F.7 Biodiversity Development Assessment Report

Gunlake Quarry Continuation Project (SSD-12469087)

Biodiversity Development Assessment Report

Prepared for Gunlake Quarries Pty Ltd
September 2021

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Gunlake Quarry Continuation Project (SSD-12469087)

Biodiversity Development Assessment Report

Report Number

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Client

Gunlake Quarries Pty Ltd

Date

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Prepared by	**Approved by**
	
Bianca Seal	**Nathan Garvey**
Ecologist	Associate Director
16 September 2021	16 September 2021

Executive Summary

ES1 Introduction

Gunlake Quarries Pty Ltd (Gunlake) operates a hard rock quarry (the 'Quarry') located at 715 Brayton Road, Marulan NSW. The Quarry is approximately 7 kilometres (km) north-west of the centre of Marulan in the Goulburn Mulwaree local government area. The land surrounding the Quarry is rural land with a low population density. Gunlake commenced operations in 2009 under project approval 07-0074 granted in September 2008.

Since the Quarry received approval for the Extension Project in 2017 (SSD 7090, NSW Land and Environmental Court Approval 20017/108663), the tonnage of saleable product dispatched by the Quarry has steadily increased and, with an infrastructure boom across the State, Gunlake forecast that demand for products from the Quarry will continue to increase. In response to the increased demand for products from the Quarry, it is proposed to transport more saleable product along the Primary Transport Route. This will require an increase in truck movements than what is currently approved. The additional truck movements will all occur on the recently upgraded Primary Transport Route that has been designed to accommodate comfortably the additional truck movements. The Project is known as the Gunlake Quarry Continuation Project (the 'Continuation Project'). The ignimbrite hard-rock resource will continue to be extracted and processed using the methods currently employed at the Quarry.

The Continuation Project is classified as a State Significant Development (SSD) under Schedule 1, Clause 7 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). This Biodiversity Development Assessment Report (BDAR) accompanies the Environmental Impact Statement (EIS) for a new State significant development (SSD) application for the Continuation Project and addressed the requirements of the Secretary's Environmental Assessment Requirements (SEARs).

ES2 Gunlake Quarry Continuation Project

Gunlake seeks a new development approval for the Continuation Project that allows:

- ongoing quarry operations;
- a maximum of 375 inbound and 375 outbound daily truck movements with no more than 4.2 million tonnes per annum (Mtpa) of quarry products transported from the site in any calendar year;
- 24-hours quarry operations Monday to Saturday, except 6 pm Saturday to 2 am Monday;
- an extraction depth of 546 metres Australian Height Datum (mAHD); and
- a 30-year quarry life (from the date of Continuation Project approval).

As no increase to the previously approved (MP 07_0074/NSW LEC Approval 2017/108663) surface disturbance area is proposed, this BDAR is primarily to assess the prescribed (uncertain) biodiversity impacts associated with the increased pit depth and groundwater drawdown in the prescribed impact area. The 'prescribed impact area' is the area where prescribed (uncertain) biodiversity impacts have the potential to occur. In this BDAR, this is the area where groundwater drawdown of 2 m or greater is predicted to occur over the life of the Quarry.

ES3 Landscape context

The project area (the Gunlake Quarry site) is within the South Eastern Highlands IBRA region and the Bungonia IBRA subregion. The project area is also within the Wollondilly – Bindook Tablelands and Gorges BioNet NSW Landscape (formerly Mitchell Landscapes). There are 15 unnamed first-order water courses and four unnamed second-order water courses within the prescribed impact area. These flow into Chapman's Creek and Jaorimin Creek to the north-east and the Lockyersleigh Creek to the west of the project area and prescribed impact area, both of which flow into the Wollondilly River to the north-west of the project area and prescribed impact area.

The native vegetation cover and patch size have not been calculated for this project, as the project does not require clearance of native vegetation beyond that previously approved by MP 07_0074/NSW LEC Approval 2017/108663. These landscape attributes are used to assess and score the landscape context and determine candidate species credit species requiring assessment but are not relevant for the project assessed in this BDAR.

The project area does not contain karst, caves, crevices, cliffs or other areas of geological significance. No soil hazards such as acid sulfate soils are mapped within the Project area, nor are there any areas of outstanding biodiversity value, as declared by the NSW Minister for Energy and Environment. No nationally important or RAMSAR wetlands have been mapped within the Project area or are located within close proximity and no Coastal Wetlands defined under the Coastal Management SEPP are mapped within the Project area.

ES4 Native vegetation

A desktop assessment of available vegetation data derived from extensive field surveys previously undertaken across the Gunlake Quarry (Ecotone 2008, Biosis 2014 EMM, 2016, 2018), supplemented by regional vegetation mapping datasets, (Section 1.5) was used to identify plant community types (PCTs) and potential terrestrial GDEs known to occur within prescribed impact area. Given this past work, no field surveys were required to be undertaken as part of the Continuation Project.

Five plant community types (PCTs) were identified within the prescribed impact area. This included PCT 1330 which is listed as a threatened ecological community (TEC) under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). PCT 1330 is listed as White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered).

PCT 1256 also occurs within the prescribed impact area and is aligned with Montane Peatlands and Swamps TEC under the BC Act and EPBC Act; however, does not include the characteristic dominant species for the TEC, and was concluded not to meet the description of the TECs.

The remaining PCTs within the prescribed impact area are not associated with any EPBC Act or BC Act listed TECs.

ES5 Threatened species

To assist in the identification of predicted candidate species credit species which could be affected by the proposed quarrying activities within the prescribed impact area, the species associated with PCTs mapped within the prescribed impact areas were assessed using the vegetation associations reports from the threatened biodiversity data collection (TBDC) to generate a list of predicted ecosystem and threatened species credit species. No targeted surveys were required to be undertaken as a part of this assessment as extensive field surveys have previously been undertaken across the Gunlake Quarry (Ecotone 2008, Biosis 2014 EMM, 2016, 2018).

Ecosystem credit species predicted by the Biodiversity Assessment Method Calculator (BAMC) include 26 bird species, three reptiles and ten mammals. Candidate species credit species predicted by the BAMC include 11 bird species, 25 plants, three reptiles, 13 mammals, one insect and five frogs.

There will not be any direct impacts to native vegetation or habitat for threatened species. As such, an assessment of impacts to these species is not warranted.

ES6 Groundwater-dependent ecosystems

An assessment of groundwater dependent ecosystems (GDEs) was undertaken in accordance with the NSW Government Risk Assessment Guidelines for Groundwater Dependent Ecosystems (Serov et al. 2012). To identify groundwater-dependent terrestrial ecosystems (phreatophytes), an analysis was undertaken documenting the association of the PCTs previously mapped within the broader Gunlake Quarry (EMM2016, 2018) and derived from regional vegetation datasets (EcoLogical 2015) with groundwater levels as modelled by the regional numerical groundwater flow model developed as a part of the groundwater assessment (EMM 2021b). Vegetation mapping undertaken previously for the Gunlake Quarry was preferenced, where available, over regional mapping as it is considered more reliable and the data has been ground-truthed.

Two PCTs have facultative association with groundwater, while three are considered non-dependent. The PCTs with a facultative association with groundwater are:

- PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion; and
- PCT 1330 - Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion.

A drawdown of 2 m is predicted to extend up to 1.3 km from the edge of the pit at the end of the Continuation Project. This is less that the predicted maximum extent of the 2 m drawdown predicted for the Extension Project due to refinements in the analytical model and the collection of additional groundwater monitoring data.

The initial risk assessment identified that a small area (2.38 ha) of PCT 1256 may be at high risk of predicted impact given the level of drawdown and the facultative – proportional dependence of this community on groundwater (Section 6.2). However, these impacts will occur to a small portion of these communities at a local scale. Overall, the risk of impact is considered low.

PCT 1330 is considered to be at low risk of impact given the level of groundwater drawdown and the small extent of the community that will be impacted.

The overall impacts to GDEs are assessed as low.

The Continuation Project impacts to GDEs are not predicted to increase, as the predicted area of drawdown for the Continuation Project is less than the predicted area of drawdown for the approved Extension Project.

ES7 Impact avoidance, minimisation and mitigation

The existing quarry pit will be deepened as part of the Continuation Project but will not have any direct or indirect surface impacts.

Prescribed impacts that are considered to have potential to occur as a result from the quarry activities within the prescribed impact area are assessed in Table 7.1. Overall, prescribed impacts to GDEs arising from the Gunlake Continuation Project are predicted to be minor in both extent and/or nature and represent a low risk of impact to the GDEs at a local scale.

Mitigation measures for the Project include groundwater drawdown monitoring to ensure it is consistent with the predictions in the groundwater assessment (EMM 2021b), throughout the life of the quarry and two years after closing.

ES8 Assessment of impacts under other relevant biodiversity legislation

ES8.1 Environment Protection and Biodiversity Conservation Act 1999

Three listed threatened ecological community (TECs) are predicted to occur within the locality based on a search of the PMST. No direct and/or indirect impacts will occur to these communities as there will be no surface disturbance works.

Fifty-six threatened flora and fauna, and migratory species were predicted to occur within the study area (PMST search). These species are shown in Table 8.1. None of these threatened species or communities or migratory species will be impacted as there will be no direct and/or indirect impacts.

The Continuation Project will not result in any direct or indirect impacts to threatened species or communities or migratory species listed under the EPBC Act. The project will not result in a significant impact to any MNES and referral of the project to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) is not required.

ES8.2 Fisheries Management Act 1994

The quarry layout and quarrying methods will remain consistent with those currently approved. While there is an increase in the maximum depth of the extraction area from 572 mAHD to 546 mAHD, with a minor reduction in baseflow to Chapmans Creek due to dewatering for quarry development (EMM 2021b), this degree of impact is considered unlikely to have a significant impact on any threatened aquatic species, populations or communities, or key fish habitat.

The existing water management system (Gunlake Quarries Pty Ltd 2020c) will continue under the Continuation Project and no changes are proposed.

ES8.3 Biosecurity Act 2015

Gunlake Quarry operates according to the Gunlake Quarry Environmental Management System that has been approved by the Department of Planning, Industry and Environment (DPIE) and includes the Biodiversity and Rehabilitation Management Plan (Gunlake Quarries Pty Ltd 2015).

The Biodiversity and Rehabilitation Management Plan identifies five weed species previously listed under the repealed *Noxious Weeds Act 1993*. Weed control would be implemented based on the methodologies outlined within the Biodiversity and Rehabilitation Management Plan (Gunlake Quarries Pty Ltd 2015) and would include existing and new weed species which may encroach into the project area.

ES8.4 Water Management Act 2000

The level of impact to the water table, water pressure and groundwater quality are considered to be less than the Level 1 minimal impact considerations under the NSW Aquifer Interference Policy (AIP, DPI 2012) and are therefore considered to be acceptable.

ES9 Biodiversity impacts and offsets

As the project will not result any direct impacts to native vegetation or habitat for threatened species, and that prescribed/uncertain impacts to GDE are considered highly unlikely to occur, offsets are not required.

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Part A

Stage 1: Biodiversity Assessment

1 Introduction

1.1 Overview of the Project

Gunlake Quarries Pty Ltd (Gunlake) operates a hard rock quarry (the 'Quarry') located at 715 Brayton Road, Marulan NSW. The Quarry is approximately 7 kilometres (km) north-west of the centre of Marulan in the Goulburn Mulwaree local government area (Figure 1.1). The land surrounding the Quarry is rural land with a low population density. Gunlake commenced operations in 2009 under project approval 07-0074 granted in September 2008.

Since the Quarry received approval for the Extension Project in 2017 (SSD 7090, NSW Land and Environmental Court Approval 20017/108663), the tonnage of saleable product dispatched by the Quarry has steadily increased and, with an infrastructure boom across the State, Gunlake forecast that demand for products from the Quarry will continue to increase. In response to the increased demand for products from the Quarry, it is proposed to transport more saleable product along the Primary Transport Route. This will require an increase in truck movements than what is currently approved. The additional truck movements will all occur on the recently upgraded Primary Transport Route that has been designed to accommodate comfortably the additional truck movements. The Project is known as the Gunlake Quarry Continuation Project (the 'Continuation Project'). The ignimbrite hard-rock resource will continue to be extracted and processed using the methods currently employed at the Quarry.

The Continuation Project is classified as a State Significant Development (SSD) under Schedule 1, Clause 7 of the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). This report accompanies a new SSD application and environmental impact statement (EIS) for the Continuation Project.

1.2 Project scope

A detailed description of the Project is provided within the EIS (EMM 2021a). Key features of the Project are shown in Figure 1.3 and discussed below.

1.2.1 The Continuation Project

Gunlake seeks a new development approval for the Continuation Project that allows:

- ongoing quarry operations;
- a maximum of 375 inbound and 375 outbound daily truck movements with no more than 4.2 million tonnes per annum (Mtpa) of quarry products transported from the site in any calendar year;
- 24-hours quarry operations Monday to Saturday, except 6 pm Saturday to 2 am Monday;
- an extraction depth of 546 metres Australian Height Datum (mAHD); and
- a 30-year quarry life (from the date of Continuation Project approval).

As no increase to the previously approved (MP 07_0074/NSW LEC Approval 2017/108663) surface disturbance area is proposed, this BDAR is primarily to assess the additional (prescribed) impacts associated with the increased pit depth and groundwater drawdown in the prescribed impact area. The 'prescribed impact area' is the area where prescribed (uncertain) biodiversity impacts have the potential to occur. In this BDAR, this is the area where groundwater drawdown of 2 m or greater is predicted to occur over the life of the Quarry.

1.3 Project elements

Table 1.1 Terms identifying Project elements in this BDAR

Project elements	Definition
Project area	The Gunlake Continuation Project application area (ie the Quarry site).
Direct impact area	The proposed activities will be within the previously approved (MP 07_0074/NSW LEC Approval 2017/108663) surface disturbance area and will include deepening the pit. No direct impacts will occur as there will be no further surface disturbance within the project area.
Indirect impact area	No indirect impacts will occur as there will be no further surface disturbance in the project area. The proposed mining activities comprise of the existing workings being deepened.
Prescribed impact area	The area where prescribed (uncertain) biodiversity impacts have the potential to occur. In this BDAR, this is the area where groundwater drawdown of 2 m or greater is predicted to occur over the life of the Quarry (Figure 1.3).
Locality	Comprised of a much broader area (10 km buffer) than just the Project Area to inform threatened biodiversity database searches and literature reviews.

