or on nearby Aboriginal communities?

Have any of the previous or current mine owner provided any type of training or employment opportunities, educational scholarships/sponsorships or Aboriginal community development funding to Aboriginal individuals or Aboriginal communities during the life of the Koomaringa quarry, if not why hasn't this occurred?

Why hasn't a road been marked out and inspected for Aboriginal cultural material and then graded which would allow for easy walking or vehicle access to eastern Cultural site A?

There are so many other questions and concerns that need to be addressed around the ongoing quarrying within the "Koomaringa Aboriginal Place" and the ongoing protection of Wiradjuri Aboriginal Cultural Sites A & B.

I understand that Mark Saddler – Bundyi Cultural Services has made a number of recommendations within his comments, I strongly support his recommendations and I look forward to working with both Mark and James to immediately address some of our mutual concerns.

Mandaang Guwu (Thank you)

Robert Carroll
Wiradjuri Ngurrundra Gibir

Appendix 1 Figure 12: Letter from Mark Saddler (Bundyi Culture), 29 November 2023.

29th November 2023

To OzArk Environment & Heritage & Geoff Pigram PA Woods Pty Ltd.

My comments and replies to your Plan of Management Koomaringa Aboriginal Place, Rankin Springs, NSW, June 2023 are as follows.

Section 1.3.5 Historical management arrangements within the Aboriginal Place, Page 9.

Quote "The stakeholder and landowners will take steps to mitigate the harm to Aboriginal Places which may be caused by animals".

What steps WILL be enforced onto stakeholders and landholders?

Section 1.3.5 Historical management arrangements within the Aboriginal Place, Page 10.

Quote "Stakeholders and landowners will be encouraged to consider the need for buffer zones around specific, sensitive sites within the Aboriginal Place"

I insist that buffer zones be enforced and not just encouraged.

Section 1.4 CULTURAL HERITAGE VALUES Page 12,

Quote "On 25 January 2019 Mr. Ethan Williams on behalf of the Griffith Local Aboriginal Land Council wrote:

This unique Wiradjuri Aboriginal quarry is of enormous spiritual and cultural significance to many Aboriginal groups and communities throughout this Region, and needs to be afforded the cultural respect, appreciation and protection it deserves."

Why is it that Mr. Ethan Williams did not enforce that buffer zones and that fencing be erected for the protection of our ancient site back in 2019?

Just making statements does not give protection of sites, they are only words spoken!

Section 2 MANAGEMENT PLAN

2.1 WIRADJURI STAKEHOLDERS AND OTHER PARTIES

In this section it appears that my name and role has not been entered, please ensure that Mark Saddler, Bundyi Culture RAP is included.

Also, I state that I was not sent the draft POM at any stage during this process. I find that strange as I was the one that instigated the investigation into WaterNSW taking resources from an Aboriginal Place that had no POM in place. So why is it that I was not given the draft report POM until 28/11/2023?

Section 3.1 KOOMARINGA MANAGEMENT GROUP

I need this report to also reflect the high importance of local Wiradjuri RAP (Registered Aboriginal Parties) in the draft report POM. Not just LALC's. It appears as though RAPs have been excluded from this process and report, we must be included as RAPs and "Knowledge Holders" in all processes in this report and POM and also in the KOOMARINGA MANAGEMENT GROUP. Also be advised that Wiradjuri Quarry Sites are mainly areas for men.

4.7.2 Newly identified heritage items

2. Advice will first be sought from a qualified archaeologist to determine whether the find constitutes an Aboriginal object, or a historic item of heritage significance.

This point needs to be expanded to include that "Wiradjuri Knowledge Holders and RAPs" be included in the process of identifying our items. Archaeologists are not the knowledge holders of our culture, we are.

4.8 SPECIFIC MANAGEMENT MEASURES TO MITIGATE RISK TO KNOWN HERITAGE SITES

4.8.1 Site demarcation and signage

There are sixteen sites located outside the maximum limit of disturbance at the WRQ (Koomaringa OS-01, OS-02, OS-3, OS-4, OS-05, OS-06, OS-07, OS-8, OS-09, OS-10, OS-11, IF-01, IF-02, PL-01, PL-02, and ST-01). To protect these sites from any inadvertent impacts during the life of the WRQ, it is recommended that two-star pickets with a sign attached between them be installed at each site facing the most obvious direction of travel from the quarry area.

We local RAPs are to be involved in the process of marking these above areas. Remuneration must also be paid for the time our people spend to do this work.

4.8.3 Public / Aboriginal community access

Permission to access the Koomaringa AP must be sought in writing from the Koomaringa Management Group.

You have no contact details for the above group in your Contacts, Page 45.

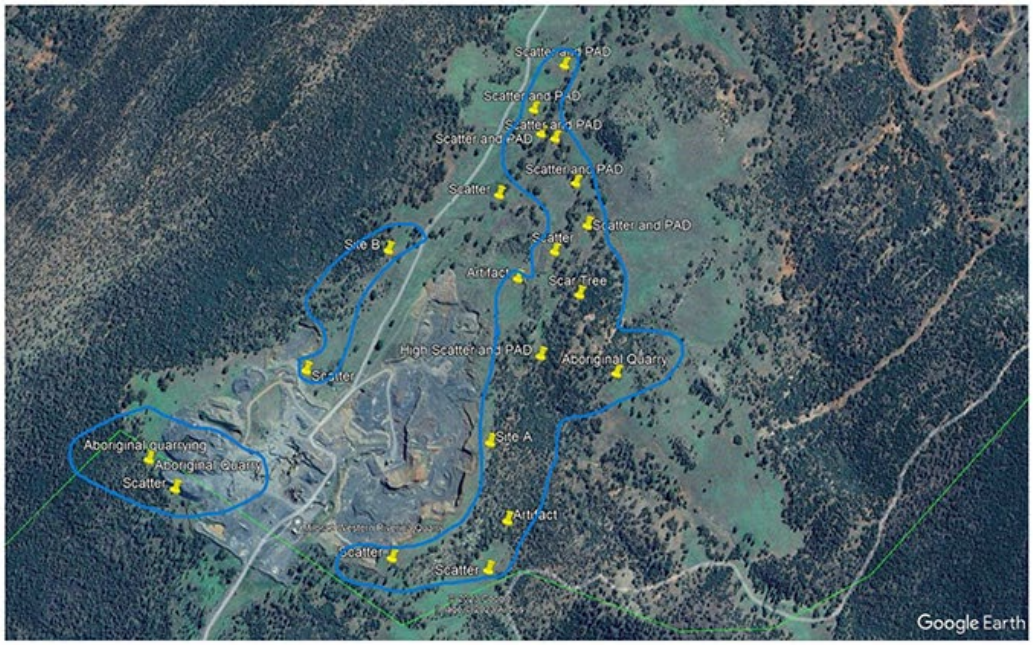
With regards to our survey work next week, James Ingram, Robert Carroll and Mark Saddler (RAPs) will be onsite and searching for the sites that have been recorded in your report, page 14.

We intend to also have Site A and Site B expanded so as to ensure that good coverage of artifacts and PADS are protected. We will be marking out places to have fencing erected as well.

Once the fencing is done (urgently) we will return to ensure that this has been done to our satisfaction. We would then insist that the new expanded areas and sites be updated on AHIMS to reflect the widened areas and protection zones.

I also have concerns about the Southern Side of the quarry site that has an area of high importance, site Koomaringa PL-01. This site has not been given exclusion zone status as have Sites A & B. Why is that? (see attached map next page)

My attached map also shows the extended areas of protection that I want to also have covered as we have many items and places that have already been recorded but have been left out of exclusion zone areas. Some areas are also very close to the places where this quarry operation are dumping their unwanted resources. Vehicles are driving over our sites.



Can I also have Ben Churcher supply me the GPS Eastings and Northings coordinates for the boundary areas of Sites A and B so that next week we can better identify the areas for widening fencing boundaries. Once done the areas then need to be surveyed again, GPS and recorded to AHIMS

I need to have my questions answered urgently and also need to have the GPS points sent to me this week.

Guwayu (safe travels)

Mark Saddler

Bundyi Culture

E: marksad@live.com.au

P: 0412 693 030

Appendix 1 Figure 13. Letter from Mark Saddler 3 January 2024.

"Plan Of Management (POM) for Koomaringa"

Important issues that need to be addressed and included in the POM Report.