It is noted that a 1,500 m buffer of the project footprint (an assessment area surrounding the subject lands) has not been applied because it is not relevant in this particular project. The assessment is focused on the potential for hydraulic connectivity between the proposed increased extraction depth and the terrestrial vegetation which may be impacted.

No direct surface impacts will occur and therefore no credit calculations have been undertaken.

1.4 Purpose of the report

The specific objectives of this BDAR, are to:

- describe biodiversity values of the project area;
- assess the likelihood that threatened species and communities listed under the *Biodiversity Conservation Act 2016* (BC Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) could occur in the prescribed impact area;
- document the strategies implemented to avoid and/or minimise impacts of the proposed Continuation Project;
- assess residual threatened biodiversity impacts, after avoidance and minimisation strategies have been implemented; and
- provide environmental safeguards to mitigate threatened biodiversity impacts during construction and operation.

This BDAR has been prepared in accordance with the Biodiversity Assessment Method (the BAM, DPIE 2020a), the EPBC Act, *Fisheries Management Act 1994* (FM Act), the legislative framework outlined in Section 2, and assessment guidelines and requirements outlined below.

1.4.1 Assessment guidelines and requirements

Gunlake submitted a request for Secretary's Environmental Assessment Requirements (SEARs) to the Department of Planning, Industry and Environment (DPIE) on 18 December 2020, along with supporting documentation describing the project, stakeholder engagement, key matters to be addressed in the EIS and the proposed assessment methods. The SEARs were issued on 6 May 2021. Table 1.2 sets out the SEARs requirements that are relevant to this biodiversity assessment and where they have been addressed in this BDAR.

Table 1.2 Secretary's Environmental Assessment Requirements

Requirement	Section addressed
A description of the existing environment likely to be affected by the development, using sufficient baseline data.	Sections 3 to 6
An assessment of the likely impacts of all stages of the development, including any cumulative impacts, taking into consideration any relevant laws, environmental planning instruments, guidelines, policies, plans and industry codes of practice.	Section 7
A description of the measures that would be implemented to avoid, minimise, mitigate and/or offset the likely impacts of the development.	Section 7.2
The EIS must address the following biodiversity issues: • accurate predictions of any vegetation clearing on site; • a detailed assessment of the likely biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems, undertaken in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR), unless a BDAR waiver is issued in respect of the Project; and • a strategy to offset any residual impacts of the development in accordance with the Biodiversity Offsets Scheme (where applicable);	• Section 7 • Offsetting for residual impacts in accordance with the Biodiversity Offsets Scheme is not applicable
Biodiversity impacts related to the proposed the Gunlake Continuation project are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method.	All sections of this BDAR
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	Section 7
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 development/project; • the number and classes of like-for-like biodiversity credits proposed to be retired; • the number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; • any proposal to fund a biodiversity conservation action; • any proposal to conduct ecological rehabilitation (if a mining project); and • 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 proposed quarrying activities will not directly or indirectly impact native vegetation, threatened communities or threatened species, and therefore no new biodiversity offsets are required, other than those already provided for.

Table 1.2 Secretary's Environmental Assessment Requirements

Requirement	Section addressed
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*.	This BDAR has been prepared by accredited assessor Nathan Garvey (BAAS17037).

1.5 Information sources

1.5.1 Publications and databases

In order to provide context for the project area, information about flora and fauna species, populations, communities and habitats from the locality (within 10 km) was obtained from the following databases:

- BioNet Atlas of NSW Wildlife for previous threatened species records;
- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES) likely to occur within the subject lands; and
- the NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database (DPIE 2021a).

Numerous ecological assessments have taken place in proximity to the Project Area and were used to assess existing records of threatened species and inform the current assessment. These studies include:

- Gunlake Quarry Biobank Site, Biodiversity Assessment Report (EMM 2018);
- Gunlake Quarry Environmental Monitoring Results Summary Report (Gunlake Quarries Pty Ltd 2020a);
- Gunlake Quarry Extension Project Environmental Impact Statement (EMM 2016);
- Flora and Fauna Survey and Ecological Impacts Assessment Report: Proposed Hard Rock Quarry, Haul Road and Bypass Roads Near Marulan (Ecotone 2008); and
- Extensions to Gunlake Quarry, Marulan: Supplementary Flora and Fauna Assessment (Biosis 2014).

1.5.2 Spatial data

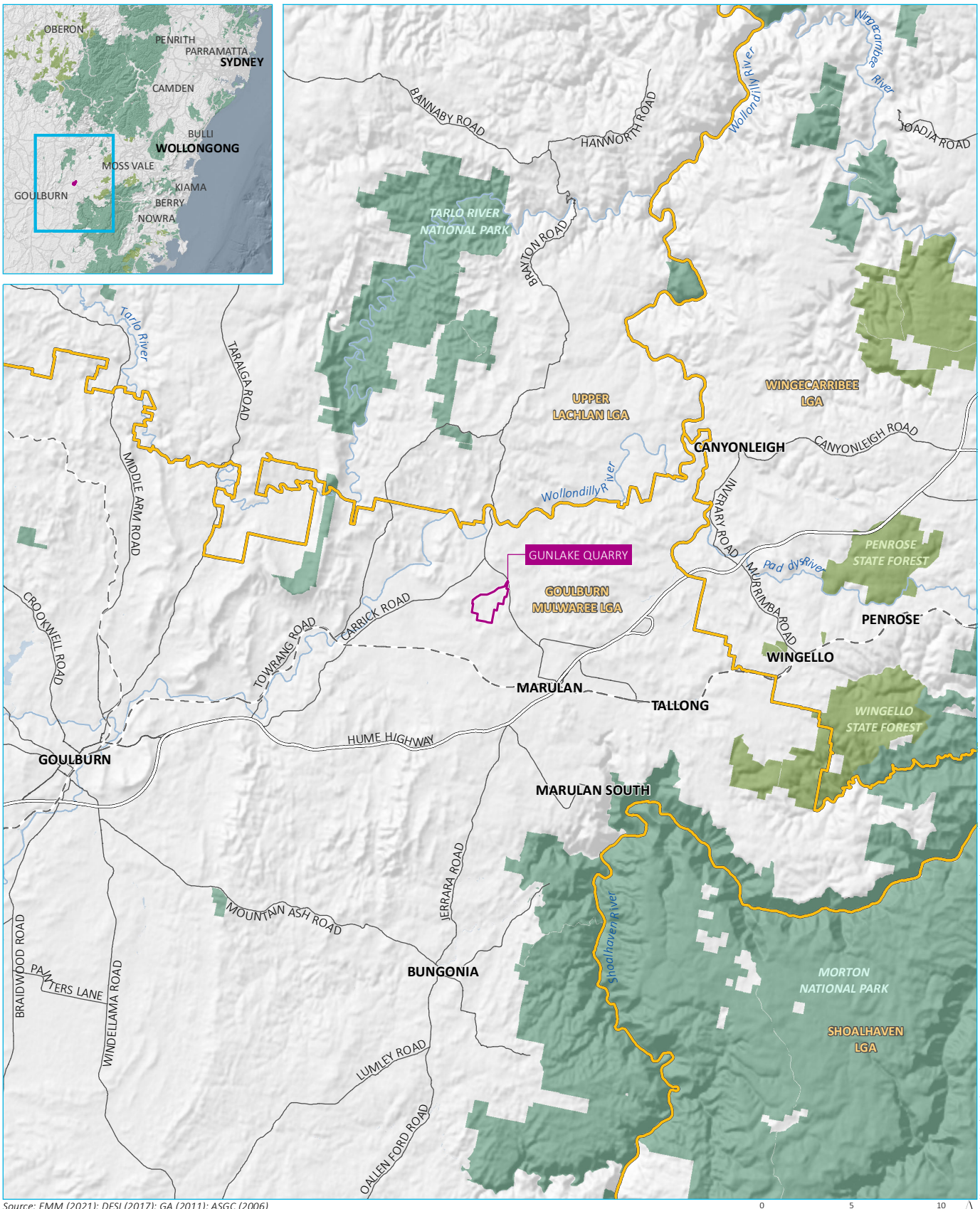
Spatial data encompassing the project area was provided by Gunlake Quarries Pty Ltd while data related to groundwater depths and extent of drawdown were developed by EMM as a part of the groundwater assessment (EMM 2021b). Base map data was obtained from NSW Department of Finance, Services and Innovation (DFSI) databases, with cadastral data obtained from DFSI digital cadastral database. Mapping for stream orders was obtained from NSW Department of Primary Industry (DPI).

The following spatial datasets were utilised during the development of this report:

- South East Local Land Services Biometric vegetation map, 2014. VIS_ID 4211 (EcoLogical 2015);
- Mitchell Landscapes Version V3.1 (OEH 2017);

- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7 (DoEE 2018);
- Directory of important wetlands in Australia (DAWE 2021a); and
- Australian Ramsar Wetlands (DAWE 2021b).

Spatial data relevant to this BDAR will be provided to the DPIE following lodgement of the BDAR.



Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006)

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GDA 1994 MGA Zone 55

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KEY

- Site boundary
- Local government area
- Rail line
- Highway
- Major road
- River
- Waterbody
- NPWS reserve
- State forest

Regional context

Gunlake Quarry Continuation Project
Biodiversity Development Assessment Report
Figure 1.1

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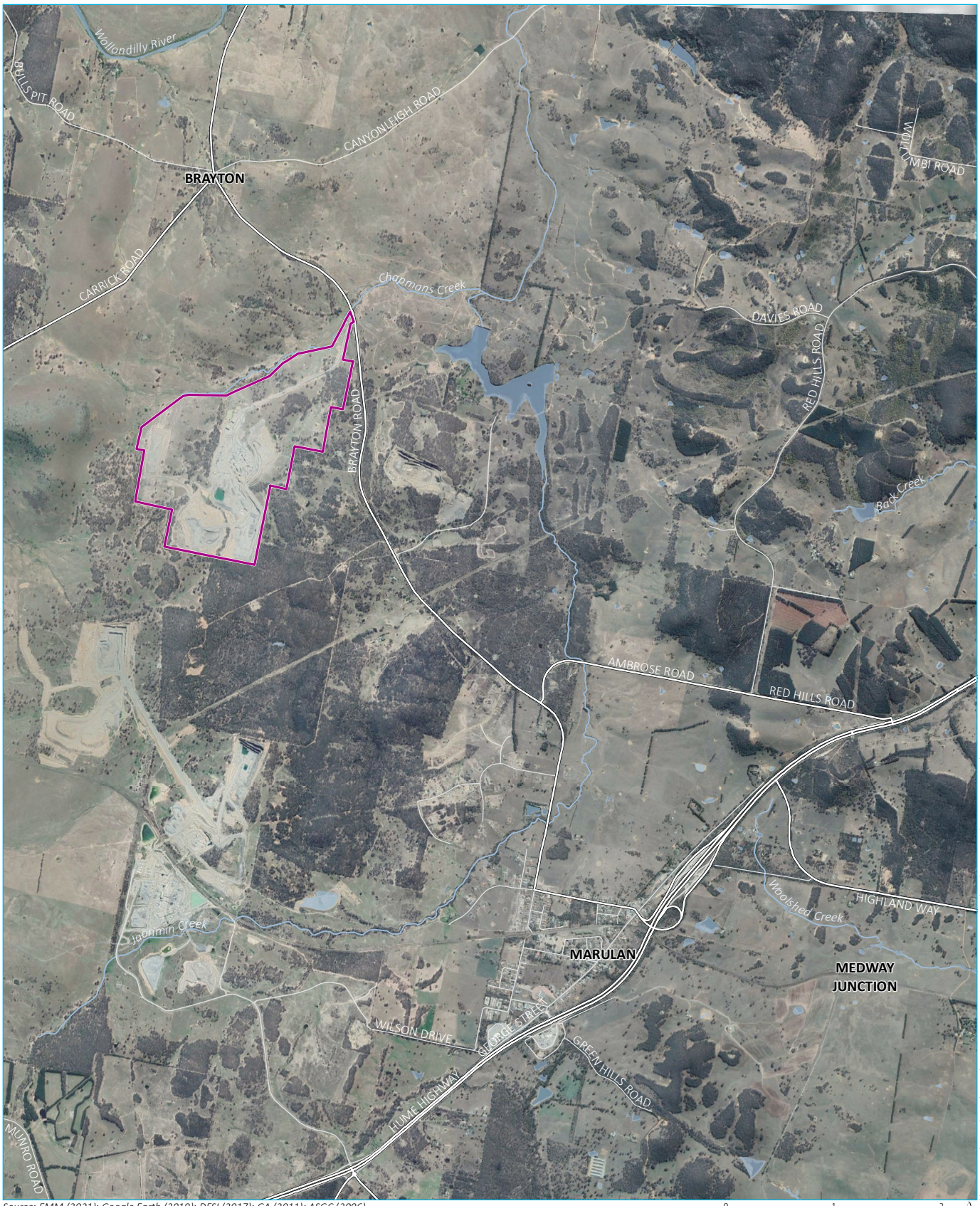

Source: EMM (2021); Google Earth (2019); DFSI (2017); GA (2011); ASGC (2006)

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GDA 1994 MGA Zone 55

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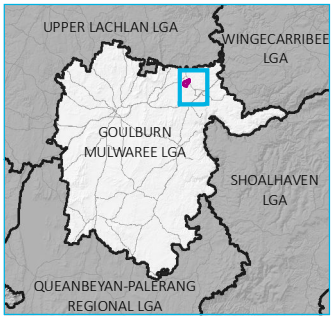

KEY

- Site boundary
- Major road
- Minor road
- Named watercourse
- Waterbody

Local context

Gunlake Quarry Continuation Project
Biodiversity Development Assessment Report
Figure 1.2