- *A strong all-out effort/attempt must be made by NP&WS - Heritage NSW to elevate the importance and significance of the Wiradjuri Koomaringa tool making and cultural sites to government, mainstream community, Wiradjuri Aboriginal people and communities but also to anyone and everyone who has a deep interest in the ongoing protection and promotion of traditional Aboriginal culture and history.*

- *Registered Aboriginal Party (RAP) Names must be entered into the Plan Of Management as Mark Saddler - Bundyi Culture, James Ingram - Bidya Marra, Robert Carroll & Neerim Carroll -Miyagan Culture & Heritage.*

- *Four (4) Steel/aluminium signs are to be erected on steel poles at the North entrance, and just inside the individual boundary protection fences to major tool making Sites A, B and C (Which is located in a northern direction and adjacent to a massive pile of crushed rock/metal) at Koomaringa that advise of the importance of the area and also of the history of the Toolmaking site to Wiradjuri people and their traditional country. (The signs can be designed and produced at Design & Signs, Unit 2/68 Willandra Ave, Griffith - 02 69641488) These signs are to be designed by local RAPs and Aboriginal communities. The cost of the signs and their erection is to be to be paid for by the quarry owners.*

- *The ongoing monitoring of the quarry site and important cultural sites by the RAPs is to occur at least 4 times a year, these roles will be remunerated by agreed contracts.*

- *Feral animal "Eradication Programs' ' for feral pigs and goats need to be undertaken on an ongoing basis because these animals after wet weather are digging up the country, dispersing artefacts and destroying Wiradjuri sites.*

- *Community and individual access to Wiradjuri Cultural Places Toolmaking Sites A,B and C at Koomaringa is to be allowed to continue into the future with appropriate times and dates agreed to by all parties.*

- *A proportion of the existing poor road up to Site B Toolmaking site needs to be further developed/graded which would allow vehicle access for Aboriginal Elders and other interested groups entering from the "Northern Access Gate"*

- *A large "Car Park" and shelter area to be erected opposite Site A so that Wiradjuri Elders can undertake cultural training for our people as well as to non-Aboriginal people. Shelter should be large enough to accommodate at least 30 + people with some seating areas. and a Car Park for at least 10 cars.*

1

- *Cultural Training and Awareness Programs to be delivered to all staff who work on or with Koomaringa and any other quarry sites in Wiradjuri country. This will be delivered by Bundyi Culture as per an agreed contract. This must take place urgently.*

- *A written commitment to erect further fencing to protect additional recently identified Northern Wiradjuri cultural areas.*

Since Uncle Rob Carroll, Uncle James Ingram and myself have been out to Koomaringa and surveyed large areas, we are requesting that the exclusion zones for sites A, B and C be documented to AHIMS as we have extended those areas to try and cover as many special areas and Wiradjuri cultural items as possible.

Further sites to the North of Koomaringa also need to be protected and fenced in the very near future to ensure that these sites are also protected from any further quarry expansion. See Map 1 Page 3. Sites highlighted Red Circles.

We also need Site C, to the South of Quarry, also to be included in the AHIMS update as a protected area. This area also has had exclusion zone fencing erected. See Map 2, Page 3. Site highlighted Red Pins.

With regards to 1.3.3 Local development POM (Plan of Management) Report.

Western Riverina Quarry (WRQ), also known as Koomaringa Quarry, was originally granted development consent by the Carrathool Shire Council on 25 May 1987 with a modified development consent granted on 19 July 1991.

As WRQ are seeking an extension their quarry site, I request a copy of the "modified Development Consent" that was granted on 19th July 1991 as well as any other consents that may have been granted, so as we may read and understand the extent of the proposed expansion areas to assess what, if any, further interference with our Wiradjuri places and items may possibly occur.

As RAPs, Wiradjuri Senior Men and Uncles, we are satisfied that Mr Chris Woods has done what we have asked, with regards to erecting "Exclusion Zone Fencing" to try to protect our Wiradjuri culture and places.

Once we can see the revised POM (Plan of Management) written, commitments in writing with regards to our requests for Koomaringa and the extension of our exclusion zones recorded to AHIMS, we would be in agreement to have WaterNSW continue to source from Koomaringa Quarry Site knowing that a correct POM (Plan of Management) is in place.

Guwayu (Safe Travel)

Mark Saddler - Bundyi Culture (RAP)

James Ingram - Bidya Marra (RAP)

Robert Carroll & Neerim Carroll -Miyagan Culture & Heritage. (RAP)

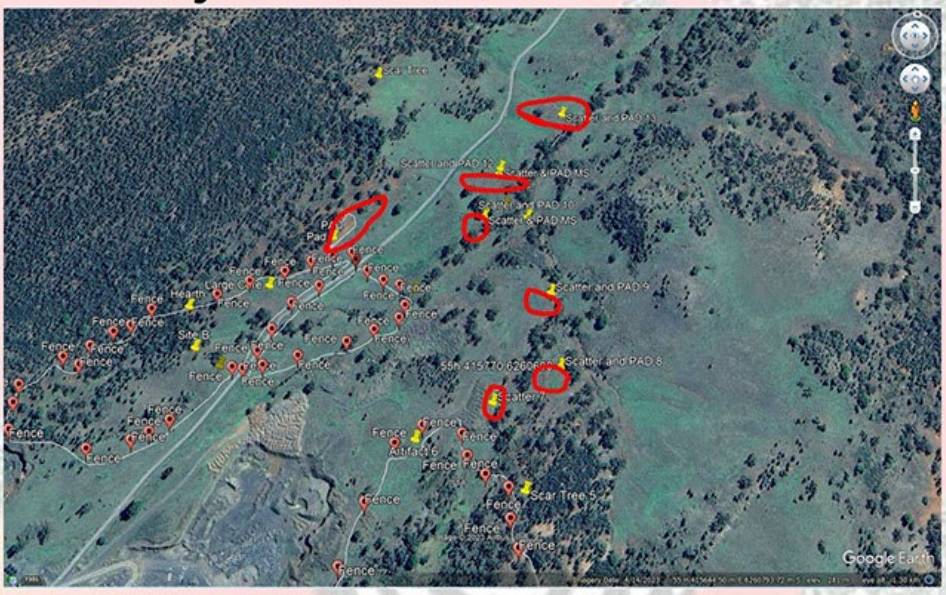
3rd January 2024.

Background Artwork, Murrawarra (Stand Your Ground) Mark Saddler

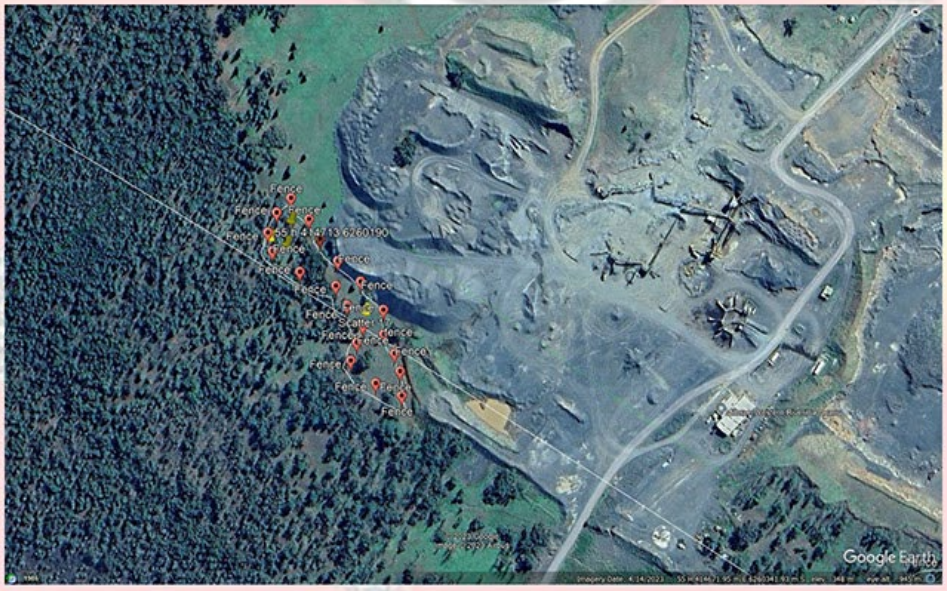
2

Map 1 Sites A & B

Wiradjuri Artifacts and Work Areas



Map 2 Site C



3

Appendix 1 Figure 14: OzArk response to RAP submissions.

Response to Robert Carroll - Miyagan Culture & Heritage

OzArk Environment & Heritage
Dubbo | Queanbeyan
Wollongong | Newcastle
Katoomba
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enquiry@ozarkehm.com.au
www.ozarkehm.com.au
ABN 59 104 582 354
145 Wingewarra St
PO Box 2069
DUBBO NSW 2830

18 February 2024

Robert Carroll & Neerim Carroll -Miyagan Culture & Heritage

KOOMARINGA ABORIGINAL PLACE PLAN OF MANAGEMENT
RESPONSE TO RAP SUBMISSIONS

Dear Robert,

Thank you for your letter of 29 November 2023 regarding the Plan of Management (POM) for Koomaringa Aboriginal Place.

I have taken the liberty to tabulate your main questions and have provided a response to each below.

Should anything here raise any concerns, please do not hesitate to get in touch.