EMM creating opportunities

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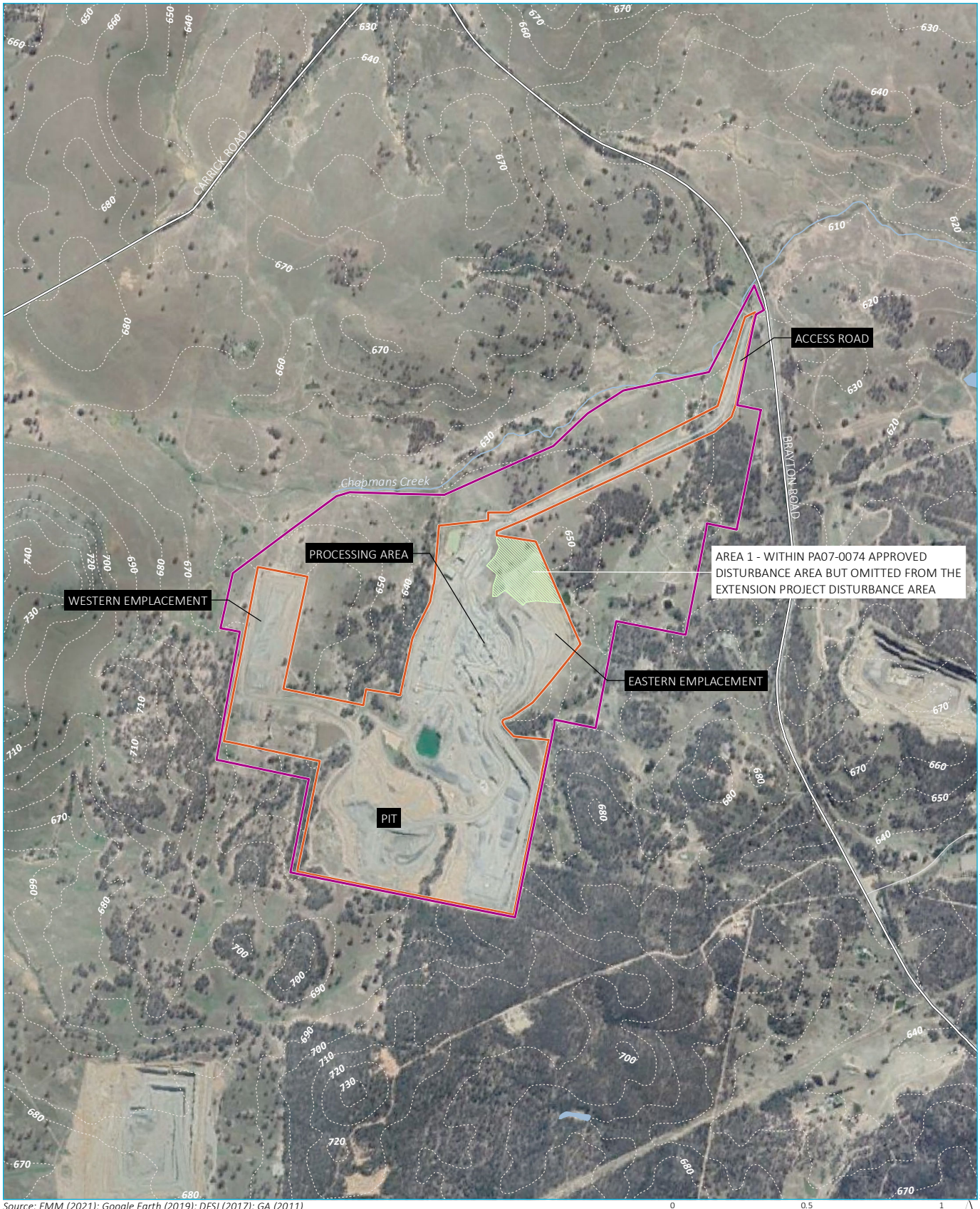

Source: EMM (2021); Google Earth (2019); DFSI (2017); GA (2011)

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GDA 1994 MGA Zone 55

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KEY

- Site boundary
- Continuation project disturbance area
- Area 1
- Major road
- Minor road
- Topographic contour (10 m interval)
- Named watercourse
- Waterbody

Project features

Gunlake Quarry Continuation Project
Biodiversity Development Assessment Report
Figure 1.3

EMM creating opportunities

2 Legislative context

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

2.1 Commonwealth

2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as Matters of National Environmental Significance (MNES) under the EPBC Act. These are:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. A proponent proposing to take such an action must refer the project to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for determination as to whether or not it is a controlled action. If deemed a controlled action the project is assessed under the EPBC Act, and a decision made as to whether to grant approval.

Should approval under the EPBC Act be required, a bilateral agreement between the Australian Government and the State of New South Wales (enacted on 5 April 2020) allows for DAWE to use the NSW assessment process for State Significant Development (SSD) projects to assess impacts under the EPBC Act (DAWE 2021c).

It has been confirmed by DAWE that a new referral is not required for the Continuation Project. An assessment of the Project against the EPBC Act is provided in Section 8.1.

2.2 State

2.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community in NSW. The EP&A Act is administered by DPIE.

The EP&A Act provides the overarching structure for planning in NSW and is supported by other statutory environmental planning instruments (EPIs) including SEPPs. EPIs relevant to the natural environment are outlined further below.

i State Environmental Planning Policy (Koala Habitat Protection) 2021

The State Environmental Planning Policy (Koala Habitat Protection) 2021 (the Koala SEPP 2021) 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. It applies to development applications on land which is >1 hectares (ha) on its own, or together with adjoining land in the same ownership, whether or not the development application applies to only part of the land, and which is within council areas listed in Schedule 1 of Koala SEPP 2021.

The Koala SEPP 2021 does not apply to assessments under Part 5 of the EP&A Act, or to SSD projects. Further, there will not be any direct or indirect impacts to Koala habitat arising from the Continuation Project as there will be no further surface disturbance in the project area.

2.3 Biodiversity Conservation Act 2016

The BC Act is responsible for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations, and ecological communities. The BC Act, together with the Biodiversity Conservation Regulation 2017 (BC Regulation), establish the Biodiversity Offsets Scheme (BOS).

The BOS includes establishment of the Biodiversity Assessment Method (BAM) (DPIE 2020a) for use by accredited persons in biodiversity assessment under the scheme. The purpose of the BAM is to assess the impact of actions on threatened species and threatened ecological communities, and their habitats, and determine offset requirements. For SSD projects, use of the BAM is mandatory unless a BDAR waiver is granted.

The BAM sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land to:

- identify the biodiversity values on land subject to proposed development area;
- determine the impacts of a proposed development, following all measures to avoid, minimise and mitigate impacts; and
- quantify and describe the biodiversity credits required to offset the residual impacts of proposed development on biodiversity values.

This biodiversity assessment has been undertaken in accordance with the requirements of the BAM.

2.4 Fisheries Management Act 1994

The FM Act contains provisions for the conservation of fish stocks, key fish habitat, biodiversity, threatened species, populations, and ecological communities. It regulates the conservation of fish, vegetation and some aquatic macroinvertebrates and the development and sharing of the fishery resources of NSW for present and future generations. The FM Act lists threatened species, populations and ecological communities, key threatening processes (KTPs) and declared critical habitat. Assessment guidelines to determine whether a significant impact is expected are detailed in section 220ZZ and 220ZZA of the FM Act.

Another objective of the FM Act is to conserve key fish habitat (KFH). These are defined as aquatic habitats that are important to the sustainability of recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. KFH is defined in Section 3.2.1 and 3.2.2 of the Policy and Guidelines for Fish Conservation and Management (DPI 2013). KFH has been mapped within the prescribed impact area along Chapmans Creek and associated tributaries (DPI 2021a & 2021b).

The project is assessed against the requirements of the FM Act in Section 8.2.

2.5 Biosecurity Act 2015

The primary objective of the *Biosecurity Act 2015* (Biosecurity Act) is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The Biosecurity Act stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about;
- applies to all land within NSW and all waters within the limits of the State; and
- local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan.

The Biosecurity Act imposes a general duty on persons who deal with biosecurity matters to prevent, minimise and eliminate the risk so far as is reasonably practicable, and also imposes mandatory measures for Weeds of National Significance (WoNS) as per Part 2, Division 8, clause 33 of the NSW Biosecurity Regulation 2018, being that a person must not import into the State or sell.

An assessment of the Project against the requirements of the Biosecurity Act is provided in Section 8.3.

2.6 Water Management Act 2000

Division 6 of the *Water Management Act 2000* (WM Act) requires consideration of controlled activities (ie activities within 40 m of riparian land) and aquifer interference activities. The NSW Aquifer Interference Policy (DPI 2012) requires an assessment of potential impacts on groundwater users, including groundwater dependent ecosystems.

Impacts on groundwater dependent ecosystems are considered in Section 6 of this report. An assessment for the project against the requirements of the WM Act is provided in Section 8.4.

3 Landscape context

The identification of landscape features in the locality was undertaken in accordance with Section 3 of the BAM (DPIE 2020a), and results are summarised within this chapter. The landscape features described in the following sections are summarised in Table 3.1 and shown in Figure 3.1 and Figure 3.2.

Table 3.1 Landscape features of the subject site

Landscape feature	Subject site
Method applied for site context components	Site-based (1,500 m buffered assessment area); however, this has not been applied because it is not relevant for this particular project. The assessment is focused on the potential for hydraulic connectivity between the proposed increased extraction depth and the terrestrial vegetation which may be impacted. No direct surface impacts will occur and therefore no credit calculations have been undertaken.
Interim Biogeographic regionalisation of Australia (IBRA) bioregion	South Eastern Highlands
IBRA subregion	Bungonia
BioNet NSW landscapes (formerly Mitchell landscapes)	Wollondilly – Bindook Tablelands and Gorges
Rivers, streams and estuaries	The following rivers, streams and estuaries have been mapped within the prescribed impact area: • Fifteen unnamed first-order water courses; and • Four unnamed second-order water courses. These flow into Chapman's Creek and Jaorimin Creek to the north-east and the Lockyersleigh Creek to the west of the project area and prescribed impact area, all of which flow into the Wollondilly River to the north-west of the project area and prescribed impact area.
Wetlands	No Nationally Important Wetlands have been mapped within the Project area. No Coastal Wetlands defined under the *State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP)* are mapped within the Project area.
Connectivity of different areas of habitat	The project area is located on the edge of a large patch of woody vegetation to the south-east and historically cleared paddocks to the north-west. A number of unnamed vegetated waterways also provide connectivity to Jaorimin Creek to the north-east and the vegetated extent in the south-east.
Areas of geological significance and soil hazard	There are no areas of geological significance within the Project area. No soil hazards, such as acid sulfate soils, are mapped within the Project area (DPIE 202b).
Areas of outstanding biodiversity value	There are no areas of outstanding biodiversity value mapped within the project area.
Percent native vegetation cover	The Continuation Project does not require clearance of native vegetation therefore, native vegetation cover and patch size have not been calculated for this project.

3.1 Landscape features

3.1.1 Bioregions and Mitchell landscapes

The project area is within the South Eastern Highlands IBRA region and the Bungonia IBRA subregion (Figure 3.1). The project area is also within the Wollondilly – Bindook Tablelands and Gorges BioNet NSW Landscape (formerly Mitchell Landscapes).

3.1.2 Connectivity

The project area is located on the edge of a large patch of woody vegetation primarily zoned RU2-Rural Landscape. This woody vegetation is located to the south-east of the project area and supports connective features for terrestrial and arboreal mammals, birds and reptiles. Large extents of historically cleared grassed paddocks and remnant trees also occur to the north-west of the project area, which limits connectivity to further patches of wooded vegetation and the Wollondilly River approximately 1.5 km from the project area.

A number of unnamed waterways are located within the prescribed impact area (see Section 3.1.5), which connects to Jaorimin Creek and the Wollondilly River further to the north-east. These unnamed, vegetated waterways are likely to provide connectivity as fauna corridors to connected vegetation, which allows faunal movement around the project area.

3.1.3 Areas of geological significance and soil hazard features

The project area does not contain karst, caves, crevices, cliffs or other areas of geological significance. No soil hazards such as acid sulfate soils are mapped within the Project area.

3.1.4 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value, as declared by the NSW Minister for Energy and Environment, within the Project area.

3.1.5 Waterways and wetlands

The prescribed impact area contains a number of unnamed waterways including:

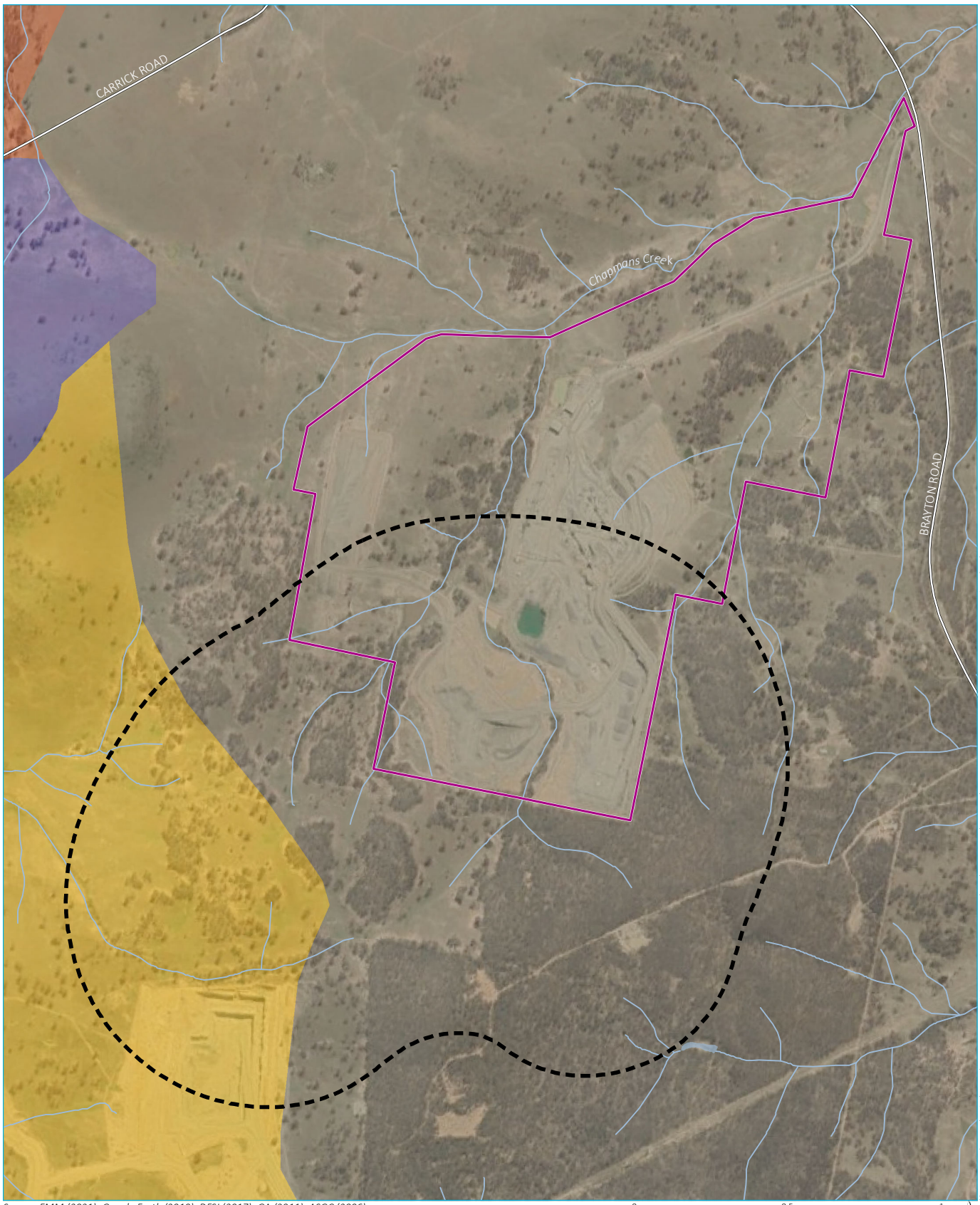
- fifteen unnamed first-order water courses; and
- four unnamed second-order water courses.

These flow into Chapman's Creek and Jaorimin Creek to the north-east and the Lockyersleigh Creek to the west of the project area and prescribed impact area, both of which flow into the Wollondilly River to the north-west of the project area and prescribed impact area.

No nationally important or RAMSAR wetlands have been mapped within the project area or are located within close proximity. No Coastal Wetlands defined under the Coastal Management SEPP are mapped within the project area.

3.2 Assessment of site context

The native vegetation cover and patch size have not been calculated for this project, as the project does not require clearance of native vegetation. These landscape attributes are used to assess and score the landscape context and determine candidate species credit species requiring assessment but are not relevant for the project assessed in this BDAR.



Source: EMM (2021); Google Earth (2019); DFSI (2017); GA (2011); ASGC (2006)

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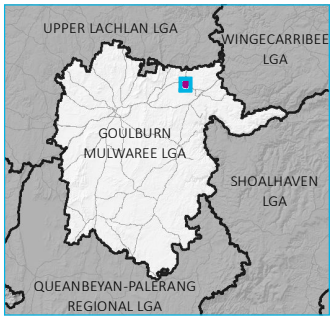

KEY

- Site boundary
- Prescribed impact area
- Major road
- Watercourse/drainage line
- Waterbody

Mitchell landscape

- Crookwell Basalts and Sands
- Oberon - Kialla Granites
- Rockley Plains
- Wollondilly - Bindook Tablelands and Gorges

NOTE:
IBRA7 region: South Eastern Highlands
IBRA7 subregion: Bungonia

Location map

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Biodiversity Development Assessment Report
Figure 3.1

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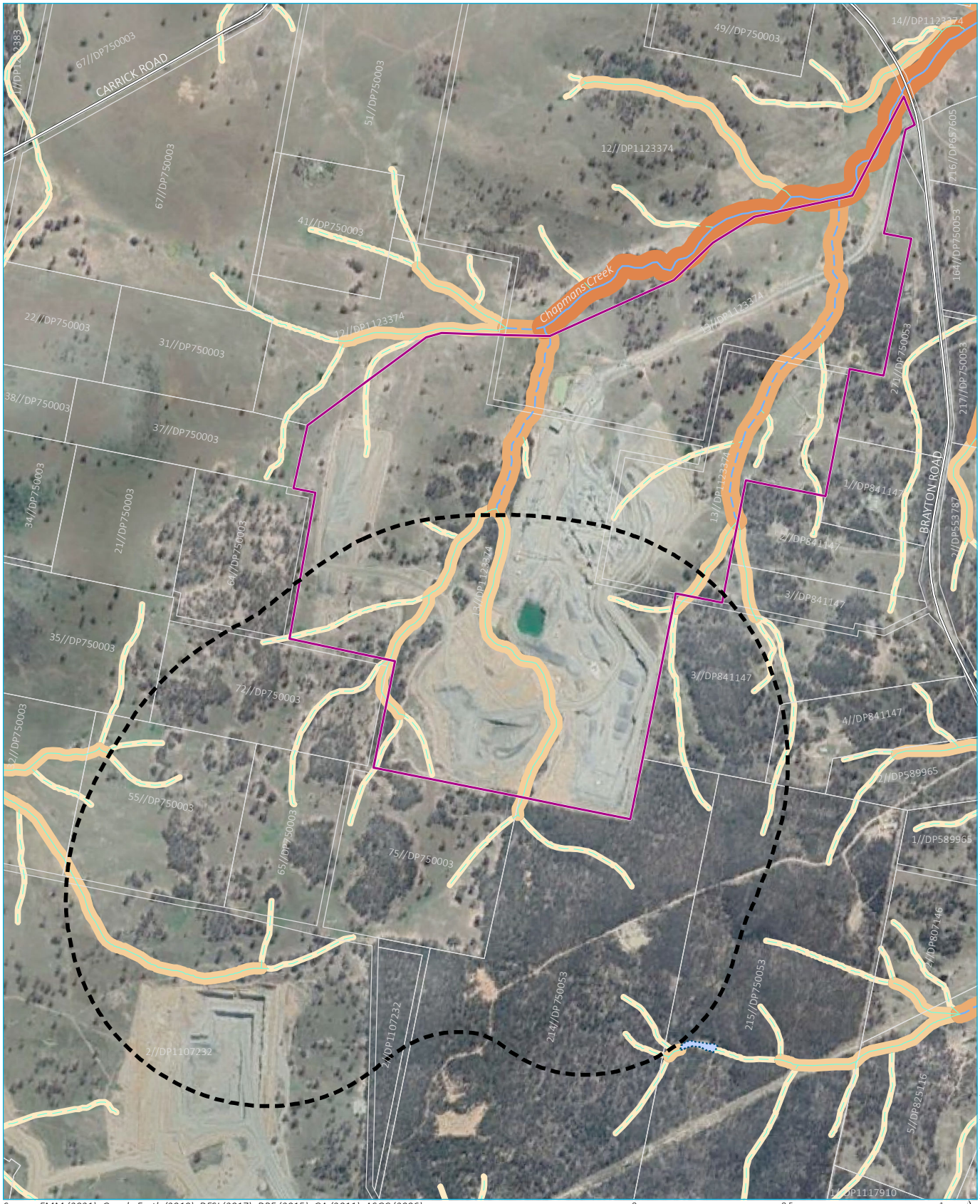

Source: EMM (2021); Google Earth (2019); DFSI (2017); DPE (2015); GA (2011); ASGC (2006)

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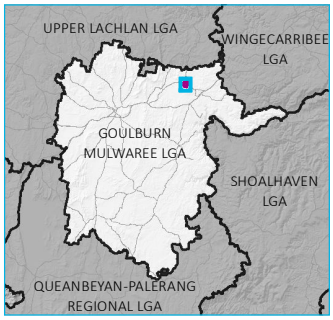

KEY

- Site boundary
- Prescribed impact area
- Major road
- Cadastral boundary
- Waterbody

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order

Riparian buffer

- 10 m
- 20 m
- 30 m
- 40 m

Site map

Gunlake Quarry Continuation Project
Biodiversity Development Assessment Report
Figure 3.2

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4 Native vegetation

4.1 Methods

A desktop assessment of available vegetation data derived from extensive field surveys previously undertaken across the Gunlake Quarry (Ecotone 2008, Biosis 2014 EMM, 2016, 2018), supplemented by regional vegetation mapping datasets, was used to identify plant community types (PCTs) and potential terrestrial GDEs known to occur within the prescribed impact area. Given this past work, no field surveys were required to be undertaken as part of the Continuation Project.

The assessment of native vegetation considered to be groundwater dependent within the prescribed impact area was completed in accordance with *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (Serov et al. 2012) and is provided in Section 6.

4.2 Results

4.2.1 Plant community types

PCTs identified within the prescribed impact area based on review of regional mapping and previous studies, as well as their vegetation formation, vegetation class and whether they align with an EPBC Act and/or BC Act listed threatened ecological community (TEC) are shown in Table 4.1 and Figure 4.1. A description of these PCTs, as provided by EMM (2018) and the Bionet Vegetation Classification database (DPIE 2021a) is also included below.

Table 4.1 PCTs, including vegetation formation and vegetation class, identified within the prescribed impact area

PCT	Vegetation formation	Vegetation class	Area (ha)[1]
PCT 731 - Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion	Grassy Woodland	Southern Tableland Grassy Woodlands	19.80
PCT 888 - Inland Scribbly Gum - Brittle Gum low woodland of the eastern tablelands, South Eastern Highlands	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	90.65
PCT 1150 - Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	South East Dry Sclerophyll Forests	12.22
PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Freshwater Wetlands	Montane Bogs and Fens	2.38
PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Grassy Woodland	Southern Tableland Grassy Woodlands	104.34
Total			**229.40**

Notes: 1. May include areas that have been previously cleared

i PCT 731- Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion

This community is found on mid to upper slopes and away from drainage lines.

Where present, the overstorey contains Thin-leaved Strinybark (*Eucalyptus eugenioides*), Argyle Apple (*Eucalyptus cinerea*), Red Stringybark (*Eucalyptus macrorhyncha*) and Apple Box (*Eucalyptus biridgesiana*) (Photograph 4.1). In areas of medium and high condition a sparse shrub layer is present and includes species such as Urn Heath (*Melichrus urceolatus*), Gorse Bitter Pea (*Daviesia ulicifolia*), Native Cranberry (*Astroloma humifusum*) and Dolly Bush (*Cassinia aculeata*). The native groundcover is dense to sparse, depending on condition, and includes species such as Poverty Raspwort (*Gonocarpus tetragynus*), Ivy Goodenia (*Goodenia hederacea*), Hoary Guinea Flower (*Hibbertia obtusifolia*), Stinking Pennywort (*Hydrocotyle laxiflora*), Small St John's Wort (*Hypericum gramineum*), Wattle Matt-rush (*Lomandra filiformis* subsp. *coriacea*), Weeping Grass (*Microlaena stipoides*) and *Oxalis perennans*.

Exotic species are present in low to moderate abundance and include species such as Spear thistle (*Cirsium vulgare*), *Conyza* sp. and Catsear (*Hypochaeris radicata*). Major weeds such as Serrated Tussock (*Nassella trichotoma*) and Blackberry (*Rubus fruticosus*) are also present, particularly in areas of medium condition.

Photograph 4.1 PCT 731 directly north of the project area

ii PCT 888 - Inland Scribbly Gum - Brittle Gum low woodland of the eastern tablelands, South Eastern Highlands

This community occurs as a low woodland or open forest on sandy loams mainly derived from fine-grained sedimentary rocks on low ridges.

PCT 888 is characteristically dominated by Inland Scribbly Gum (*Eucalyptus rossi*), Brittle Gum (*Eucalyptus mannifera*), Broad-leaved Peppermint (*Eucalyptus dives*) and Red Stringybark (*Eucalyptus macrorhyncha*). The shrub layer primarily consists of sclerophyllous species such as Black She-oak (*Allocasuarina littoralis*), Daphne Heath (*Brachyloma daphnoides*), Hoary Guinea Flower (*Hibbertia obtusifolia*), Urn Heath and Narrow-leaved Geebung (*Persoonia linearis*). The ground layer is characteristic of native sedges, grass and forbs. Species can include Poverty Raspwort, Ivy Goodenia, Wattle Matt-rush, Redanther Wallaby Grass (*Joycea pallida*) and *Lepidosperma gunnii*.

iii PCT 1150 - Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion

PCT 1150 occurs as an open forest on the coastal ranges of the lower North Coast at lower elevations and on lower fertility substrates.

The canopy of PCT 1150 is diverse, dominated by Small-fruited Grey Gum (*Eucalyptus propinqua*) and occurring with other species such as Turoentine (*Syncarpia glomulifera*), Tallowwood (*Eucalyptus microcorys*), Pink Bloodwood (*Corymbia intermedia*) and Brush Box (*Lophostemon confertus*). A diverse shrub layer also occurs, interspersed by smaller trees and vines. Species include Forest Oak, Scentless Rosewood (*Synoum glandulosum*), Coffee Bush (*Breynia oblongifolia*), Lawyer Vine (*Smilax australis*), Wonga Wonga Vine (*Pandorea pandorana*) and Native Yam (*Dioscorea transversa*). The ground layer is a mix of grass and forb species including *Oplismenus imbecillis*, Blady Grass (*Imperata cylindrica*), *Doodia aspera* and Blue Flax-lily (*Dianella caerulea*).

iv PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

This community occurs as a treeless shrubland on peats and humic loams in sediment-filled valleys up to 1,000 m in the western Blue Mountains and Southern Tablelands.

The shrub layer is characteristic of species such as Prickly Tea-tree (*Leptospermum juniperinum*), *Leptospermum obovatum* and Purple Loosestrife (*Lythrum salicaria*). The ground layer is characterised by species which tolerate waterlogging and include Tall Spike Rush (*Eleocharis sphacelata*), Swamp Millet (*Isachne globosa*), Common Reed (*Phragmites australis*) and River Buttercup (*Ranunculus inundatus*).

v PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion

This community is found associated with drainage lines, gullies and lower slopes.

Where present, the overstorey contains Blakely's Red Gum (*Eucalyptus blakelyi*) and Yellow Box (*Eucalyptus melliodora*) with scattered Argyle Apple.

In areas of medium and high condition, a sparse shrub layer is present and includes species such as Urn Heath (*Melichrus urceolatus*), Peach Heath (*Lissanthe strigosa*) and Black Wattle (*Acacia mearnsii*). Native groundcover is dense to sparse, depending on condition, and includes species such as Red Grass (*Bothriochloa macra*), Poverty Raspwort, Ivy Goodenia, Stinking Pennywort, Wattle Matt-rush and Weeping Grass. Exotic species are present in low to moderate abundance and include species such as Catsear and Hop Clover (*Trifolium campestre*). Major weeds such as Serrated Tussock (*Nassella trichotoma*) and Blackberry (*Rubus fruticosus*) are also present.