Kind regards,

Ben Churcher
Principal Archaeologist
ben@ozarkehm.com.au

RAP comment	OzArk comment
I remember in an earlier visit to the site, that I clearly noticed there were very visible steel star pegs with yellow plastic tips marking the buffer or exclusion area to the site, they all appear to have been removed, and only a few wooden pegs remain and the once very noticeable and prominent mounds of worked felsite debitage or tailings have all been scattered and are no longer visible.	This concern has been acted on with the establishment of new fencing to protect Sites A, B, and C. OzArk is not aware of the 'felsite mounds' and has no comment on why they may not be present today.
My question is why was this allowed to happen and who was responsible for it happening? because it has completely ruined the protection and overall appearance and importance of the site to any potential future untrained Aboriginal or non-Aboriginal visitor to the site eg Elder or children's groups undertaking a cultural or education excursion.	To the best of OzArk's knowledge, Site A and Site B have not been disturbed by the activities at the Western Riverina Quarry (WRQ) and that all impacts have remained outside of the buffer established in 1987.
These prominent Wiradjuri tool making felsite debitage mounds need to be re-established and fenced off for ongoing protection from native or feral animals such as emu's, kangaroos, pigs and goats.	Sites have been demarcated with new fencing. While this fencing does not exclude wildlife, it will ensure that there is no inadvertent harm arising from the quarry activities.
Why are there no Cultural signs on the edge of the buffer or exclusion zone that clearly explains the history, significance, and importance of the Koomaringa Aboriginal Place to various traditional and contemporary Wiradjuri Aboriginal groups and communities?	E.B. Mawson & Sons Pty Ltd has undertaken to fund this. The location and wording of any signage will be discussed with the Koomaringa Management Group when it is formed. It is imagined that the signs would recognise the significance of the Aboriginal Place and provide site access details.
Why has it taken so long to develop a "Plan of Management" for the Koomaringa Aboriginal Place, when you consider it was declared an Aboriginal Place back on the 1st of February 1991, and received a letter of support from the Griffith LALC to acquire government grant funding on the 25th of January 2019, and now finally there is light at the end of tunnel and a draft document.?	OzArk is not aware of why it took so long for a Plan of Management to be developed but notes that this has now been completed.
Why have members of various Wiradjuri Aboriginal communities and RAPs been effectively shut out of the "Komaringa Aboriginal Place" over the past 30 odd years and yet the various owners such as Milbrae Quarries Pty Ltd and EB Mawson & Sons Pty Ltd been allowed to mine non-stop, with no-one engaged on a full-time or part-time basis to regularly monitor the impacts or effects of the mining on the Aboriginal site or on nearby Aboriginal communities?	As far as OzArk is aware, no one from the Wiradjuri Aboriginal community and RAPs have ever been excluded from the Quarry Site. E.B. Mawson & Sons Pty Ltd will maintain any site demarcation fencing and signage. It will be the responsibility of the E.B. Mawson & Sons Pty Ltd to monitor site buffers at the boundary of the WRQ operational areas on a regular basis and not less than every two years. Photos from the northern, southern, eastern, and western perimeters of the approved quarry site

OzArk Environment & Heritage

RAP comment	OzArk comment
	boundary will be taken to provide evidence that quarrying activities are within the approved quarry curtilage. Monitoring will be undertaken by at least two representatives of the Koomaringa Management Group, where practicable. At other locations within the Koomaringa AP, the Koomaringa Management Group should explore funding options with Heritage NSW (HNSW), to organise monitoring of the Koomaringa Aboriginal Place (AP) on at least a two-yearly basis.
Have any of the previous or current mine owner provided any type of training or employment opportunities, educational scholarships/sponsorships or Aboriginal community development funding to Aboriginal individuals or Aboriginal communities during the life of the Koomaringa quarry, if not why hasn't this occurred?	The WRQ has worked with the Aboriginal community and has an Indigenous engagement program in place. Past efforts of engagement have been unsuccessful as local groups did not have programs in place.
Why hasn't a road been marked out and inspected for Aboriginal cultural material and then graded which would allow for easy walking or vehicle access to eastern Cultural site A?	E.B. Mawson & Sons Pty Ltd have agreed to facilitate access to the significant cultural heritage sites near the WRQ. This includes providing a car park and arranging access visits based on staff availability (for escorts) and operations at the WRQ (i.e. access being unsafe).

Response to Mark Saddler - Bundyi Culture

OzArk Environment & Heritage **ABN 59 104 582 354**

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Katoomba

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PO Box 2069
DUBBO NSW 2830

18 February 2024

Mark Saddler - Bundyi Culture

KOOMARINGA ABORIGINAL PLACE PLAN OF MANAGEMENT
RESPONSE TO RAP SUBMISSIONS

Dear Mark,

Thank you for your letter of 29 November 2023 regarding the Plan of Management (POM) for Koomaringa Aboriginal Place.

I have taken the liberty to tabulate your main questions and have provided a response to each below.

Should anything here raise any concerns, please do not hesitate to get in touch.

Kind regards,

Ben Churcher
Principal Archaeologist
ben@ozarkehm.com.au

POM recommendation	RAP comment	OzArk comment
Section 1.3.5 Historical management arrangements within the Aboriginal Place, Page 9.		
Quote "The stakeholder and landowners will take steps to mitigate the harm to Aboriginal Places which may be caused by animals".	What steps WILL be enforced onto stakeholders and landholders?	Feral animal control within the Koomaringa AP will be the responsibility of the Koomaringa Management Group who should explore funding options with HNSW to organise feral animal control. It is noted that this activity was also suggested by Mr Peter Ingram in his response to the Koomaringa AP Plan of Management. Table 3-1 of the Koomaringa AP Plan of Management allows poisoning of feral animals to proceed within the Koomaringa AP without further management.
Section 1.3.5 Historical management arrangements within the Aboriginal Place, Page 10.		
Quote "Stakeholders and landowners will be encouraged to consider the need for buffer zones around specific, sensitive sites within the Aboriginal Place"	I insist that buffer zones be enforced and not just encouraged.	This request has been completed and the fencing has been installed with the assistance of Registered Aboriginal Parties (RAPs).
2. Advice will first be sought from a qualified archaeologist to determine whether the find constitutes an Aboriginal object, or a historic item of heritage significance.	This point needs to be expanded to include that "Wiradjuri Knowledge Holders and RAPs" be included in the process of identifying our items. Archaeologists are not the knowledge holders of our culture, we are.	Advice from an archaeologist is only the first stage of identifying whether an Aboriginal object has been discovered. If the object is Aboriginal, RAPs will be consulted.
(Koomaringa OS-01, OS-02, OS-3, OS-4, OS-05, OS-06, OS-07, OS-8, OS-09, OS-10, OS-11, IF-01, IF-02, PL-01, PL-02, and ST-01). To protect these sites from any inadvertent impacts during the life of the WRQ, it is recommended that two-star pickets with a sign attached between them be installed at each site facing the most obvious direction of travel from the quarry area.	We local RAPs are to be involved in the process of marking these above areas. Remuneration must also be paid for the time our people spend to do this work.	RAPs will be engaged to assist with the fencing of sites as is set out Section 9.2.4 of the Aboriginal Cultural Heritage Assessment Report (ACHAR).

Response to Mark Saddler - Bundyi Culture, James Ingram - Bidya Marra, and Robert Carroll & Neerim Carroll - Miyagan Culture & Heritage.

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18 February 2024

Mark Saddler - Bundyi Culture
James Ingram - Bidya Marra
Robert Carroll & Neerim Carroll -Miyagan Culture & Heritage.

KOOMARINGA ABORIGINAL PLACE PLAN OF MANAGEMENT
RESPONSE TO RAP SUBMISSIONS

Dear Mark, James, and Robert

Thank you for your letter of 3 January 2024, "Plan of Management (POM) for Koomaringa".

I have taken the liberty to tabulate your main questions and have provided a response to each below.

Should anything here raise any concerns, please do not hesitate to get in touch.

Kind regards,

Ben Churcher
Principal Archaeologist
ben@ozarkehm.com.au

RAP recommendation	OzArk comment
Four (4) Steel/aluminium signs are to be erected on steel poles at the North entrance, and just inside the individual boundary protection fences to major tool making Sites A, B and C (Which is located in a northern direction and adjacent to a massive pile of crushed rock/metal) at Koomaringa that advise of the importance of the area and also of the history of the Toolmaking site to Wiradjuri people and their traditional country. (The signs can be designed and produced at Design & Signs, Unit 2/68 Willandra Ave, Griffith - 02 69641488) These signs are to be designed by local RAPs and Aboriginal communities. The cost of the signs and their erection is to be to be paid for by the quarry owners.	E.B. Mawson & Sons Pty Ltd has undertaken to fund this. The location and wording of any signage will be discussed with the Koomaringa Management Group when it is formed. It is imagined that the signs would recognise the significance of the Aboriginal Place and provide site access details.
The ongoing monitoring of the quarry site and important cultural sites by the RAPs is to occur at least 4 times a year, these roles will be remunerated by agreed contracts.	E.B. Mawson & Sons Pty Ltd will maintain any site demarcation fencing and signage. It will be the responsibility of the E.B. Mawson & Sons Pty Ltd to monitor site buffers at boundary of the Western Riverina Quarry (WRQ) operational areas on a regular basis and not less than every two years. Photos from the northern, southern, eastern, and western perimeters of the approved quarry site boundary will be taken to provide evidence that quarrying activities are within the approved quarry curtilage. Monitoring will be undertaken by at least two representatives of the Koomaringa Management Group, where practicable. At other locations within the Koomaringa AP, the Koomaringa Management Group should explore funding options with Heritage NSW (HNSW), to organise monitoring of the Koomaringa Aboriginal Place (AP) on at least a two-yearly basis.
Feral animal "Eradication Programs' ' for feral pigs and goats need to be undertaken on an ongoing basis because these animals after wet weather are digging up the country, dispersing artefacts and destroying Wiradjuri sites.	Feral animal control within the Koomaringa AP will be the responsibility of the Koomaringa Management Group who should explore funding options with HNSW to organise feral animal control. It is noted that this activity was also suggested by Mr Peter Ingram in his response to the Koomaringa AP Plan of Management. Table 3-1 of the Koomaringa AP Plan of Management allows poisoning of feral animals to proceed within the Koomaringa AP without further management.