Photograph 4.2 PCT 1330 directly north of the project area

4.2.2 Threatened Ecological Communities

Two PCTs have been identified in the prescribed impact area as aligning with two threatened ecological communities (TECs) listed under the BC Act and EPBC Act, shown in Table 4.2 below. Other PCTs are not associated with any EPBC Act or BC Act listed threatened ecological communities.

Table 4.2 PCT alignment with threatened ecological communities

PCT	TEC association	
	BC Act	EPBC Act
PCT 731 - Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion	Not listed	Not listed
PCT 888 - Inland Scribbly Gum - Brittle Gum low woodland of the eastern tablelands, South Eastern Highlands	Not listed	Not listed
PCT 1150 - Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion	Not listed	Not listed
PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Not listed (see below)	Not listed

Table 4.2 PCT alignment with threatened ecological communities

PCT	TEC association	
	BC Act	EPBC Act
PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered)	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered)

i Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions (Endangered)

Montane Peatlands and Swamps are comprised of treeless wetlands with a dense to open shrub layer with a dense groundcover of sedges, grasses and forbs. It is the only type of wetland that may contain more than trace amounts of Sphagnum spp., the hummock peat-forming mosses. The community is distributed in areas above 400 m above sea level (ASL) in the headwaters of streams and waterways (DPIE 2021b)

DECC (2008) provides identification guidelines for the Montane Peatlands and Swamps. While the site is located above 400 m ASL, appears to consist of a "generally boggy flat area near the headwaters of a stream" and has a complete absence of trees, the area of PCT 1256 mapped within the prescribed impact area does not appear to support areas of Sphagnum moss and is more likely to consist of mesic vegetation including sedges and rushes.

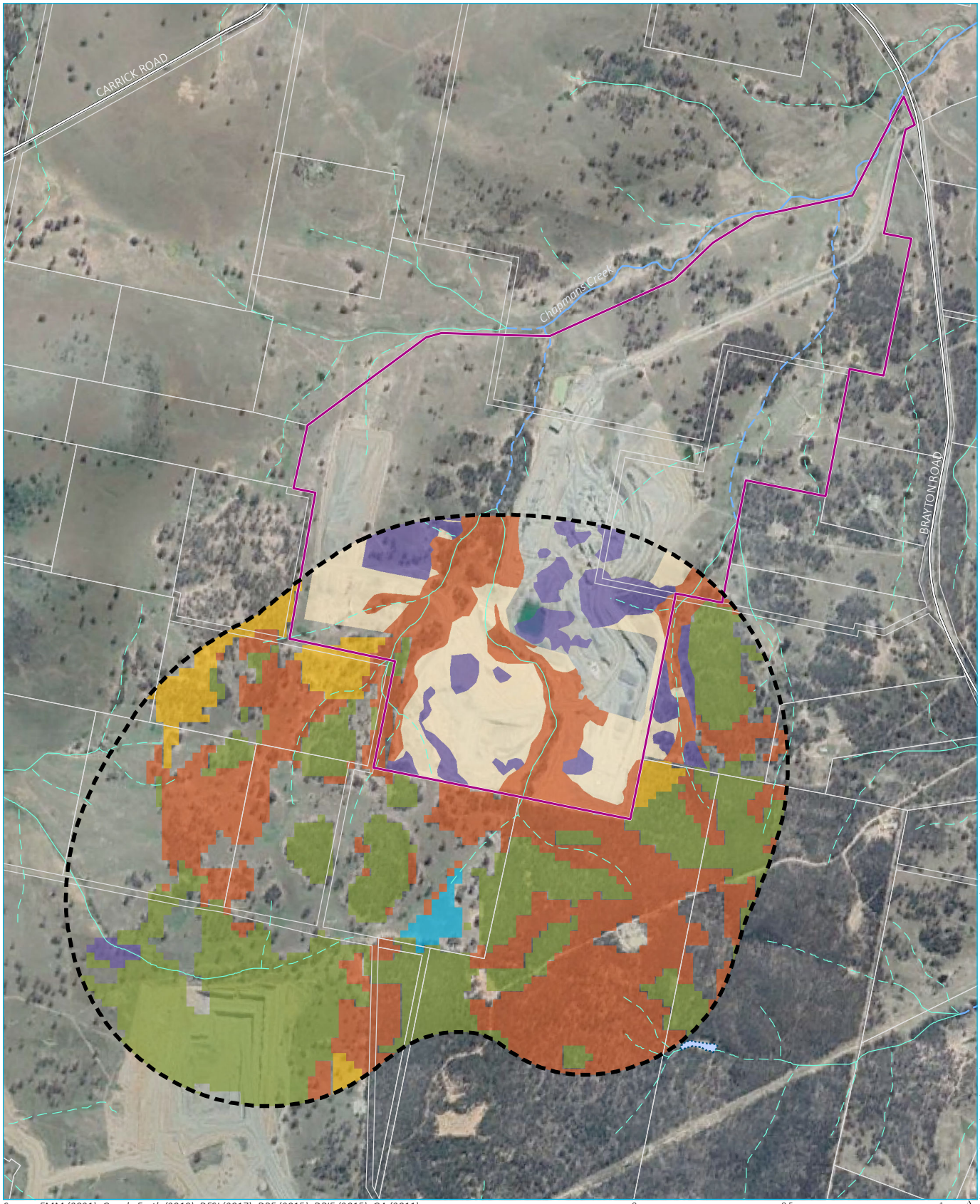
On this basis, it is concluded that PCT 1256 is unlikely to be representative of the Montane Peatlands and Swamps Endangered Ecological Community.

ii White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community

NSWTSSC (2020) outlines that the CEEC occurs within the South Eastern Highlands IBRA region as fragmented remnants primarily within cleared landscapes. White Box (*Eucalyptus albens*), Yellow Box and Blakely's Red Gum *Eucalyptus blakelyi*) are or were characteristically dominant. These species are dominant across large portions of PCT 1330 within the prescribed impact area. NSWTSSC (2020) also outlines an assemblage of species that characterise the CEEC; this is consistent with the floristic composition of PCT 1330 within the prescribed impact area. This CEEC occurs on hilly to undulating landscapes in areas with soils of moderate fertility derived from a range of lithologies, including alkaline and acid volcanics, granites, sediments, serpentinites and metamorphics. This description aligns with the soils profile within the prescribed impact area (DPIE 2020b). Previous studies by EMM (2016, 2018) have also identified this CEEC to occur directly north of the project area. This CEEC was determined to occur based on the presence of Blakely's Red Gum and Yellow Box and the presence of a grassy understorey and the potential for assisted natural regeneration of all strata.

Based on the above, it is considered that PCT 1330 is consistent with the White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC, as listed under the BC Act. However, only higher quality portions of PCT 1330 within the prescribed impact area are considered likely to align with White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, listed as a CEEC under the EPBC Act in line with the criteria listed in DEH (2006).

A total of 104.34 ha of White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland, listed as a Critically Endangered Ecological Community (CEEC) is mapped as occurring within the prescribed impact area.



Source: EMM (2021); Google Earth (2019); DFSI (2017); DPE (2015); DPIE (2015); GA (2011)

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KEY

- Site boundary
- Prescribed impact area
- Major road
- Cadastral boundary
- Waterbody

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- Native pasture

Plant community type

- 731 | Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion
- 888 | Inland Scribbly Gum - Brittle Gum low woodland of the eastern tablelands, South Eastern Highlands
- 1150 | Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion
- 1256 | Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion
- 1330 | Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands

Vegetation mapping within the prescribed impact area

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Figure 4.1

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5 Threatened Species

5.1 Methods

5.1.1 Identification of candidate species

Candidate species for further assessment were identified in accordance with Step 1 to 2 (Section5.2.1 to 5.2.2) of the BAM. For this assessment, there are no direct impacts, and therefore threatened species assessments are not triggered by the BAMC as there is no vegetation clearance.

The potential impact on the prescribed impact area is a prescribed/uncertain impact and, as such, adaptive management is proposed (Section 7.2.1). To assist in the identification of predicted candidate species credit species which could be affected by the proposed quarrying activities within the prescribed impact area, the species associated with PCTs mapped within the prescribed impact areas was assessed using the vegetation associations reports from the threatened biodiversity data collection (TBDC) to generate a list of predicted ecosystem and threatened species credit species.

Both ecosystem species and species credit species are identified. Ecosystem credit species are those threatened species which are considered under the BAM to have habitat that can be reliably predicted to occur within a PCT. Species credit species are those threatened species which, under the BAM, are considered to require assessment of habitat (or components of habitat) for those particular species.

No targeted surveys were required to be undertaken as a part of this assessment as extensive field surveys have previously been undertaken across the Gunlake Quarry (Ecotone 2008, Biosis 2014 EMM, 2016, 2018).

5.2 Results

5.2.1 Predicted species assessment

Ecosystem credit species predicted by the BAMC are provided in Table 5.1.

Table 5.1 Ecosystem credit species predicted to occur within the prescribed impact area

Scientific Name	Common name	EPBC Act	BC Act
Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Critically Endangered
Artamus cyanopterus cyanopterus	Dusky Woodswallow		Vulnerable
Botaurus poiciloptilus	Australasian Bittern	Endangered	Endangered
Callocephalon fimbriatum	Gang-gang Cockatoo		Vulnerable
Calyptorhynchus lathami	Glossy Black-Cockatoo		Vulnerable
Chthonicola sagittata	Speckled Warbler		Vulnerable
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)		Vulnerable
Daphoenositta chrysoptera	Varied Sittella		Vulnerable
Dasyurus maculatus	Spotted-tailed Quoll	Endangered	Vulnerable
Epthianura albifrons	White-fronted Chat		Vulnerable

Table 5.1 Ecosystem credit species predicted to occur within the prescribed impact area

Scientific Name	Common name	EPBC Act	BC Act
Falco subniger	Black Falcon		Vulnerable
Falsistrellus tasmaniensis	Eastern False Pipistrelle		Vulnerable
Glossopsitta pusilla	Little Lorikeet		Vulnerable
Grantiella picta	Painted Honeyeater	Vulnerable	Vulnerable
Haliaeetus leucogaster	White-bellied Sea-Eagle		Vulnerable
Hieraaetus morphnoides	Little Eagle		Vulnerable
Hirundapus caudacutus	White-throated Needletail	Vulnerable	Not Listed
Hoplocephalus bungaroides	Broad-headed Snake	Vulnerable	Endangered
Lathamus discolor	Swift Parrot	Critically Endangered	Endangered
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)		Vulnerable
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)		Vulnerable
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat		Vulnerable
Miniopterus australis	Little Bent-winged Bat		Vulnerable
Miniopterus orianae oceanensis	Large Bent-winged Bat		Vulnerable
Neophema pulchella	Turquoise Parrot		Vulnerable
Ninox connivens	Barking Owl		Vulnerable
Ninox strenua	Powerful Owl		Vulnerable
Pachycephala olivacea	Olive Whistler		Vulnerable
Petaurus australis	Yellow-bellied Glider		Vulnerable
Petroica boodang	Scarlet Robin		Vulnerable
Petroica phoenicea	Flame Robin		Vulnerable
Phascolarctos cinereus	Koala	Vulnerable	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat		Vulnerable
Scoteanax rueppellii	Greater Broad-nosed Bat		Vulnerable
Stagonopleura guttata	Diamond Firetail		Vulnerable
Suta flagellum	Little Whip Snake		Vulnerable
Tyto novaehollandiae	Masked Owl		Vulnerable
Varanus rosenbergi	Rosenberg's Goanna		Vulnerable

5.2.2 Candidate species

Candidate species credit species predicted by the BAMC are shown in Table 5.2.

Table 5.2 Species credit species predicted to occur within the prescribed impact area