OzArk Environment & Heritage

RAP recommendation	OzArk comment
Community and individual access to Wiradjuri Cultural Places Toolmaking Sites A, B and C at Koomaringa is to be allowed to continue into the future with appropriate times and dates agreed to by all parties.	E.B. Mawson & Sons Pty Ltd have agreed to facilitate access to the significant cultural heritage sites near the WRQ. This includes providing a car park and arranging access visits based on staff availability (for escorts) and operations at the WRQ (i.e. access being unsafe). Times and dates of site visits will need to be pre-arranged with the WRQ.
A proportion of the existing poor road up to Site B Toolmaking site needs to be further developed/graded which would allow vehicle access for Aboriginal Elders and other interested groups entering from the "Northern Access Gate"	The decision to allow access to Site B will be taken by the Koomaringa Management Group who can decide on the location and form of any proposed access track. Until such times as the access track is installed, E.B. Mawson & Sons Pty Ltd will assist with the transport of people to Site B when required.
A large "Car Park" and shelter area to be erected opposite Site A so that Wiradjuri Elders can undertake cultural training for our people as well as to non-Aboriginal people. Shelter should be large enough to accommodate at least 30 + people with some seating areas. and a Car Park for at least 10 cars.	The Aboriginal Cultural Heritage Report (ACHAR) indicates the location for the car park (**Figure 9-2**). The location and form of the picnic shelter will be determined by the Koomaringa Management Group. E.B. Mawson & Sons Pty Ltd have undertaken to provide reasonable funding to construct the shelter and a path connecting the shelter to the car park.
Cultural Training and Awareness Programs to be delivered to all staff who work on or with Koomaringa and any other quarry sites in Wiradjuri country. This will be delivered by Bundyi Culture as per an agreed contract. This must take place urgently.	E.B. Mawson & Sons Pty Ltd agree to arranging a one-off face to face induction for WRQ staff. The content of this induction will then be presented as a training package for later use. Both the face to face induction and the provision of a training package will be under an agreed contractual arrangement.
A written commitment to erect further fencing to protect additional recently identified Northern Wiradjuri cultural areas.	The location and form of the any site fencing outside of the WRQ Quarry Site will be determined by the Koomaringa Management Group. Fencing at Sites A, B, and C has been installed with the assistance of Registered Aboriginal Parties.
Since Uncle Rob Carroll, Uncle James Ingram and myself have been out to Koomaringa and surveyed large areas, we are requesting that the exclusion zones for sites A, B and C be documented to AHIMS as we have extended those areas to try and cover as many special areas and Wiradjuri cultural items as possible.	Sites A, B, and C are currently registered with AHIMS, and as they are within the Koomaringa AP, their significance is recognised, and their current condition is protected. Site C includes sites registered by OzArk as Koomaringa PL-01 (42-5-0023) and Koomaringa OS-11 (42-5-0020).

APPENDIX 2: AHIMS EXTENSIVE SEARCHES

Appendix 2 Figure 1: 12/09/2019 AHIMS search.

Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Western Riverina 20km
Client Service ID : 449021

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
42-5-0006	Melbergen Road 1	AGD	55	401730	6263820	Open site	Valid	Modified Tree (Carved or Scarred): -	Scarred Tree	
	Contact	Recorders	Ms Vanessa Edmonds					Permits		
42-5-0001	Rothdene: Cocoparra Nature Reserve;	AGD	55	421782	6241175	Open site	Valid	Modified Tree (Carved or Scarred): -	Scarred Tree	1267
	Contact	Recorders	ASRSYS					Permits		
42-5-0002	Rothdene: Cocoparra Nature Reserve;	AGD	55	421791	6240261	Open site	Valid	Modified Tree (Carved or Scarred): -	Scarred Tree	1267
	Contact	Recorders	ASRSYS					Permits		
42-5-0004	Koomaringa	AGD	55	416000	6261200	Open site	Valid	Stone Quarry: -, Artefact: -	Quarry	
	Contact	Recorders	R Williams					Permits		
42-5-0005	Koomaringa	AGD	55	417000	6261000	Open site	Valid	Aboriginal Ceremony and Dreaming: -	Aboriginal Place	
	Contact	Recorders	Gazettal Notice					Permits		

Report generated by AHIMS Web Service on 12/09/2019 for Alyce Cameron for the following area at Datum : GDA, Zone : 55, Eastings : 394689 - 435771, Northings : 6239688 - 6281025 with a Buffer of 0 meters. Additional Info : Background. Number of Aboriginal sites and Aboriginal objects found is 5

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Page 1 of 1

Appendix 2 Figure 2: 09/08/2021 AHIMS search.

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : WRQ update
Client Service ID : 612002

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
42-5-0018	Koomaringa OS-09	GDA	55	415564	6260783	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0028	Koomaringa OS-7	GDA	55	415673	6260928	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0013	Koomaringa OS-01	GDA	55	415688	6260639	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0017	Koomaringa OS-08	GDA	55	415740	6261095	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0022	Koomaringa OS-13	GDA	55	415093	6260388	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0016	Koomaringa OS-03	GDA	55	415492	6259919	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0026	Koomaringa OS-05	GDA	55	415659	6260988	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0019	Koomaringa OS-10	GDA	55	415770	6260698	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0005	Koomaringa	AGD	55	417000	6261000	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Aboriginal Place	
	Contact	Recorders	Gazettal Notice					Permits		
42-5-0023	Koomaringa PL-01	GDA	55	414729	6260203	Open site	Valid	Stone Quarry : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0011	Koomaringa IF-02	GDA	55	415597	6260579	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0024	Koomaringa ST-01	GDA	55	415740	6260533	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0002	Rothdene;Cocoparra Nature Reserve;	AGD	55	421791	6240261	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1267
	Contact	Recorders	ASRSYS					Permits		

Report generated by AHIMS Web Service on 09/08/2021 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters. Number of Aboriginal sites and Aboriginal objects found is 26

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Page 1 of 3

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : WRQ update
Client Service ID : 612002

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
42-5-0009	Sims Gap Scar Tree	GDA	55	427441	6252733	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Department of Premier & Cabinet - Heritage (Albury),Mr.Sam Kirby					Permits		
42-5-0006	Melbergen Road 1	AGD	55	401730	6263820	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	Recorders	Ms.Vanessa Edmonds					Permits		
42-5-0015	Koomaringa OS-04	GDA	55	415640	6260394	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0014	Koomaringa OS-02	GDA	55	415749	6260802	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0020	Koomaringa OS-11	GDA	55	414784	6260133	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0008	Sims Gap Aboriginal Cultural Landscape	GDA	55	427147	6252571	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Department of Premier & Cabinet - Heritage (Albury),Mr.Sam Kirby					Permits		
42-5-0012	Koomaringa IF-03	GDA	55	415166	6259950	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0010	Koomaringa IF-01	GDA	55	415541	6260025	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0027	Koomaringa OS-6	GDA	55	415706	6260914	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0025	Koomaringa PL-02	GDA	55	415812	6260344	Open site	Valid	Artefact : -, Stone Quarry : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0001	Rothdene;Cocoparra Nature Reserve;	AGD	55	421782	6241175	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1267
	Contact	Recorders	ASRSYS					Permits		
42-5-0021	Koomaringa OS-12	GDA	55	415276	6259956	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
42-5-0004	Koomaringa	AGD	55	416000	6261200	Open site	Valid	Stone Quarry : -, Artefact : -	Quarry	
	Contact	Recorders	R Williams					Permits		

Report generated by AHIMS Web Service on 09/08/2021 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters. Number of Aboriginal sites and Aboriginal objects found is 26

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Page 2 of 3

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : WRQ update
Client Service ID : 612002

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports

** Site Status

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 09/08/2021 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters. Number of Aboriginal sites and Aboriginal objects found is 26

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Page 3 of 3

Appendix 2 Figure 3: 24/05/2023 AHIMS search.