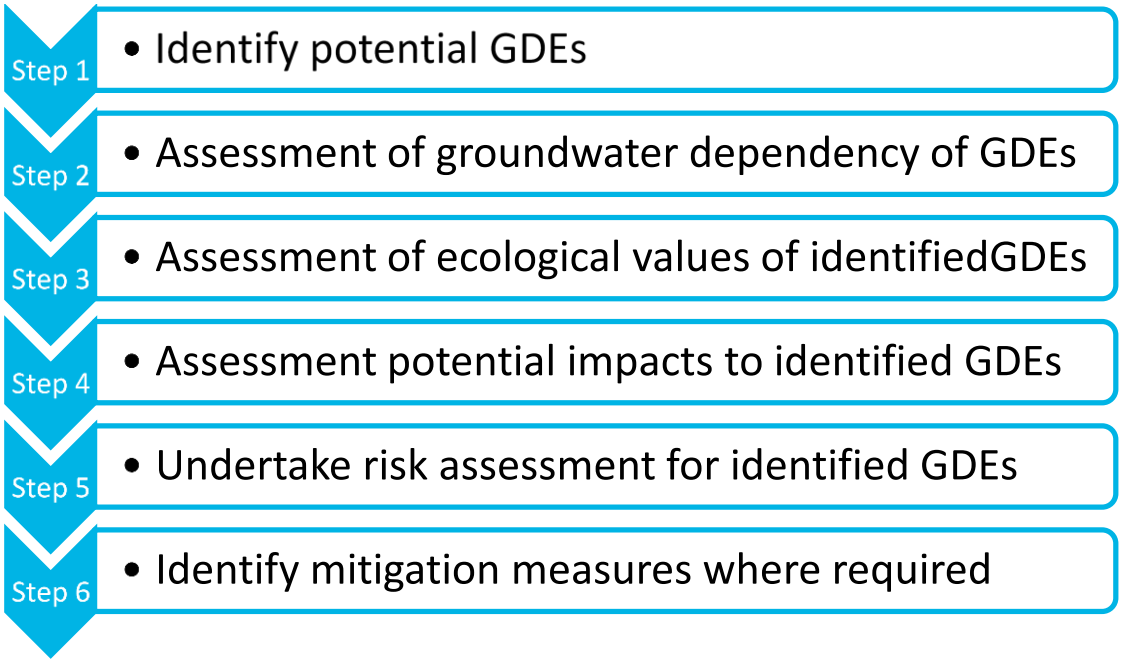
Scientific Name	Common name	EPBC Act	BC Act
Acacia flocktoniae	Flockton Wattle	Vulnerable	Vulnerable
Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Critically Endangered
Aprasia parapulchella	Pink-tailed Legless Lizard	Vulnerable	Vulnerable
Baloskion longipes	Dense Cord-rush	Vulnerable	Vulnerable
Boronia deanei	Deane's Boronia	Vulnerable	Vulnerable
Bossiaea oligosperma	Few-seeded Bossiaea	Vulnerable	Vulnerable
Caladenia tessellata	Thick Lip Spider Orchid	Vulnerable	Endangered
Callitris oblonga	Pygmy Cypress Pine	Vulnerable	Vulnerable
Callocephalon fimbriatum	Gang-gang Cockatoo		Vulnerable
Calyptorhynchus lathami	Glossy Black-Cockatoo		Vulnerable
Cercartetus nanus	Eastern Pygmy-possum		Vulnerable
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable
Delma impar	Striped Legless Lizard	Vulnerable	Vulnerable
Dillwynia glaucula	Michelago Parrot-pea		Endangered
Diuris aequalis	Buttercup Doubletail	Vulnerable	Endangered
Diuris tricolor	Pine Donkey Orchid		Vulnerable
Eucalyptus aggregata	Black Gum	Vulnerable	Vulnerable
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	Endangered	Endangered
Eucalyptus recurva	Mongarlowe Mallee	Critically Endangered	Critically Endangered
Genoplesium superbum	Superb Midge Orchid		Endangered
Grevillea renwickiana	Nerriga Grevillea		Endangered
Haliaeetus leucogaster	White-bellied Sea-Eagle		Vulnerable
Heleioporus australiacus	Giant Burrowing Frog	Vulnerable	Vulnerable
Hieraaetus morphnoides	Little Eagle		Vulnerable
Hoplocephalus bungaroides	Broad-headed Snake	Vulnerable	Hoplocephalus bungaroides
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Endangered	Isoodon obesulus obesulus
Kunzea cambagei	Cambage Kunzea	Vulnerable	Kunzea cambagei
Lathamus discolor	Swift Parrot	Critically Endangered	Endangered
Leptospermum thompsonii	Monga Tea Tree	Vulnerable	Vulnerable
Leucochrysum albicans var. *tricolor*	Hoary Sunray	Endangered	Not Listed

Table 5.2 Species credit species predicted to occur within the prescribed impact area

Scientific Name	Common name	EPBC Act	BC Act
Litoria aurea	Green and Golden Bell Frog	Vulnerable	Endangered
Litoria booroolongensis	Booroolong Frog	Endangered	Endangered
Litoria littlejohni	Littlejohn's Tree Frog	Vulnerable	Vulnerable
Lysimachia vulgaris var. *davurica*	Yellow Loosestrife		Endangered
Miniopterus australis	Little Bent-winged Bat		Vulnerable
Miniopterus orianae oceanensis	Large Bent-winged Bat		Vulnerable
Mixophyes balbus	Stuttering Frog	Vulnerable	Endangered
Myotis macropus	Southern Myotis		Vulnerable
Ninox connivens	Barking Owl		Vulnerable
Ninox strenua	Powerful Owl		Vulnerable
Persoonia mollis subsp. *revoluta*	*Persoonia mollis* subsp. *revoluta*		Vulnerable
Petalura gigantea	Giant Dragonfly		Endangered
Petauroides volans	Greater Glider	Vulnerable	Not Listed
Petaurus norfolcensis	Squirrel Glider		Vulnerable
Petrogale penicillata	Brush-tailed Rock-wallaby	Vulnerable	Endangered
Petroica rodinogaster	Pink Robin		Vulnerable
Pezoporus wallicus wallicus	Eastern Ground Parrot		Vulnerable
Phascolarctos cinereus	Koala	Vulnerable	Vulnerable
Phyllota humifusa	Dwarf Phyllota	Vulnerable	Vulnerable
Pomaderris cotoneaster	Cotoneaster Pomaderris	Endangered	Endangered
Pomaderris delicata	Delicate Pomaderris	Critically Endangered	Critically Endangered
Potorous tridactylus	Long-nosed Potoroo	Vulnerable	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable
Pultenaea pedunculata	Matted Bush-pea		Endangered
Sminthopsis leucopus	White-footed Dunnart		Vulnerable
Swainsona sericea	Silky Swainson-pea		Vulnerable
Thesium australe	Austral Toadflax	Vulnerable	Vulnerable
Tyto novaehollandiae	Masked Owl		Vulnerable

6 Groundwater dependent ecosystems

A groundwater-dependent ecosystem (GDE) risk assessment has been completed in accordance with the *NSW Government Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (Serov et al. 2012). This assessment follows the process detailed below:



6.1 Identification of potential GDEs

Ecosystems that could rely on the surface expression of groundwater within the prescribed impact area are those associated with:

- waterways across the prescribed impact area where groundwater is discharging and provides baseflow; and
- shallow (perched) and deeper regional groundwater systems.

GDEs considered in this assessment included surface ecosystems such as

- baseflow streams (surface water ecosystems); and
- groundwater-dependent terrestrial ecosystems (phreatophytes).

GDEs were classified into three categories according to their increasing dependence on groundwater. These are categorised in Table 6.1.

Table 6.1 GDE categories and definitions

GDE category	Definition (Serov et al. 2012)
Non-dependent	Ecosystems that occur mostly in recharge areas and have no connection with groundwater.
Facultative	A GDE that is not entirely dependent on groundwater and may rely on groundwater on a seasonal basis or only during extended drought periods. At other times, water requirements may be met by soil or surface water.
Entirely dependent/obligate	Ecosystems restricted to locations of groundwater discharge, eg mound springs of the Great Artesian Basin, or within aquifers, eg subterranean cave and stygofauna communities. Typically comprise of karst, wetland and hypogean/aquifer GDEs.

Access to the groundwater is dependent on several factors with the core factor being the depth to the water table. As terrestrial vegetation communities are composed of a range of vegetation types, with a range of rooting depths and strategies, there is a relationship between groundwater depth and the types and composition of the vegetation that can access it (Serov 2013).

Considerations in evaluating surface ecosystems and their potential dependency on groundwater included:

- association with groundwater levels across the region;
- the physiology of plant species that occur in that community and their likely dependence on water availability;
- a PCTs location in the landscape; and
- if the rooting depth of vegetation would be able to take up groundwater based on likely depth of the aquifer and soil characteristics.

To identify groundwater-dependent terrestrial ecosystems (phreatophytes), an analysis was undertaken documenting the association of the PCTs previously mapped within the broader Gunlake Quarry (EMM2016, 2018) and derived from regional vegetation datasets (EcoLogical 2015) with groundwater levels as modelled by the regional numerical groundwater flow model developed as a part of the groundwater assessment (EMM 2021b). Vegetation mapping undertaken previously for the Gunlake Quarry was preferenced, where available, over regional mapping as it is considered more reliable and the data has been ground-truthed. Groundwater levels across the prescribed impact area and vegetation mapping are shown in Figure 6.1.

An intersection was undertaken in ArcGIS between PCTs mapped as a part of these previous assessments against groundwater levels in the following categories:

- <2 metres below ground level (mbgl);
- 2–5 mbgl;
- 5–10 mbgl;
- 10–20 mbgl; and
- >20 mbgl.

The percentage of each PCT within these bands was determined, and the criteria listed in Table 6.2 was applied to provide an initial determination of the dependence of PCTs within the prescribed impact area on groundwater.

Table 6.2 Criteria used for determining groundwater dependence on PCTs

Dependence on groundwater	Criteria
Entirely/obligate	More than 75% of the PCT is mapped in areas with groundwater at 2 mbgl or less.
Facultative - high	More than 50% of the PCT is mapped in areas with groundwater at 2 mbgl or less, and more than 75% of the PCT is mapped in areas with groundwater at 5 mbgl or less.
Facultative - proportional	More than 75% of the PCT is mapped in areas with groundwater at 5 mbgl or less, but less than 50% of the PCT is mapped in areas with groundwater at 2 mbgl or less.
Facultative - opportunistic	More than 75% of the PCT is mapped in areas with groundwater at 20 mbgl or less, but less than 75% of the PCT is mapped in areas with groundwater at 5 mbgl.
Non-dependent	Evenly distributed across groundwater levels, with generally less than 50% of the PCT mapped in areas with groundwater at 10 mbgl or less.

6.2 Potential GDEs

Nine PCTs occur within the modelled groundwater domain:

- PCT 731- Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion;
- PCT 840 - Forest Red Gum - Yellow Box woodland of dry gorge slopes, southern Sydney Basin and South Eastern Highlands;
- PCT 858 - Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion;
- PCT 888 - Inland Scribbly Gum - Brittle Gum low woodland of the eastern tablelands, South Eastern Highlands;
- PCT 1093 - Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion;
- PCT 1100 - Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion;
- PCT 1150 - Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion;
- PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion; and
- PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion.

A review of the Groundwater Dependent Ecosystems Atlas (BOM 2019) identified that these PCTs have a low GDE potential.

Analysis of the distribution of PCTs in relation to the simulated regional groundwater levels indicate that two PCTs have facultative association with groundwater, while three are considered non-dependent (Table 6.3).

Table 6.3 PCTs within the prescribed impact area, association with simulated groundwater levels and derived GW dependence

PCT	<2 mbgl	2–5 mbgl	5–10 mbgl	10–20 mbgl	>20 mbgl	GW dependency
PCT 731- Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion	48%	3%	6%	14%	29%	Non-dependent
PCT 840 - Forest Red Gum - Yellow Box woodland of dry gorge slopes, southern Sydney Basin and South Eastern Highlands	0%	0%	0%	0%	100%	Non-dependent
PCT 858 - Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion	0%	0%	0%	0%	100%	Non-dependent
PCT 888 - Inland Scribbly Gum - Brittle Gum low woodland of the eastern tablelands, South Eastern Highlands	32%	4%	9%	20%	35%	Non-dependent
PCT 1093 - Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	7%	2%	2%	14%	75%	Non-dependent
PCT 1100 - Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion	20%	2%	6%	41%	32%	Non-dependent
PCT 1150 - Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion	13%	7%	8%	12%	59%	Non-dependent
PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	16%	20%	43%	20%	0%	Facultative - proportional
PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	41%	5%	9%	23%	21%	Facultative - opportunistic

Notes: PCTs in bold occur within the prescribed impact area. All other PCTs occur only within the modelled groundwater domain.

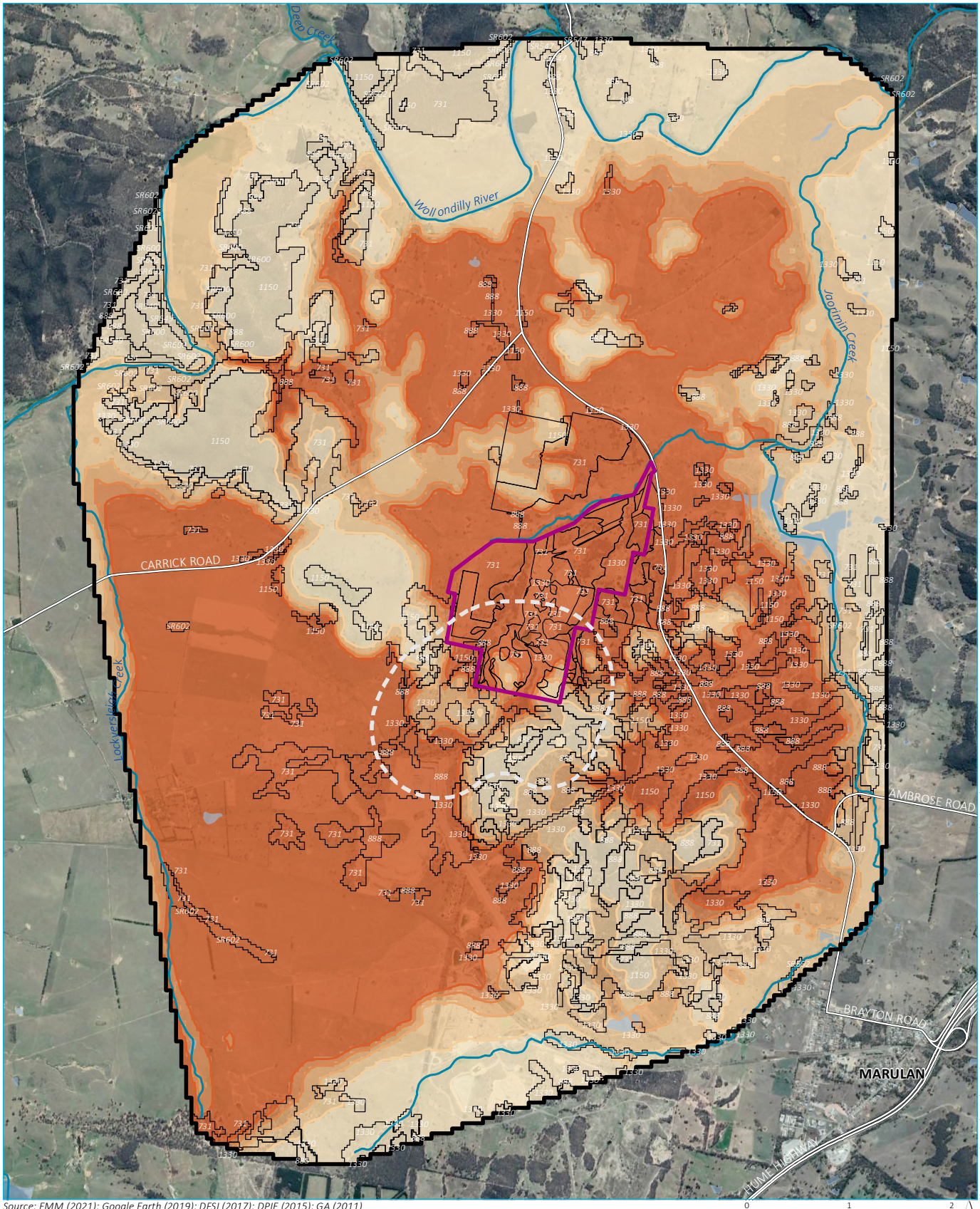
PCTs 731, 840, 858, 888, 1093 and 1150 are primarily located on mid to upper slopes and hill crests where groundwater occurs at greater depths below the ground surface. The occurrence of these PCTs is evenly distributed across the various groundwater levels. For this reason, these PCTs are deemed non-dependent on groundwater.

PCT 1100 is generally located on damp flats, in areas where surface expression of ground water could be expected to occur. The low extent of this community in areas of shallow groundwater is less than expected and may indicate the reliability of regional vegetation mapping datasets. However, as this community does not occur in the prescribed impact area this is not explored further.

PCT 1330 is primarily located along lower slopes and waterways within the prescribed impact area, where it would be expected to see groundwater expressing at shallower depths when compared to surrounding hillslopes and crests. This is reflected in the groundwater assessment. This PCT is determined to be facultative-opportunistic, in accordance with the definitions shown in Table 6.2, with 71% of the PCT mapped in areas with groundwater at 5 mbgl or less. PCTs which are considered facultative opportunistic are not considered to wholly depend on groundwater for survival; however, they are likely to use groundwater opportunistically to survive where surface water sources are absent or low, particularly during times of drought.

PCT 1256 occurs on lower slopes in impeded drainage lines, often on peats and humic loams in sediment-filled valleys. Surface expression of groundwater in these landscape positions is quite likely and this PCT may be fed by contact springs. Modelling indicates only 36% of this PCT is associated with groundwater levels <5 mbgl, with 80% associated with groundwater levels <10 mbgl. In accordance with Table 6.2, this PCT would be classified facultative-opportunistic. However, given the only occurrence of this PCT is within areas mapped by regional vegetation datasets, and the uncertainty in this data, along with inherent uncertainty in the groundwater model, this PCT was deemed to have a facultative-proportional reliance on groundwater.

The extent of mapped PCTs against modelled depth to groundwater is shown in Figure 6.1. The remainder of Section 6 only discusses GDEs within the prescribed impact area.



Source: EMM (2021); Google Earth (2019); DFSI (2017); DPIE (2015); GA (2011)

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GDA 1994 MGA Zone 55

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KEY

- Site boundary
- Prescribed impact area
- Major road
- Named watercourse
- Waterbody
- Vegetation mapping
- Groundwater model extent

Depth to groundwater (pre-mining)

- 2 mbgl
- 5 mbgl
- 10 mbgl
- 20 mbgl
- < 2 mbgl
- 2 - 5 mbgl
- 5 - 10 mbgl
- 10 - 20 mbgl
- > 20 mbgl

Mapped plant community types and modelled depth to groundwater

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Biodiversity Development Assessment Report
Figure 6.1

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6.3 Ecological values of identified GDEs

The GDEs within the prescribed impact area are deemed to have high ecological value. PCT 1330 is of high ecological value due to its listing as White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act and EPBC Act, and association with known occurrences of threatened species. PCT 1256 has the potential to support threatened species, with a conservative approach taken to the assessment of ecological value. A summary is provided in Table 6.4.

Table 6.4 Ecological value of GDEs within the prescribed impact area

Criteria	PCT 1330	PCT 1256
Does the aquifer or portion of it occur within a state reserve or support any GDEs within a subcatchment identified as High Conservation Value, eg stressed rivers; high value vegetation, SEPP wetlands, DIWA wetland, etc?	No	No
Does the aquifer support obligate/entirely dependent GDEs including: karsts, springs, mound springs, subterranean aquifer ecosystems and some wetlands such as hanging swamps.	No	No
Does the aquifer support GDEs that have any endemic, relictual, rare, or endangered biota (fauna or flora) populations or communities as listed under the *Biodiversity Conservation Act 2016*, *Fisheries Management Act 1994* or the *Environment Protection and Biodiversity Conservation Act 1999* or identified by an acknowledged expert taxonomist / regional ecologist as being important?	Listed as Critically Endangered under the BC Act and EPBC Act. Known to support threatened species.	Possible to support threatened species.
Ecological value	High	High

6.4 Assessment of predicted groundwater impacts

Predicted impacts to identified GDEs have been determined in accordance with the guidelines in Serov et al. (2012). Impact assessment has largely been restricted to predicted impacts to water quantity and biological integrity of GDEs and associated aquifers, as the Continuation Project is predicted to have negligible impacts on water quality or the geological integrity of any aquifer.

To determine the predicted impacts to surface GDEs, the area of each GDE determined in Section 6.2 within the modelled groundwater drawdown area (Figure 6.2) was determined. This data is presented in Table 6.5.

Table 6.5 Surface GDEs and the area of each GDE subject to drawdown

PCT	GW dependency	<2 mbgl	2–5 mbgl	5–10 mbgl	10–20 mbgl	>20 mbgl	Total
PCT 1330 - Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Pre-mining	35.14	9.61	17.77	20.89	20.93	104.34
	Post-mining	1.01	1.86	4.17	21.84	75.46	
PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Pre-mining	0.00	0.37	1.55	0.45	0.00	2.38
	Post-mining	0.00	0.00	0.00	0.16	2.22	

A drawdown of 2 m is predicted to extend up to 1.3 km from the edge of the pit at the end of the Continuation Project. This is less that the predicted maximum extent of the 2 m drawdown predicted for the Extension Project due to refinements in the analytical model and the collection of additional groundwater monitoring data.

PCT 1256 is predicted to experience potential impacts to less than 2.38 ha of the community with modelled drawdown of between 4 m and 14 m across the extent of the community mapped in the prescribed impact area. Given the proportional reliance of this PCT on groundwater there is a high risk of impact to this GDE within the prescribed impact area. However, the predicted drawdown will impact on 0.08% of the 3,115 ha of this PCT mapped within the local area (EcoLogical 2015). Overall impacts to community are expected to be low.

PCT 1330 is predicted to experience potential impacts to 54.53 ha of the community where groundwater drawdown is modelled to result in groundwater being at depths of >20 mbgl and thus potentially inaccessible to this portion of the community. This represents 52% of the 104 ha of the community mapped in the prescribed impact area, 0.25% of the 21,710 ha of the community mapped within the local area by EcoLogical (2015) and 0.18% of the estimated 30,000 ha of the CEEC remaining (NSWTSSC 2020). Large portions of the community occur in area where groundwater is at depths >20 mbgl prior to groundwater drawdown. This level of groundwater drawdown on a community with an opportunistic reliance on groundwater is unlikely to have any measurable effect on the ability of this community to access groundwater, except during periods of stress, and is therefore unlikely to result in any significant changes in the biological integrity of the GDEs. The extent of impact is considered minor to negligible at a local and regional scale. Given these factors, it is predicted that this facultative – opportunistic GDE is at low risk of impact, as defined in Serov et al. (2012).

6.5 Final risk assessment for identified GDEs

The GDE assessment, prepared in accordance with Serov et al. (2012), determined that all GDEs within the project area are considered as having high ecological value.

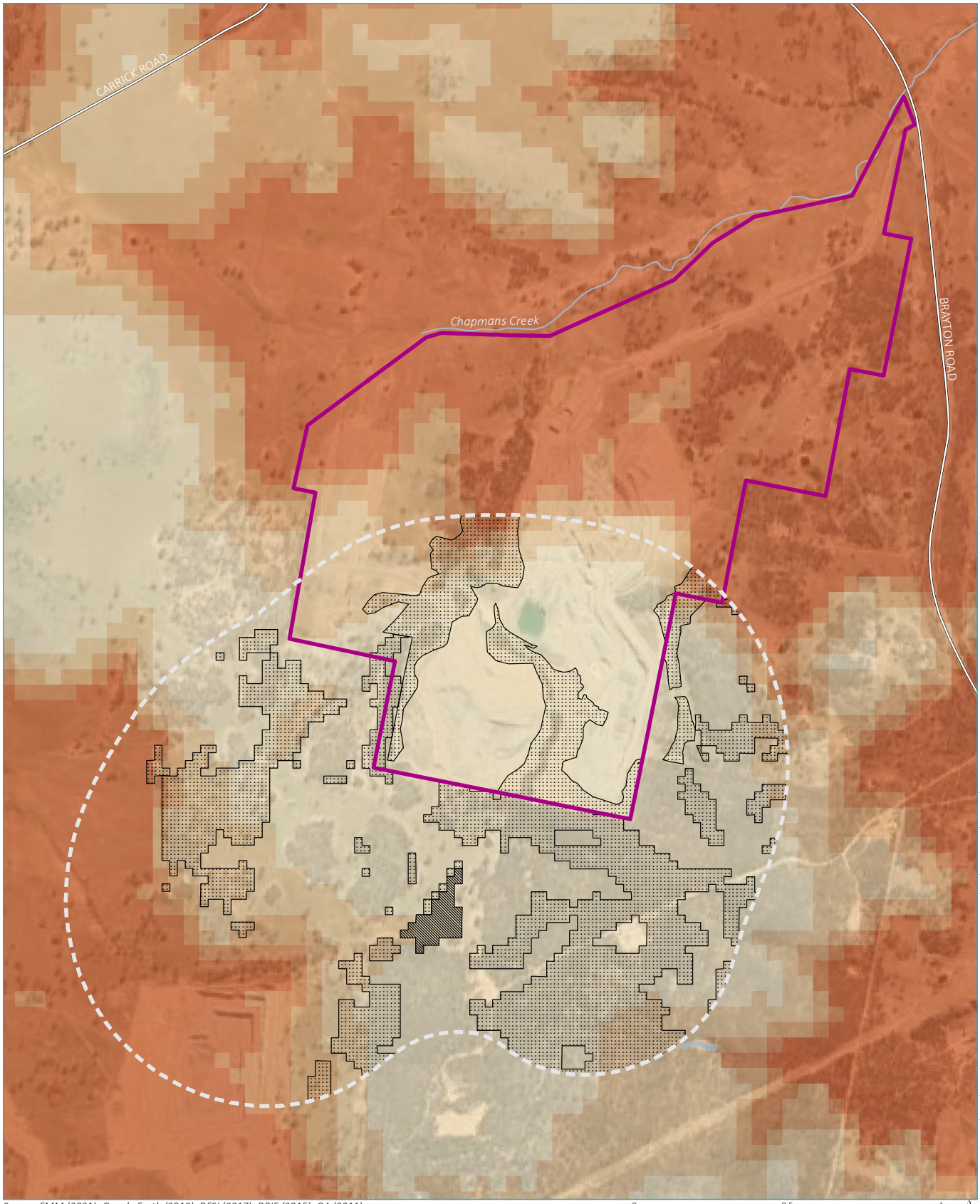
The initial risk assessment identified that PCT 1256 may be at high risk of predicted impact given the level of drawdown and the facultative – proportional dependence of this community on groundwater. However, these impacts will occur to a small portion of these communities at a local scale. Overall risk of impact is considered low.

PCT 1330 is considered to be at low risk of impact given the level of groundwater drawdown that the community is likely to experience and the small extent of the community that will be impacted at a local, regional and national scale.

The mitigation measures required by Serov et al. (2012) for GDEs at high risk include:

- protection of aquifer and GDE catchment/sub-catchments;
- monitoring to ensure no change to risk;
- mitigate impact and apply water sharing plan rules; and
- monitor effectiveness of mitigation strategy using appropriate indicators.

A monitoring program will be implemented to ensure actual impacts are within or less than predicted. If actual impacts are greater than predicted, adaptive management will be implemented. The monitoring program will be determined as a part of the Environmental Management Strategy and Soil and Water Management Plan (Gunlake Quarries Pty Ltd 2020b; 2020c).



Source: EMM (2021); Google Earth (2019); DFSI (2017); DPIE (2015); GA (2011)

0 0.5 1 km

GDA 1994 MGA Zone 55

N

KEY

- Site boundary
- Prescribed impact area
- Major road
- Named watercourse
- Waterbody

Groundwater dependent ecosystem

- 1256 | Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion
- 1330 | Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands

Depth to groundwater (post-mining)

- < 2 mbgl
- 2 - 5 mbgl
- 5 - 10 mbgl
- 10 - 20 mbgl
- > 20 mbgl

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Groundwater drawdown and GDEs

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Biodiversity Development Assessment Report
Figure 6.2

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Part B

Stage 2: Impact Assessment

7 Impact assessment

This chapter identifies the potential impacts of the project on the biodiversity values. Measures taken to date to avoid and minimise impacts are summarised and recommendations to assist in the design a development that further avoids, minimises and mitigates impacts are provided.

7.1 Potential direct, indirect, prescribed impacts and uncertain impacts

7.1.1 Direct and indirect impacts

The proposed activities will be within the previously approved (MP 07_0074/NSW LEC Approval 2017/108663) surface disturbance area and will include deepening the pit. No direct impacts will occur as there will be no further surface disturbance within the project area.

7.1.2 Prescribed and uncertain impacts

Section 8.3 of the BAM identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme. Prescribed impacts that have potential to occur include:

- changes in groundwater quantity and quality; and
- changes in surface water quantity and quality.

Prescribed impacts that are considered to have potential to occur as a result from the proposed quarry activities within the prescribed impact area are assessed in Table 7.1. Overall, prescribed impacts to GDEs arising from the Gunlake Continuation Project are predicted to be minor in both extent and/or nature and represent a low risk of impact to the GDEs at a local scale.

Table 7.1 Prescribed biodiversity impacts assessment

Criteria	Assessment response
Assessment of the impacts of the proposal on water quality, water bodies and hydrological processes that sustain threatened entities must:	
(a) describe the nature, extent and duration of short-term and long-term impacts	Impacts to GDEs identified within the prescribed impact area may result from groundwater drawdown of greater than 2 m, with impacts predicted to occur to: • 2.38 ha of PCT 1256 – Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion; and • 104.34 ha of PCT 1330 – Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion. If these occur, they could be permanent. These impacts present 0.08% and 0.48% of these communities at a regional scale (EcoLogical 2015). Given this, it is considered that overall impacts to GDEs from the proposed quarry deepening within the prescribed impact area are low.