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : Western Riverina Quarry
Client Service ID : 784830

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
42-5-0018	Koomaringa OS-09	GDA	55	415564	6260783	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0028	Koomaringa OS-7	GDA	55	415673	6260928	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0013	Koomaringa OS-01	GDA	55	415688	6260639	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0017	Koomaringa OS-08	GDA	55	415740	6261095	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0037	Jimberoo9	GDA	55	433871	6264622	Open site	Valid	Artefact : 2		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0034	Jimberoo6	GDA	55	434982	6262756	Open site	Valid	Hearth : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0022	Koomaringa OS-13	GDA	55	415093	6260388	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0016	Koomaringa OS-03	GDA	55	415492	6259919	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0026	Koomaringa OS-05	GDA	55	415659	6260988	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0019	Koomaringa OS-10	GDA	55	415770	6260698	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0005	Koomaringa	AGD	55	417000	6261000	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Aboriginal Place	
	Contact	Recorders	Gazettal Notice					Permits		
42-5-0032	Jimberoo4	GDA	55	435065	6262729	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0023	Koomaringa PL-01	GDA	55	414729	6260203	Open site	Valid	Stone Quarry : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0011	Koomaringa IF-02	GDA	55	415597	6260579	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		

Report generated by AHIMS Web Service on 24/05/2023 for Imogen Crome for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 36

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Page 1 of 3

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : Western Riverina Quarry
Client Service ID : 784830

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
42-5-0024	Koomaringa ST-01	GDA	55	415740	6260533	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0029	Jimberoo1	GDA	55	435480	6262621	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0009	Sims Gap Scar Tree	GDA	55	427441	6252733	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Department of Premier & Cabinet - Heritage (Albury),Mr.Sam Kirby					Permits		
42-5-0033	Jimberoo5	GDA	55	435049	6262731	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0030	Jimberoo2	GDA	55	435454	6262635	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0006	Melbergen Road 1	AGD	55	401730	6263820	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	Recorders	Ms.Vanessa Edmonds					Permits		
42-5-0002	Rothdene;Cocoparra Nature Reserve;	AGD	55	421791	6240261	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1267
	Contact	Recorders	ASRSYS					Permits		
42-5-0015	Koomaringa OS-04	GDA	55	415640	6260394	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0014	Koomaringa OS-02	GDA	55	415749	6260802	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0020	Koomaringa OS-11	GDA	55	414784	6260133	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0008	Sims Gap Aboriginal Cultural Landscape	GDA	55	427147	6252571	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Department of Premier & Cabinet - Heritage (Albury),Mr.Sam Kirby					Permits		
42-5-0012	Koomaringa IF-03	GDA	55	415166	6259950	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0010	Koomaringa IF-01	GDA	55	415541	6260025	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0027	Koomaringa OS-6	GDA	55	415706	6260914	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		

Report generated by AHIMS Web Service on 24/05/2023 for Imogen Crome for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 36

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Page 2 of 3

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Western Riverina Quarry
Client Service ID : 784830

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
42-5-0025	Koomaringa PL-02	GDA	55	415812	6260344	Open site	Valid	Artefact : -, Stone Quarry : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor,Alyce Cameron					Permits		
42-5-0038	Jimberoo10	GDA	55	433641	6264825	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0036	Jimberoo8	GDA	55	434591	6263264	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0035	Jimberoo7	GDA	55	434613	6263227	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0001	Rothdene;Cocoparra Nature Reserve;	AGD	55	421782	6241175	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1267
	Contact	Recorders	ASRSYS					Permits		
42-5-0021	Koomaringa OS-12	GDA	55	415276	6259956	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor,Alyce Cameron					Permits		
42-5-0004	Koomaringa	AGD	55	416000	6261200	Open site	Valid	Stone Quarry : -, Artefact : -	Quarry	
	Contact	Recorders	R Williams					Permits		
42-5-0031	Jimberoo3	GDA	55	435432	6262639	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		

** Site Status
Valid - The site has been recorded and accepted onto the system as valid
Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.
Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground
Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 24/05/2023 for Imogen Crome for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 36

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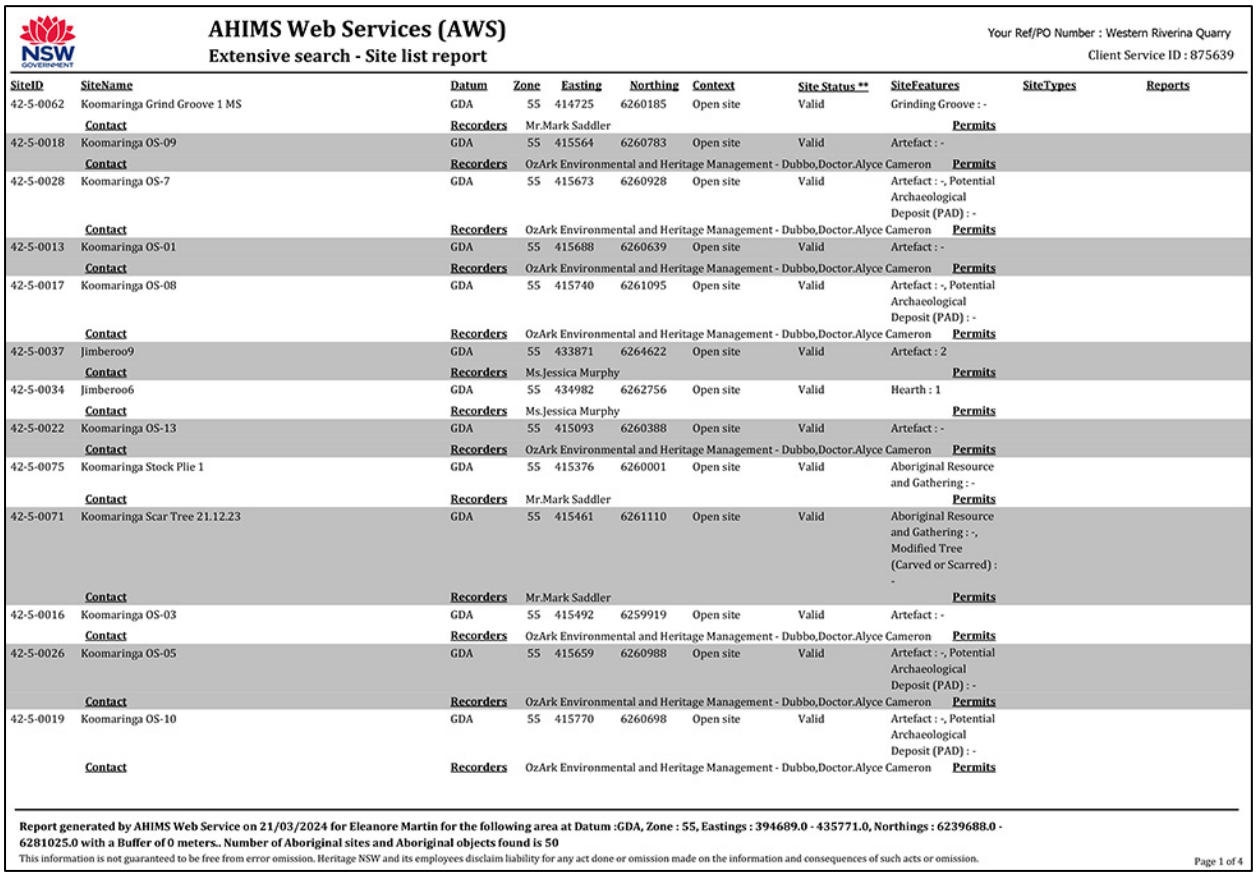
Page 3 of 3

Appendix 2 Figure 4: 23/03/2024 AHIMS search.



AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : Western Riverina Quarry
Client Service ID : 875639

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
42-5-0062	Koomaringa Grind Groove 1 MS	GDA	55	414725	6260185	Open site	Valid	Grinding Groove : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0018	Koomaringa OS-09	GDA	55	415564	6260783	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0028	Koomaringa OS-7	GDA	55	415673	6260928	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0013	Koomaringa OS-01	GDA	55	415688	6260639	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0017	Koomaringa OS-08	GDA	55	415740	6261095	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0037	Jimberoo9	GDA	55	433871	6264622	Open site	Valid	Artefact : 2		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0034	Jimberoo6	GDA	55	434982	6262756	Open site	Valid	Hearth : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0022	Koomaringa OS-13	GDA	55	415093	6260388	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0075	Koomaringa Stock Plie 1	GDA	55	415376	6260001	Open site	Valid	Aboriginal Resource and Gathering : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0071	Koomaringa Scar Tree 21.12.23	GDA	55	415461	6261110	Open site	Valid	Aboriginal Resource and Gathering : -, Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0016	Koomaringa OS-03	GDA	55	415492	6259919	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0026	Koomaringa OS-05	GDA	55	415659	6260988	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0019	Koomaringa OS-10	GDA	55	415770	6260698	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		

Report generated by AHIMS Web Service on 21/03/2024 for Eleanore Martin for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 50