Table 7.1 Prescribed biodiversity impacts assessment

Criteria	Assessment response
(b) predict the consequences to the threatened entities identified in Subsection 6.1.4 of the BAM	Drawdown of groundwater and changes to biological integrity, such as threatened flora and fauna habitat loss or changes in vegetation condition and structure, are consequences of impacts associated with groundwater drawdown. If these occur, they could be permanent. There is potential for these impacts to occur for PCT 1256 due to the higher reliance of this community on groundwater. If these impacts were to occur there is potential for consequent impacts on threatened species associated with this PCT. However, most threatened species associated with the PCT are not reliant on hydrological processes or are unlikely to occur. Further, the small scale of the impacts relevant to the extent of the community mean these consequent or secondary impacts are considered minor to negligible. Impacts to PCT 1330 due to groundwater drawdown are expected to be both minor in extent and nature and are unlikely to have any noticeable effect on the ability of this community to access groundwater, except during periods of stress. Threatened species associated with the PCT are not reliant on hydrological processes or are unlikely to occur. Impacts to threatened entities arising from groundwater drawdown for this community are considered negligible. Changes in baseflow to Chapmans Creek will result from the Continuation Project, with a predicted 4.6% decrease in baseflow (EMM 2021b). Chapmans Creek does not provide habitat for any threatened entities reliant on hydrological processes.
(c) where the proposed impact is in relation to longwall mining, calculate the maximum predicted offset liability as per the Addendum to NSW Biodiversity Offsets Policy for Major Projects: upland swamps impacted by longwall mining subsidence, using predictions of impacts on water-dependant plant communities and the threatened species they support	The prescribed impacts are not in relation to longwall mining.
(d) justify predictions of impacts with appropriate modelling (if available), relevant literature and other published sources of information, or consultation with species experts.	Mapping of potential GDEs was undertaken using a combination of review of regional datasets. Further analysis was undertaken to look at the association of GDEs with shallow groundwater in the regional system based on modelling of depth to groundwater. This process is outlined in Section 6.

Prescribed impacts not relevant to the prescribed impact area are justified in Table 7.2.

Table 7.2 Prescribed biodiversity impacts not related to the project

Prescribed Impact	Justification
Assessment of the impacts of the proposal on threatened entities associated with karst, caves, crevices, cliffs, rocks and other geological features of significance.	No karst, caves, crevices, cliffs, rocks and other geological features of significance are present within the prescribed impact area.
Assessment of the impacts of the proposal on the habitat of threatened entities associated with human-made structures or non-native vegetation	No surface impacts are predicted to occur above the prescribed impact area.

Table 7.2 Prescribed biodiversity impacts not related to the project

Prescribed Impact	Justification
Assessment of the impacts of the proposal on connectivity of habitat of threatened entities must.	No clearing of vegetation is going to occur as a result of the project, both within the project area and the prescribed impact area. Therefore, there will be no impacts on connectivity of habitat for threatened entities.
Assessment of the impacts of wind turbine strikes on protected animals.	No wind turbines are associated with this project.
Assessment of the impacts of vehicle strikes on threatened fauna or fauna.	No surface disturbances or construction activities within the prescribed impact area will occur as a result of the project. There will be an increase in the maximum number of daily product truck movements on public roads from 590 to 750 as a result of the Continuation Project. The traffic impact assessment identified that this will be a small percentage increase of existing traffic levels (EMM 2021c). A slight increase in traffic movement is unlikely to substantially impact fauna within the locality.

7.2 Measures to avoid, minimise and mitigate impacts

7.2.1 Avoidance, minimisation and mitigation strategy

Table 7.3 describes the key measures implemented through the project to avoid, minimise and mitigate biodiversity impacts.

Table 7.3 Impact avoidance, minimisation and mitigation strategy

Impact	Action	Intended outcome	Timing	Responsibility
Drawdown on the regional groundwater systems and impacts to GDEs.	Groundwater monitoring should continue in accordance with the Gunlake Quarries Soil and Water Management Plan (Gunlake Quarries Pty Ltd 2020b; 2020c).	Ensure groundwater drawdown measured through monitoring is consistent with the predictions in the groundwater assessment (EMM 2021b) both in terms of extent and nature.	Throughout the life of the quarry within the project area and for two years after closing.	Gunlake Quarry

7.3 Serious and Irreversible Impacts

7.3.1 Threatened ecological communities

White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC which is likely to occur within the prescribed impact area is listed as a candidate entity for Serious and Irreversible Impacts (SAII). Given there will not be any direct impacts to this CEEC an assessment of SAII to this community is not warranted.

7.3.2 Threatened species

Section 9.1.2 of BAM requires additional impact assessment for threatened species that are also listed as candidate entities for Serious and Irreversible Impacts (SAII). Fourteen SAII species are assumed present, based on the PCTs within the prescribed impact area:

- Regent Honeyeater (important habitat);
- Swift Parrot (important habitat);
- Large Bent-winged Bat (breeding)
- Broad-headed Snake;
- Large-eared Pied Bat;
- Brush-tailed Rock-wallaby;
- Stuttering Frog;
- Giant Dragonfly;
- Thick Lip Spider Orchid;
- Mongarlowe Mallee;
- Superb Midge Orchid;
- Nerriga Grevillea;
- Yellow Loosestrife; and
- Delicate Pomaderris.

There will not be any direct impacts to native vegetation or habitat for threatened species. As such, an assessment of SAII to these species is not warranted.

7.4 Offsets

As the project will not result any direct impacts to native vegetation or habitat for threatened species, and that prescribed/uncertain impacts to GDE are considered highly unlikely to occur, offsets are not required other than those already provided.

8 Assessment of other relevant biodiversity legislation

8.1 Environment Protection and Biodiversity Conservation Act 1999

8.1.1 Likelihood of occurrence assessment

Three listed threatened ecological community (TECs) are predicted to occur within the study area based on a search of the PMST:

- Natural Temperate Grassland of the South Eastern Highlands (Critically Endangered);
- Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion (Endangered); and
- White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered)

No direct and/or indirect impacts will occur to these communities as there will be no surface disturbance works.

Fifty-six threatened flora and fauna, and migratory species were predicted to occur within the study area (PMST search). These species are shown in Table 8.1. None of these threatened species or communities or migratory species will be impacted as there will be no direct and/or indirect impacts.

The Continuation Project will not result in any direct or indirect impacts to threatened species or communities or migratory species listed under the EPBC Act. The project will not result in a significant impact to any MNES and referral of the project to DAWE is not required. The existing DAWE approval will continue to operate.

Table 8.1 Threatened flora, fauna and migratory species predicted to occur within the study area

Scientific name	Common name	Listing
Flora		
Acacia bynoeana	Bynoe's Wattle	Vulnerable
Caladenia tessellata	Thick Lip Spider Orchid	Vulnerable
Commersonia prostrata	Dwarf Kerrawang	Endangered
Eucalyptus aggregata	Black Gum	Vulnerable
Eucalyptus aquatica	Broad-leaved Sally	Vulnerable
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	Endangered
Genoplesium baueri	Bauer's Midge Orchid	Endangered
Haloragis exalata subsp. exalata	Square Raspwort	Vulnerable
Kunzea cambagei	Cambage Kunzea	Vulnerable
Lepidium hyssopifolium	Aromatic Peppercress	Endangered
Leucochrysum albicans subsp. tricolor	Hoary Sunray	Endangered

Table 8.1 Threatened flora, fauna and migratory species predicted to occur within the study area

Scientific name	Common name	Listing
Phyllota humifusa	Dwarf Phyllota	Vulnerable
Pomaderris brunnea	Brown Pomaderris	Vulnerable
Pomaderris cotoneaster	Cotoneaster Pomaderris	Endangered
Pomaderris delicata	Delicate Pomaderris	Critically Endangered
Pomaderris pallida	Pale Pomaderris	Vulnerable
Rhizanthella slateri	Eastern Australian Underground Orchid	Endangered
Rutidosis leptorhynchoides	Button Wrinklewort	Endangered
Senecio macrocarpus	Large-fruit Fireweed	Vulnerable
Thelymitra kangaloonica	Kangaloon Sun Orchid	Critically Endangered
Thesium australe	Austral Toadflax	Vulnerable
Fauna - mammals		
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tailed Quoll	Endangered
Petauroides volans	Greater Glider	Vulnerable
Petrogale penicillata	Brush-tailed Rock-wallaby	Vulnerable
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)	Koala	Vulnerable
Pseudomys novaehollandiae	New Holland Mouse	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Fauna - reptiles		
Aprasia parapulchella	Pink-tailed Legless Lizard	Vulnerable
Delma impar	Striped Legless Lizard	Vulnerable
Fauna - insects		
Synemon plana	Golden Sun Moth	Critically Endangered
Fauna - fish		
Macquaria australasica	Macquarie Perch	Endangered
Prototroctes maraena	Australian Grayling	Vulnerable
Fauna - birds		
Anthochaera phrygia	Regent Honeyeater	Critically Endangered
Botaurus poiciloptilus	Australasian Bittern	Endangered
Calidris ferruginea	Curlew Sandpiper	Critically Endangered; Migratory
Falco hypoleucos	Grey Falcon	Vulnerable

Table 8.1 Threatened flora, fauna and migratory species predicted to occur within the study area

Scientific name	Common name	Listing
Grantiella picta	Painted Honeyeater	Vulnerable
Hirundapus caudacutus	White-throated Needletail	Vulnerable; Migratory
Lathamus discolor	Swift Parrot	Critically Endangered
Numenius madagascariensis	Eastern Curlew	Critically Endangered; Migratory
Polytelis swainsonii	Superb Parrot	Vulnerable
Rostratula australis	Australian Painted Snipe	Endangered
Migratory		
Actitis hypoleucos	Common Sandpiper	Migratory
Apus pacificus	Fork-tailed Swift	Migratory
Calidris acuminata	Sharp-tailed Sandpiper	Migratory
Calidris ferruginea	Curlew Sandpiper	Migratory; Critically Endangered
Calidris melanotos	Pectoral Sandpiper	Migratory
Gallinago hardwickii	Latham's Snipe	Migratory
Hirundapus caudacutus	White-throated Needletail	Migratory; Vulnerable
Monarcha melanopsis	Black-faced Monarch	Migratory
Motacilla flava	Western Yellow Wagtail	Migratory
Myiagra cyanoleuca	Satin Flycatcher	Migratory
Numenius madagascariensis	Eastern Curlew	Migratory; Critically Endangered
Pandion haliaetus	Osprey	Migratory
Rhipidura rufifrons	Rufous Fantail	Migratory

8.2 Fisheries Management Act 1994

The quarry layout and quarrying methods will remain consistent with those currently approved.

While there is an increase in the maximum depth of the extraction area from 572 mAHD to 546 mAHD, with a minor 4.6% reduction in baseflow to Chapmans Creek due to dewatering for quarry development (EMM 2021b), this degree of impact is considered unlikely to have a significant impact on any threatened aquatic species, populations or communities, or key fish habitat.

The existing water management system (Gunlake Quarries Pty Ltd 2020c) will continue under the Continuation Project and no changes are proposed.

8.3 Biosecurity Act 2015

Gunlake Quarry operates according to the Gunlake Quarry Environmental Management System that has been approved by DPE and includes Biodiversity and Rehabilitation Management Plan (Gunlake Quarries 2015).

The Biodiversity and Rehabilitation Management Plan identifies five weed species previously listed under the repealed *Noxious Weeds Act 1993*. Weed species are now controlled under the Biosecurity Act, under which the project area is located within the South East region (which includes the Goulburn Mulwaree LGA). These species and their biosecurity duty measures are outlined in Table 8.2.

Table 8.2 Priority weeds for the South-East previously identified within the Biodiversity and Rehabilitation Management Plan

Scientific name	Common name	Biosecurity Duty
Rubus fruticosus	Blackberry	**Prohibition on dealings** Must not be imported into the State or sold
Echium plantagineum	Paterson's Curse	Not listed as a priority weed
Nassella trichotoma	Serrated Tussock	**Prohibition on dealings** Must not be imported into the State or sold **Regional Recommended Measure** *Core infestation*: whole region except the exclusion zone of Shoalhaven, Eurobodalla, Kiama, Wollongong, Bega Valley and Shellharbour councils *Whole region*: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: Land managers should mitigate spread from their land. Core area: Land managers reduce impacts from the plant on priority assets.
Hypericum perforatum	St. Johns Wort	Not listed as a priority weed
Rosa rubiginosa	Sweet Briar	Not listed as a priority weed

Weed control would be implemented based on the methodologies outlined within the Biodiversity and Rehabilitation Management Plan (Gunlake Quarries 2015) and would include existing and new weed species which may encroach into the project area.

8.4 Water Management Act 2000

As described in the Gunlake Quarry Continuation Project Groundwater Assessment (EMM 2021b), groundwater impacts are predicted to be minor and locally confined to around the quarry pit. Groundwater inflows to the pit of up to 68 megalitres per year (ML/year) are predicted and licensing of these inflows is required from either market trading or obtaining a new licence from unallocated water in the *Groundwater Water Sharing Plan* under the *Water Management Act 2000*. There is sufficient water volume within the market or within the next controlled allocation order to allow the required WAL (or WALs) to be obtained. A drawdown of 2 m is predicted to extend up to 1.3 km from the edge of the pit at the end of the Continuation Project. There are no impacts predicted at nearby landholder bores. Groundwater levels in 2007 (prior to quarrying) were similar to those in 2020, indicating that quarry operations to date have not impacted ground level levels.

The final landform will create an inward hydraulic gradient preventing the discharge of water from the pit into the fractured rock groundwater source. Salinities within the pit may increase slightly over time, however because of the inward gradient there is negligible risk to groundwater in the regional fractured rock or adjacent surface water features. There will be no impact on the beneficial use class of the groundwater source (ie less productive and used for stock).

No cumulative groundwater impacts are predicted.

The level of impact to the water table, water pressure and groundwater quality are considered to be less than the Level 1 minimal impact considerations under the NSW Aquifer Interference Policy (AIP, DPI 2012) and are therefore considered to be acceptable.

9 Conclusion

The Continuation Project does not include any surface disturbance and will not result in any direct or indirect impacts to identified biodiversity values.

Prescribed impacts to two GDEs (PCTs 1256 and PCT 1330) may occur as a result of the project, with a small area of PCT 1256 predicted to be at high risk of impact. However, due to the extent and nature of these impacts the overall risk to these two GDEs is assessed as low.

No offsets are required for the Continuation Project.

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