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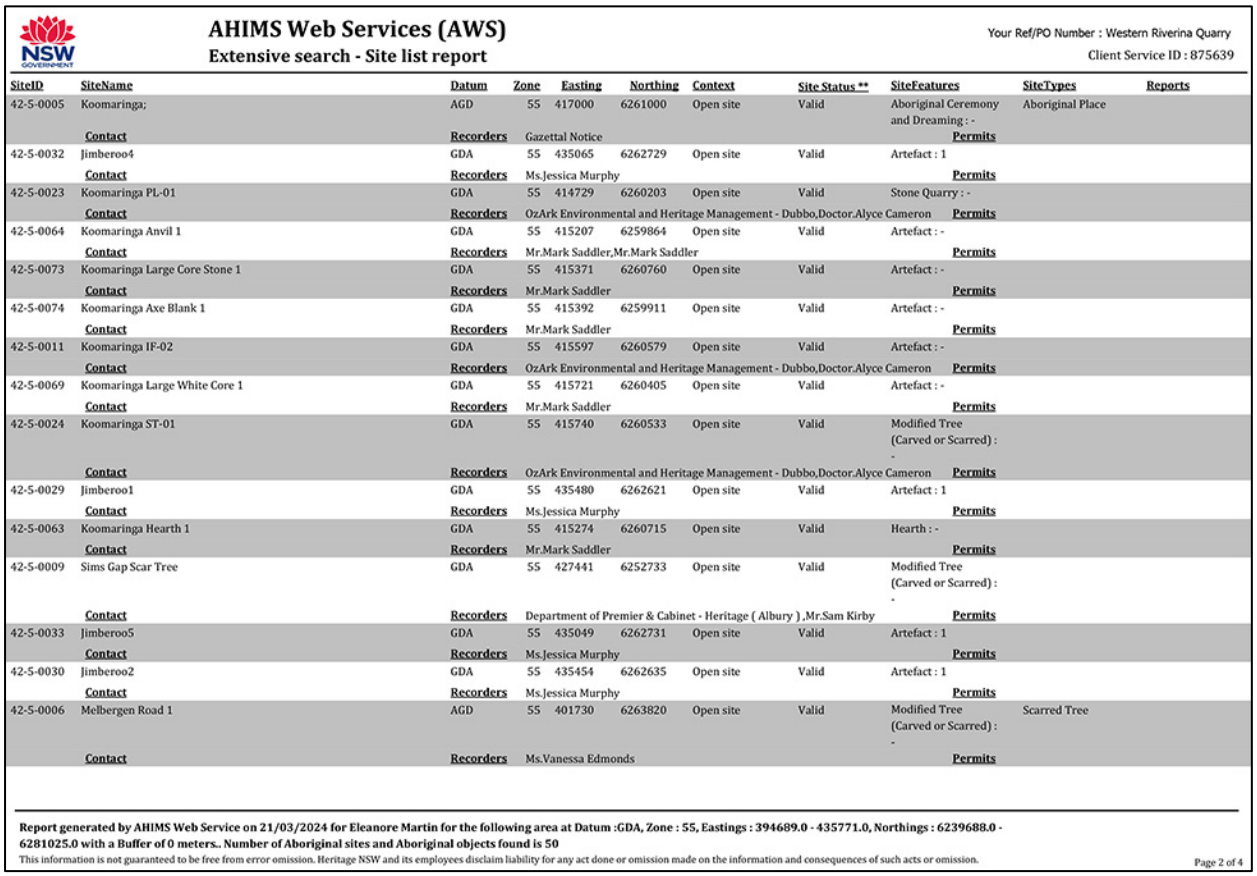
Page 1 of 4



AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : Western Riverina Quarry
Client Service ID : 875639

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
42-5-0005	Koomaringa;	AGD	55	417000	6261000	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Aboriginal Place	
	Contact	Recorders	Gazettal Notice					Permits		
42-5-0032	Jimberoo4	GDA	55	435065	6262729	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0023	Koomaringa PL-01	GDA	55	414729	6260203	Open site	Valid	Stone Quarry : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0064	Koomaringa Anvil 1	GDA	55	415207	6259864	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler,Mr.Mark Saddler					Permits		
42-5-0073	Koomaringa Large Core Stone 1	GDA	55	415371	6260760	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0074	Koomaringa Axe Blank 1	GDA	55	415392	6259911	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0011	Koomaringa IF-02	GDA	55	415597	6260579	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0069	Koomaringa Large White Core 1	GDA	55	415721	6260405	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0024	Koomaringa ST-01	GDA	55	415740	6260533	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0029	Jimberoo1	GDA	55	435480	6262621	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0063	Koomaringa Hearth 1	GDA	55	415274	6260715	Open site	Valid	Hearth : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0009	Sims Gap Scar Tree	GDA	55	427441	6252733	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Department of Premier & Cabinet - Heritage (Albury),Mr.Sam Kirby					Permits		
42-5-0033	Jimberoo5	GDA	55	435049	6262731	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0030	Jimberoo2	GDA	55	435454	6262635	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0006	Melbergen Road 1	AGD	55	401730	6263820	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	Recorders	Ms.Vanessa Edmonds					Permits		

Report generated by AHIMS Web Service on 21/03/2024 for Eleanore Martin for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 50

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Page 2 of 4

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Western Riverina Quarry
Client Service ID : 875639

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
42-5-0002	Rothdene;Cocoparra Nature Reserve;	AGD	55	421791	6240261	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1267
	Contact	Recorders	ASRSYS					Permits		
42-5-0070	Koomaringa Anvil 22.12.23	GDA	55	414841	6260441	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0072	Koomaringa PAD Site 21.12.23	GDA	55	415442	6260843	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0015	Koomaringa OS-04	GDA	55	415640	6260394	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0067	Koomaringa PAD 2 MS	GDA	55	415648	6260979	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0014	Koomaringa OS-02	GDA	55	415749	6260802	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0020	Koomaringa OS-11	GDA	55	414784	6260133	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0068	Koomaringa PAD 1 MS	GDA	55	415645	6260907	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0008	Sims Gap Aboriginal Cultural Landscape	GDA	55	427147	6252571	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Department of Premier & Cabinet - Heritage (Albury),Mr.Sam Kirby					Permits		
42-5-0012	Koomaringa IF-03	GDA	55	415166	6259950	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0065	Koomaringa Hammer Stone 1	GDA	55	415447	6259944	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0010	Koomaringa IF-01	GDA	55	415541	6260025	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0027	Koomaringa OS-6	GDA	55	415706	6260914	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0025	Koomaringa PL-02	GDA	55	415812	6260344	Open site	Valid	Artefact : -, Stone Quarry : -		

Report generated by AHIMS Web Service on 21/03/2024 for Eleanore Martin for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 50

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Page 3 of 4

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Western Riverina Quarry
Client Service ID : 875639

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0038	Jimberoo10	GDA	55	433641	6264825	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0036	Jimberoo8	GDA	55	434591	6263264	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0035	Jimberoo7	GDA	55	434613	6263227	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		
42-5-0001	Rothdene;Cocoparra Nature Reserve;	AGD	55	421782	6241175	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1267
	Contact	Recorders	ASRSYS					Permits		
42-5-0021	Koomaringa OS-12	GDA	55	415276	6259956	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Doctor.Alyce Cameron					Permits		
42-5-0004	Koomaringa	GDA	55	415300	6260684	Open site	Valid	Stone Quarry : -, Artefact : -	Quarry	
	Contact	Recorders	R Williams,OzArk Environmental and Heritage Management - Dubbo,Mr.Ben Churc					Permits		
42-5-0066	Koomaringa Scar 1	GDA	55	415569	6260039	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
42-5-0031	Jimberoo3	GDA	55	435432	6262639	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms.Jessica Murphy					Permits		

** Site Status
Valid - The site has been recorded and accepted onto the system as valid
Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.
Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground
Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 21/03/2024 for Eleanore Martin for the following area at Datum :GDA, Zone : 55, Eastings : 394689.0 - 435771.0, Northings : 6239688.0 - 6281025.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 50

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Page 4 of 4

APPENDIX 3: ABORIGINAL HERITAGE: UNANTICIPATED FINDS PROTOCOL

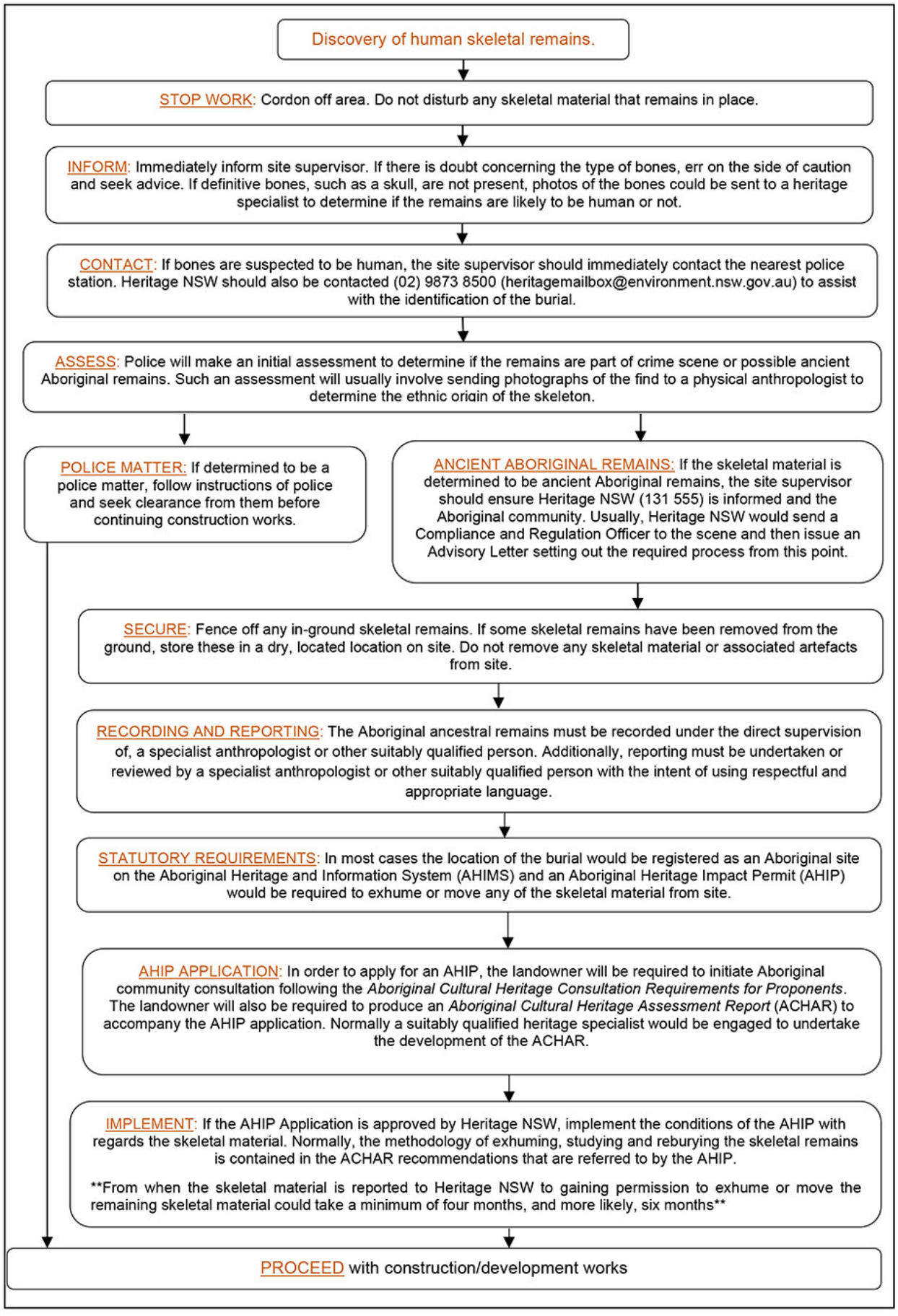
An Aboriginal artefact is anything which is the result of past Aboriginal activity. This includes stone (artefacts, rock engravings etc.), plant (culturally scarred trees) and animal (if showing signs of modification; i.e., smoothing, use). Human bone (skeletal) remains may also be uncovered while onsite.

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 consider scientific and educational value.

Protocol to be followed if previously unrecorded or unanticipated Aboriginal object(s) are encountered:

17. If any Aboriginal object is discovered and/or harmed in, or under the land, while undertaking the proposed development activities, the Applicant must:
    a. Not further harm the object
    b. Immediately cease all work at the particular location
    c. Secure the area to avoid further harm to the Aboriginal object
    d. Notify HNSW as soon as practical on (02) 9873 8500 (heritagemailbox @environment.nsw.gov.au), providing any details of the Aboriginal object and its location
    e. Not recommence any work at the particular location unless authorised in writing by HNSW.
18. If Aboriginal burials are unexpectedly encountered during the activity, work must stop immediately, the area secured to prevent unauthorised access and NSW Police and HNSW contacted (see **Appendix 4**).
19. Cooperate with the appropriate authorities and relevant Aboriginal community representatives to facilitate:
    f. The recording and assessment of the find(s)
    g. The fulfilment of any legal constraints arising from the find(s), including complying with HNSW directions
    h. The development and implementation of appropriate management strategies, including consultation with stakeholders and the assessment of the significance of the find(s).
20. 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 HNSW (normally an AHIP).

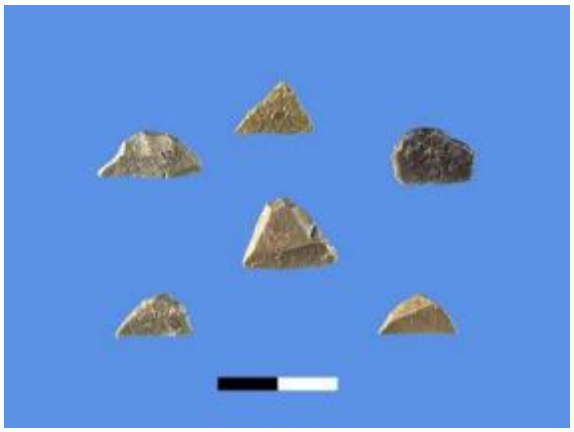
APPENDIX 4: UNANTICIPATED SKELETAL REMAINS PROTOCOL



APPENDIX 5: ABORIGINAL HERITAGE: ARTEFACT IDENTIFICATION

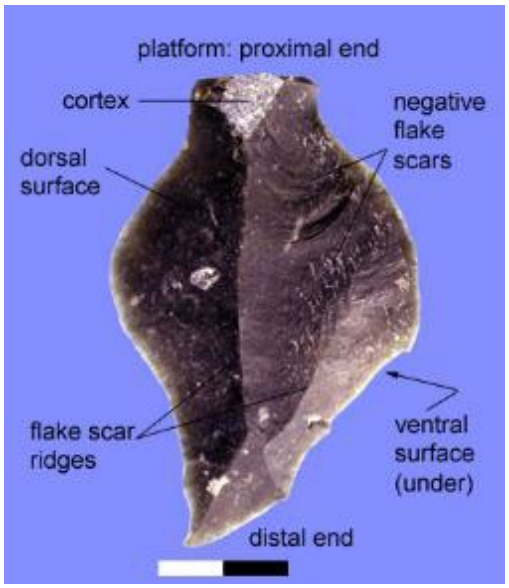
Retouched blades (scale = 1cm)

Flake

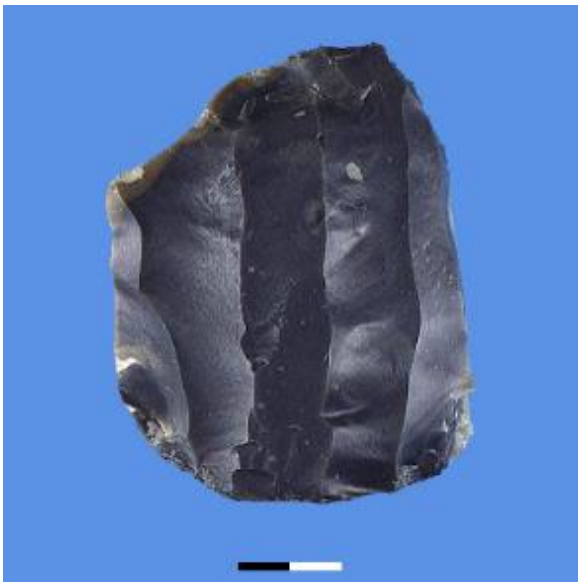


Microliths (scale = 1cm)

Scraper (scale = 1cm)



Flake characteristics (scale = 1cm)



Core from which flakes have been removed (scale = 1cm)

APPENDIX 6: ARTEFACT CATALOGUE

Site name	Art. ID	Art. Type	Art. Material	Material Colour	Integrity	Reduction	Platform	Termination	Length (mm)	Width (mm)	Thickness (mm)	Notes
Key: Artefact type F=flake, FP=flaked piece (debitage), C=core, HS=hammerstone, GP=grinding plate. Raw material F=felsite, S=silcrete, Qz=quartzite, Q=quartz, SS=sandstone. Integrity C=complete, PF=proximal fragment, DF=distal fragment, LB=longitudinal break. Reduction P=primary, S=secondary, T=tertiary.												
IF-01	A23	F	F	White	PF	T			32	35	1	Retouch
IF-02	A24	C	F		C	T			81	70	75	
IF-03	A74	C	F		C	T			50	50	20	
OS-01	A40	F	F		PF	T			58	35	18	
OS-01	A41	FP	F		C	S			35	30	5	5% cortex
OS-01	A42	F	F	White/red	PF	T			45	25	10	Approximately 20 broken flakes and flaked pieces surrounding point
OS-02	A35	F	F	White/grey	C	T			40	25	7	
OS-02	A36	C	F	Tan/orange	C	T			78	60	50	
OS-02	A37	C	F		C	T			35	45	34	Unidirectional. More than 10 flake scars present. Less than 5% cortex
OS-02	A38	FP	F		C	S			53	40	20	
OS-02	A39	F	F		C	T			78	100	35	Retouch. Scraper.
OS-03	A10	F	F	Grey	C	T			30	25	8	
OS-03	A11	F	F	Grey	C	T	Simple	Feather	25	20	5	
OS-03	A12	F	F	Tan	C	T	Simple	Feather	30	20	7	
OS-03	A13	FP	F	Grey	C	T			13	15	4	
OS-03	A14	F	F	White	C	T	Flaked	Hinge	27	20	6	
OS-03	A15	FP	F	Tan	C	T			12	15	3	
OS-03	A16	FP	F	White	C	S			30	40	5	
OS-03	A17	F	F		C	T			40	20	8	
OS-03	A18	FP	F		C	T						
OS-03	A19	FP	F									
OS-03	A20	F	F	White	PF	T			25	20	5	
OS-03	A21	FP	F		C	S						

Site name	Art. ID	Art. Type	Art. Material	Material Colour	Integrity	Reduction	Platform	Termination	Length (mm)	Width (mm)	Thickness (mm)	Notes
Key: Artefact type F=flake, FP=flaked piece (debitage), C=core, HS=hammerstone, GP=grinding plate. Raw material F=felsite, S=silcrete, Qz=quartzite, Q=quartz, SS=sandstone. Integrity C=complete, PF=proximal fragment, DF=distal fragment, LB=longitudinal break. Reduction P=primary, S=secondary, T=tertiary.												
OS-03	A22	FP	F		C	S						
OS-04	A76	F	F	Grey	C	S	Simple	Feather	100	90	20	
OS-04	A77	F	F		C	T	Simple	Feather	30	20	5	
OS-04	A78	FP	F						20	15	8	
OS-04	A79	F	F	Cream	PF	T			25	22	9	
OS-04	A80	H	B			P			150	200		
OS-04	A81	F	F	Cream/grey	C	T	Simple	Feather	48	20	5	
OS-04	A82	FP	F	Cream/grey	C	T			23	15	10	
OS-04	A83	FP	F	Grey	C	T			35	30	10	
OS-04	A84	SS	F	Grey	C	T	Flaked		65	55	20	Retouch.
OS-04	A85	F	F	White	PF	T	Simple		25	18	5	
OS-04	A86	F	F		PF	T						
OS-04	15 artefacts	F & FPs	F									In a 0.5 m by 0.5 m square
OS-04	17 artefacts	F & FPs	F									In a 0.5 m by 0.5 m square
OS-04	19 artefacts	F & FPs	F									In a 0.5 m by 0.5 m square
OS-04	3 artefacts	F & FPs	F									In a 0.5 m by 0.5 m square
OS-04	8 artefacts	F & FPs	F									In a 0.5 m by 0.5 m square
OS-05	A47	F	F		C	T	Simple	Hinge/Step	40	42	10	
OS-05	A48	F	F		C	T	Simple	Feather	40	18	4	
OS-05	A49	FP	F		C	T			25	26	5	
OS-05	A50	F	F		C	S	Simple	Feather	70	60	15	
OS-05	A51	FP	F						30	25	3	
OS-05	A52	FP	F						40	20	10	

Site name	Art. ID	Art. Type	Art. Material	Material Colour	Integrity	Reduction	Platform	Termination	Length (mm)	Width (mm)	Thickness (mm)	Notes
Key: Artefact type F=flake, FP=flaked piece (debitage), C=core, HS=hammerstone, GP=grinding plate. Raw material F=felsite, S=silcrete, Qz=quartzite, Q=quartz, SS=sandstone. Integrity C=complete, PF=proximal fragment, DF=distal fragment, LB=longitudinal break. Reduction P=primary, S=secondary, T=tertiary.												
OS-05	A53	GP	SS		LB				120	80	30	Slight patina on flat edge, rough on other side. Broken in half
OS-05	A54	F	F		C	S	Crushed	Feather	98	65	28	
OS-06	A25	F	F		C	T			75	80	30	
OS-06	A26	FP	F		C	T			20	18	5	
OS-06	A27	FP	F						18	15	2	
OS-06	A28	F	F	Red/black	C	T	Flaked	Feather	110	82	30	Retouch
OS-06	A29	F	F	Grey/red	C	T	Flaked	Feather	40	20	8	
OS-06	A30	FP	F		C	T			20	22	3	
OS-06	A31	F	F		DF	T			0-20			
OS-06	A32	F	F		C	S			0-20			
OS-06	A33	F	Q		PF	T			0-20			
OS-06	A34	C	F		C	T			70	65	30	
OS-06	A87	H	F		C	Nil			100	90	110	Pitting around edges
OS-07	A45	F	F		C	S	Simple	Hinge/Step	30	33	7	Cortex on outer side of flake
OS-07	A46	F	F		C	T	Simple	Hinge/Step	50	43	15	
OS-08	A55	FP	F		C	T			65	30	17	
OS-08	A56	F	F		C	T	Flaked	Hinge/Step	45	80	15	Use wear
OS-08	A57	F	F		C	T	Simple	Feather	30	20	3	
OS-08	A88	F	F	Yellow	C	T	Simple	Hinge/Step	20	20	3	
OS-09	A43	F	F		C	T	Simple	Hinge/Step	52	35	10	
OS-09	A44	FP	F		C	T			25	10	10	
OS-10	A94	FP	F	White	C	S			30	34	4	
OS-10	A95	FP	F	White	C	T			20	22	3	
OS-10	A96	FP	F	White	C	T			40	30	10	
OS-11	A60	F	F	Red	C	T	Simple	Feather	20	15	5	Thumbnail scraper

Site name	Art. ID	Art. Type	Art. Material	Material Colour	Integrity	Reduction	Platform	Termination	Length (mm)	Width (mm)	Thickness (mm)	Notes
Key: Artefact type F=flake, FP=flaked piece (debitage), C=core, HS=hammerstone, GP=grinding plate. Raw material F=felsite, S=silcrete, Qz=quartzite, Q=quartz, SS=sandstone. Integrity C=complete, PF=proximal fragment, DF=distal fragment, LB=longitudinal break. Reduction P=primary, S=secondary, T=tertiary.												
OS-11	A61	FP	F	Red	C	S			40	30	10	50% cortex
OS-11	A62	FP	F	Cream	C	T			50	35	15	
OS-11	A63	F	F	Red	C	T	Simple	Hinge/Step	42	25	6	
OS-11	A64	C	F	Red/Orange	C	S			80	50	30	50% cortex, unidirectional, 2 flake scars
OS-11	A65	FP	F	Cream	C	T			70	30	10	
OS-11	A66	C	F	Red	C	T			45	40	30	50% cortex, unidirectional, 2 flake scars, opportunistic core
OS-11	A67	F	F	Tan	C	S	Simple	Feather	50	30	10	20% cortex
OS-11	A89	FP	F									
OS-11	A90	C	F	Grey/orange	C	S			53	40	20	50% cortex, reduced/globular core
OS-11	A91	C	F	Grey	C	S			200	150	180	Opportunistic core, unidirectional
OS-11	A92	FP	F	Cream	C	T						
OS-12	A1	F	F	White	PF	T			30	27	8	
OS-12	A2	FP	F	White	C	T			30	25	13	
OS-12	A73	F	F	White	LB	T	Cortex	Feather	30	25	7	
OS-12	A75	C	F	White/cream	C	T			30	100	90	Unidirectional. 13 flake scars. Horse
OS-12	A93	F	F	Red/orange	PF	T	Simple		40	35	8	
OS-13	A68	F	F	Red	C	T	Simple	Feather	35	25	7	
OS-13	A69	F	F	Cream	C	T	Crushed	Hinge/Step	45	60	15	
Site A	A3	F	F		PF	T			45	40	5	
Site A	A4	F	F		C	T			48	22	1	
Site A	A5	F	F		PF	T			40	22	6	
Site A	A6	FP	F									
Site A	A7	FP	F									
Site A	A8	C	F									

Site name	Art. ID	Art. Type	Art. Material	Material Colour	Integrity	Reduction	Platform	Termination	Length (mm)	Width (mm)	Thickness (mm)	Notes
Key: Artefact type F=flake, FP=flaked piece (debitage), C=core, HS=hammerstone, GP=grinding plate. Raw material F=felsite, S=silcrete, Qz=quartzite, Q=quartz, SS=sandstone. Integrity C=complete, PF=proximal fragment, DF=distal fragment, LB=longitudinal break. Reduction P=primary, S=secondary, T=tertiary.												
Site A	A9	FP	F		C	S			20	24	1	
Site A	A97	C	F									
Site B	A72	C	F	Tan/green	C	T			150	110	50	

APPENDIX 7: HISTORIC HERITAGE: UNANTICIPATED FINDS PROTOCOL

A historic artefact is anything which is the result of past activity not related to the Aboriginal occupation of the area. This includes pottery, wood, glass and metal objects as well as the built remains of structures, sometimes heavily ruined.

Heritage significance of historic items is assessed by suitably qualified specialists who place the item or site in context and determine its role in aiding the community's understanding of the local area, or their wider role in being an exemplar of state or even national historic themes.

The following protocol should be followed if previously unrecorded or unanticipated historic objects are encountered:

1. All ground surface disturbance in the area of the finds should cease immediately, then:
    a) The discoverer of the find(s) will notify machinery operators in the immediate vicinity of the find(s) so that work can be halted
    b) The site supervisor will be informed of the find(s).
2. If finds are suspected to be human skeletal remains, then NSW Police must be contacted as a matter of priority.
3. If there is substantial doubt regarding the historic significance for the finds, then gain a qualified opinion from an archaeologist as soon as possible. This can circumvent proceeding further along the protocol for items which turn out not to be significant. If a quick opinion cannot be gained, or the identification is that the item is likely to be significant, then proceed to the next step.
4. Notify HNSW as soon as practical on (02) 9873 8500 (heritagemailbox @environment.nsw.gov.au),providing any details of the historic find and its location.
5. If in the view of the heritage specialist or HNSW that the finds appear not to be significant, work may recommence without further investigation. Keep a copy of all correspondence for future reference.
6. If in the view of the heritage specialist or HNSW that the finds appear to be significant, facilitate the recording and assessment of the finds by a suitably qualified heritage specialist. Such a study should include the development of appropriate management strategies.
7. If the find(s) are determined to be significant historic items (i.e. of local or state significance), any re-commencement of ground surface disturbance may only resume following compliance with any legal requirements and gaining written approval from HNSW.